JSA's information service dates back to 1972 when it opened Foreign Standards Library. The library, located in JAS's headquarters in Tokyo, contains foreign standards issued by 225 organizations (totaling 740,000) and domestic industry standards (about 5,160) published by 202 organizations besides JIS and JAS that are made available to the public free of charge. It also has libraries in Osaka and Nagoya offices.

f) Easy access to publications related to standardization

JSA has established a distribution system to provide easy access to JSA publications on JIS as well as standardization and quality control, in around 500 bookstores on special contract, and JSA headquarters and regional offices.

Program 8: Diversification of standard drafting process for increased involvement of industry

Program Description

The Ministry of Industry, controlling approximately 70% of SNI standards, plans to develop 500 draft SNI standards annually. This will be done by R&D institutions and regional institutes under BPPI. The program proposes to rationalize the draft standards development system which involves substantial amount of work, including maintenance work covering the review and revision of SNI.

Program 6 is designed to set forth the legal foundation for the rationalization and streamlining of the standards development process. This program focuses on the establishment of an actual system and structure to rationalize and streamline standards development. This is accomplished under the following strategic directions:

1) To adopt international and foreign standards as far as possible in order to limit the scope of SNI to be locally developed. This will reduce workload for standards development.
2) To entrust the development and review of draft SNI standards to industrial associations to reduce resource requirements, while reflecting opinions of the industries on the standards development process.

(1) Adoption of international and foreign standards for draft SNI

Indonesia is expected to develop its own standards in critical areas such as consumer protection, safety, public health, and environmental protection, that can be used to supplement regulatory measures by making them mandatory standards. On the other hand, it is desirable to adopt international standards such as ISO/IEC, and such foreign standards as ANSI, BS, AS, and JIS as voluntary standards after they have been translated. They can later be revised to reflect local conditions (for adaptation of foreign

standards, their copy rights should not be infringed).

(2) Outsourcing of standards development

The development of draft standards for which international or foreign standards cannot be adopted should be entrusted to industrial associations or other institutions specializing in a particular field to reduce workload. The outsourcing process should start from the organ of a technical committee within an industrial association to which the development process shall be is entrusted. At the initial stage, the officer in charge of standards development should provide necessary assistance and advice to develop the ability by attending technical committee meetings. The government should subsidize costs and expenses related to the development process.

At present, draft standards are being developed by research institutions under BPPI. By entrusting the work to industrial associations, various benefits can be enjoyed, including: 1) standards meeting the needs of the industries; and 2) new draft proposals from the industrial associations expected. In addition, the outsourcing will provide hands-on experience to industrial associations in facilitating the development of industry standards.

(3) Entrusting of review of existing standards

SNI is expected to review every standard every five years after its initial establishment or revision. It is important to ensure that all the SNI standards are updated to make them suitable for intended purposes all the time. In reality, however, the ability and resources for reviewing every standard periodically is extremely limited, so it is recommended to entrust the work to industrial associations specializing in respective fields[8].

(4) Encouragement of industry standards

While some industries and associations in various fields participate in the SNI standards development process with request of the government, they still have to develop their own standards (industry standards). In the future, these organizations may be encouraged to develop their own standards, which can be promoted to SNI standards after a certain period of practical application. As they gain experience in standards development, they can be entrusted with development of draft SNI standards and the

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[8] JIS is reviewed every five years after its establishment or revision. Any standard consistent with current technology trends and requirements is "verified", and those that are not are "revised" to incorporate latest data and information. On the other hand, product standards may be abolished if a particular product is no longer manufactured. This helps reduce workload required for maintenance of standards.

review process, contributing to acceleration of the standardization project and the streamlining of the standards establishment process.

Key Success Factors

1) The most important element of the program is to promote participation of the industries in the standards development and revision process. In Indonesia where national standards are not widely used, ensuring active participation of the industries seems to be a difficult task. Nevertheless, it is still more important to encourage participation of the industries than to achieve the target number of standards development.
2) Even if development of draft standards is entrusted to private organizations, the government's standardization organizations need to communicate the government's intent and maintain neutrality of standards development by sending their representatives to technical committees drafting standards. In case the government have heavier financial burdens from development of standards, the revenues of promotional system revenues from sales of standards may be used to partially cover the government's cost burden.

Suggestion for Implementation

(1) Organizational setup

1) Leading agency: PUSTAN, MOI, and other standardization organizations under various ministries and agencies
2) Other supporting and implementation bodies: Standardization and quality control promotion organization (Program 7)

(2) Implementation steps

Implementation steps are described as follows.

Year :	1st	2nd	3rd	4th	5th
Program 8: Diversification of standards drafting process for increased involvement of industry					
1) Consensus on increased adoption of int'l & foreign standards					
2) Promotion of QC					
3) Encouragement of association standards					
4) Increased involvement of industry in standards development					
Program 6: Decision of delegation of authority					
Program 7:Organization for standard'n and QC promotion					

Note: The above steps includes the first phase only.

Recommendation 6: Encouragement of Industry Standards[9)]

Promotion of the national standardization project needs to be proceeded in consideration of the current levels of ongoing standardization projects, namely international, national, association (industry), and internal standards. In particular, the development of industry standards is most closely associated with national standardization efforts.

This means, if the standardization process is accelerated through discussion between parties in the same industry, it brings benefits to related persons and companies quickly and timely. Then if a trade organization can expand its standardization activity into the national level under collaboration with other trade organizations, the process will further accelerate and produce more benefits. This approach is advantageous in that standardization at the national level can be initiated by related industries, rather than the wholesale approach that takes a relatively long period of time within which to gain consensus among a variety of industries. Typical examples are standardization for new products to be commercialized in the near future, and those related to the subject affecting common interest of a particular industry, such as consumer safety, public health, and environmental protection. These activities are critical in the forefront stage for the national standardization process. At the same time, the process is used for unification and simplification of detailed specifications applicable to a particular product in a particular industry, which cannot be readily dealt with in the national standardization process.

Following are the items suitable for association standardization:

1) Establishment of testing methods for new products;
2) Definition of product specifications;
3) Securing of product quality standards;
4) Introduction and dissemination of new technology (to the industry);
5) Long-term preservation of traditional technology; and
6) Cooperation to national standardization activity (including the development of draft SNI standards).

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9) Standardization activity of industry organizations in Japan: Standardization activity of Japanese industry organizations is highly invigorated. As of the end of December 1994, 196 organizations owned 5,164 standards in total. In addition, 542 organizations are developing draft JIS standards under contract with the Japanese government and/or Japan Standards Association. The development of industry standards in Japan peaked during the high economic growth period between the 1960s and the 1970s when the economy expanded rapidly and when a wide range of products in large volumes, including raw materials, parts and semi-finished products, were traded between companies in a complex way. Since the national industrialization process was unable to handle detailed specifications of diverse products used in each industry, industry organizations started to develop their own standards.

Program 9: Increase in public confidence on product certification system

Program Description

The certification system is a very effective instrument for promotion of standardization and quality control. In Indonesia, however, it is rarely used except for the industrial electrical equipment industry as it is required to obtain certification for products procured by PLN. This is because: 1) the present certification system is not well known by consumers and users and thus, is not widely used in the industries; and 2) because of insufficient operating rules including mandatory certification, the system is not fully relied on. This program embodies some suggestions to develop the certification system into the one that meet industrial needs, and is widely used among the related industries. It is assumed that the following actions will be taken for this purpose:

1) Increase in usefulness
   a) Reappraisal of priority for mandatory certification according to industrial needs
   b) Proposal of new areas of mandatory standards in response to increasing participation of industry organizations
   c) Designation of priority items for voluntary certification and implementation of advertising activity
2) Securing of reliability
   a) Separation of safety and quality marks
   b) Unification and redefinition of procedural rules of ministries and agencies
   c) Development of the testing and inspection system for certification
   d) Development of the calibration system
   e) Maintenance of certification levels by full enforcement of the certification system
   f) Training of assessors and inspectors

(1) Reviewing of certification items

As discussed in programs targeting the standardization project, the SNI establishment and revision process that forms the basis of the SNI mark system should be proceeded by encouraging voluntary participation of the private sector, particularly of related industries.

The scope of certification, namely the order of priority for products subject to mandatory certification needs to be reviewed. This is particularly important to ensure a complete enforcement of certification procedures as will be discussed later.

Similarly, priority products should preferably be designated for voluntary certification taking account of the capacity of minimum-required testing equipment, and

also, efforts should be made to promote the certification system for these products. To this end, selection of priority products will be made with the cooperation of industries. In particular, since raw materials and parts are commonly used by various industries, the interest for their selection will attract participation of the industries. Also, these items can enjoy the benefits of the marking system, such as simplification of acceptance inspection.

(2) Separate operation of safety mark and quality mark

The certification system under SSN contains both mandatory marks intended for regulatory purposes, such as "product safety mark certification system", and voluntary certification marks. They have are very different purpose and nature and so are their treatement. They should be made into separate certification systems.

The mandatory certification system in the case of safety, uses a special "product safety mark" for the clear purpose of "protecting consumer safety." Such marking system may require certification for each model, basically consisting of "product test" and "shop inspection." This principle can apply to other areas, such as safety of mines, traffic safety, and import and export control of products.

Also, they are related to regulatory measures, not within the scope of the standards and certification system. Thus, the standardization project should limit its role to the provision of standards required for a particular purpose.

On the other hand, the (voluntary) quality mark system is used to certify that the quality, performance and other attributes of a product conform to specific standards. The present SNI mark system will be established to fulfill the latter purpose.

This problem will become apparent when all the areas designated to each ministries are controlled under the SNI mark system. In the past, many areas under their jurisdiction have been regulated by it using mandatory certification. If all the mandatory certifications are implemented under the unified national standardization project, and approved at the DSN level, the areas under the jurisdiction of different ministries have to be discussed at the DSN level.

Furthermore, the present coexistence of mandatory and voluntary certification create confusion among industries about the present certification system.

(3) Establishment of unified procedural rules among ministries and agencies

1) Unification of operating rules for the SNI mark system among ministries and agencies

At present, the Ministry of Industry is developing relevant regulations including

ministerial ordinances. Similarly, other ministries and agencies are developing operating rules on the basis of Cabinet Order No.15-1991 and Presidential Decree No.12-1991. In addition, further promotion of the SNI mark will require the unification of application procedures, review methods, and other operating rules of different ministries that govern applicants of the SNI mark system.

2) Disclosure and publicizing of the procedural rules

Procedural rules related to the SNI mark system can be used as the effective means to review the standardization and quality control system of each company, thus they should be published in a book, and widely circulated.

3) Definition of positioning of private certification organizations in the KAN system.

(4) Full enforcement of procedural rules

The Ministry of Industry has been enacting procedural rules for the SNI mark system, including basic rules as well as operating rules for the system based on ministerial ordinances. In the future, the ministry is expected to promote the system under these rules. For this purpose, there must be an organizational setup that will fully enforce the rules to achieve the purpose of the system. In particular, the SNI mark system requires certification for both product standards and quality systems, and major issues to ensure full enforcement of these operational rules for each certification are described as follows.

1) Product standards certification

SSN's accredited testing laboratory take product samples, conduct tests for SNI's requirements, and accept or reject the test results. On the other hand, certification of compliance is accepted for any product standards. In other words, to ensure full enforcement of procedural rules, a complete set of testing equipment capable of handling tests for all the SNI product standards is required.

In fact, the testing laboratory national network currently promoted by SSN is designed to secure such testing resources. In reality, however, it is very difficult for the network to secure testing equipment required for all the standards. Moreover, the present rules may prevent new product standards from being established unless it is demonstrated that required tests can be conducted by any of the accredited laboratories, affecting that the future SNI expansion plan.

2) Quality systems certification

The SNI mark system incorporates quality system certification under ISO 9000 series. The certification system however, has two problems. First, it requires strict qualification for assessors who are difficult to find in any country. Another is related to difficulty of applying the certification system to small-and-medium-sized enterprises.

The following actions are recommended to overcome these problems:

1) Testing facilities and equipment

To provide a complete set of testing facilities and equipment requires large amounts of fund, and a lot of manpower. In addition, as SNI increasingly covers high-tech products with the technological advancement of industries, new testing equipment that meet the emerging needs become necessary. Alternatively, testing equipment owned by manufacturers can be used for the purpose. For instance, if an applicant is found to own properly calibrated equipment for testing and inspection on quality required by a particular SNI product standard, the applicant should be allowed to conduct required tests with the attendance of an assessor who accepts or rejects the test results. This way, workload of the accredited testing laboratory can be reduced, while saving some time and cost on the part of the applicant, as a result of simplified procedures.

The assessor's attendance at the compliance test can be done in the following way:

a) On the day of assessment, test specimen is collected at random from a lot or batch for which final inspection has been completed.
b) The current state of testing equipment used by the applicant is checked.
c) The test using the specimen is conducted with the attendance of the assessor who checks whether the test is carried out with the use of the above testing equipment, in accordance with the specified testing method.
d) The assessor checks the test result and accepts it, if it is sufficiently within a range of past acceptable test results given a tolerance.

2) Securing of assessors for quality system certification

Although efforts have been made to increase the number of assessors with higher ability, the result is still far from satisfactory[10]. Also, the number of certification organizations is very small (only three at present, and two are waiting for accreditation). They should be increased as early as possible and ready for assignment throughout the country.

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[10] At present, there are 10 provisional assessors, 3 qualified assessors, and 32 internal auditors.

Assessors should be trained in a planned manner. An example of the training program is shown in Chart 8-3. To train assessors in the short term, on-the-job training that involves field work assisted by experienced assessors is most effective.

Also, if products eligible for marking may be designated in a planned manner, as done in the JIS marking system, it will allow the reinforcement of testing facilities and equipment as well as, training of assessors to be proceeded consistently with product designation.

3) Dissemination of quality system certification to small-and-medium-sized enterprises

Quality system certification under the SSN is not limited to those under ISO 9000 series, but includes self-declaration under ISO 9000. This is highly suitable for small enterprises which face difficulty in certifying the quality system under ISO 9000 series.

Furthermore, for small enterprises which experience difficulty in using the system, the development and dissemination of the modified quality control system proposed in Program 3 is called for.

Key Success Factors

1) Except for the Ministry of Industry, most ministries and agencies are still in the preparation stage for KAIT that shall form the backbone of the certification and accreditation system. The establishment of KAIT and operating manuals (including related ministerial orders) should be completed as early as possible to make the system ready for operation.
2) The program requires some changes, in addition to the basic concept of existing (under development) certification system, but does not require overall reforms. The improvement should be done as part of the implementing actions for the existing system as far as possible, with due care of not forcing the process of developing the system to revert back to its starting point.
3) To completely enforce procedural rules while ensuring the expansion of the certification system, the key lies on the ability of the organ to operate the certification system. Consideration should be given to the simplification and streamlining of certification and accreditation services by separating the organ's authority to decide on key policies and plans, from the day-to-day management responsibility, by means of delegation of authority.

Suggestion for Implementation

(1) Organizational setup

1) Leading agency: DSN

2) Other supporting and implementation bodies: Standardization organizations of ministries

(2) Implementation steps

Implementing steps are shown below.

Year :	1st	2nd	3rd	4th	5th
Program 9: Increase in public confidence on product certification system					
1) Change in the scope of system to limit to voluntary certification	▬				
2) Review of the items based on the above		▬	▬		
3) Revision of testing labo accreditation scheme	▬				
4) Establishment of same procedure guideline among ministries	▬				
5) Training program for quality system certification assessors	▬	▬	▬	▬	
Program 3: Certification scheme of QC system for SMEs				△	

(*) Including separate operation of safety mark and quality mark.

Note: The above steps include the preparation and first phase operation only.

Thrust 4: Establishment of an Internationally-Recognized Accreditation and Certification System

Program 10: Promotion of international mutual recognition of certification system

Program Description

With the assessment and registration of the quality system under ISO 9000 series becoming a global phenomenon, attention is also raised to demand mutual approval of the system under a bilateral or multilateral arrangement. This move, if successfully progressed, will further unleash market globalization.

Nevertheless, mutual certification on a bilateral basis involves various special factors in addition to a standard form of mutual approval at an international level, and thus would be very difficult to achieve unless there is an internationally recognizable national system.

The program is designed to prepare for the goal of bilateral mutual certification.

(1) Reappraisal and full enforcement of the existing accreditation and certification system based on the ISO/IEC system

As pointed out earlier, mutual certification on a bilateral basis involves various special factors in addition to a standard form of mutual approval at an international level,

necessitating a phased approach. As a first step, standards should achieve a level required for general form of international approval. The basis of international certification will be the global ISO/IEC Quality System Assessment Recognition Program which will soon become effective. Also, the IECQ system having more than 10 years of track record can be used in the area of electronic components.

Under the certification system, accrediting organizations registered with the ISO/IEC system mutually evaluates each other's capabilities. Once they recognize that they have similar levels of capability with sufficient technical reliability, certification services of certifying by certification organizations, and accredited by the accreditation organizations are assumed to be equivalent and mutually recognizable. The evaluation process is based on philosophy of certification, technology, capability and reliability at a practical level, with two organizations expecting to agree on the following areas:

1) The current state of preparation of operating manuals and their levels;
2) Performance, namely, documentation on certification record, the total number of certifications issued, evaluation methods and levels, and response to the result, etc.;
3) Levels of companies certified

Thus, the first step of the program involves the review of the existing system based on the ISO/IEC certification and accreditation system.

Then, based on the result of the review, the certification system should be fully operated to gain further record and experience, which form the prerequisite to the next step.

(2) Promotion of joint assessment and mutual surveillance with foreign certification body

Assuming that the two certification organizations have recognized that their technical levels used in the assessment process are more or less the same, and that there is sufficient technical reliability, they move one step further at a certain stage of progress, and these involve the exchange of the memorandum of understanding, and joint assessment and mutual surveillance. These activities are effective in reinforcing the technical reliability between the two organizations.

Finally, before making mutual certification, policy and economic aspects have to be taken into account. Nevertheless, basic requirements for mutual certification are fulfilled by mutual verification of technical reliability in assessing each organization, and thus, the above preparation process constitutes a vital and indispensable step.

Key Success Factors

The most important element of the program is to ensure complete implementation of the certification system that has been reviewed on the basis of generally and internationally recognizable standards, and to gain sufficient experience and record. On this basis, Program 9 serves to form its prerequisite.

Suggestion for Implementation

(1) Organizational setup

1) Leading agency: DSN

2) Other supporting and implementation bodies: Standardization organizations of ministries

(2) Implementation steps

Implementing steps are shown below.

Year :	1st	2nd	3rd	4th	5th
Program 10: Promotion of international mutual recognition of certification system					
1) Review of the existing system based on ISO/IEC system					
2) Complete operation of the system according to the above guideline					
3) Joint assessment and mutual surveillance w/foreign certification body					
Program 7:Organization for standard'n and QC promotion					

Chart 8-1 : Industrial Standardization and Quality Control Promotion and their Contribution to Industrial Development

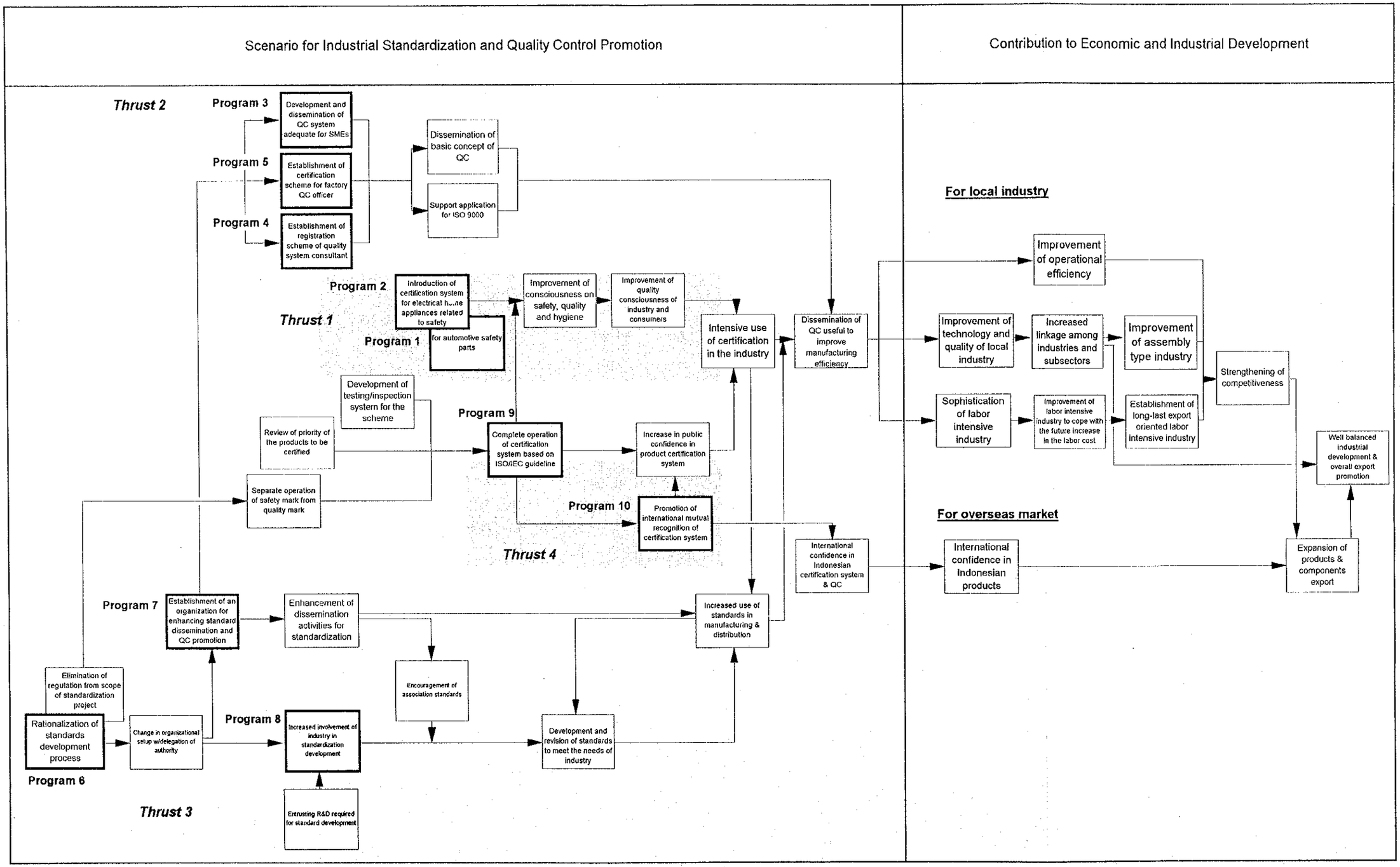

Chart 8-2 List of Testing Equipment for Electric Product (1/6)

Group I : Wire and Cables	
Abrasion Test Apparatus	
Analytical Balance	
Autoclave	
Bending Machine w/Mandrels	
Bending Test Machine	
Bunsen Burner	
Circulating Oven	
DC Voltage Source	
Desiccator	
Die Cut Apparatus	
Double Bridge	
Flame Test Apparatus	
Heater	
High Voltage Test Set	
Hot Plate	
Impact Test Apparatus	
Insulation Fault Tester	
Insulation Thickness Gauge or Profile Projector	
Lab. Glasswares	
Low Temp. Chamber	
Metal Analyzer	
Micrometer	
Micrometer Caliper	
Moisture Chamber	
Pencil Hardness Test Apparatus	
Precision Double Bridge	
Profile Projector	
Reciprocating Scrape Test	
Soxhlet Extractor	
Solder Dip	
Springback Testing Machine	
Stirrer	
Tensile Tester	
Test Mandrel	
Twist Testing Machine	
Unidirectional Scrape Test	
Uniformity Test Machine	
Vacuum Oven	
Vernier Caliper	
Voltage Source	
Water Bath	
Wheatstone Bridge	
Wire Twist Apparatus	
Estimated Cost (FOB Japan; Million Japanese Yen)	64.8

Chart 8-2 List of Testing Equipment for Electric Product (2/6)

Group II : Lump and Relted Equipment (1)
AC Voltage Transformer/Transducer
Aging Test Rack
Ammeter
Apparatus for Cycle Test
Apparatus for Endurance Test
Appropriate Circuit
Artificial Rain Apparatus
Ball Pressure Tester
Cacilloscope
Cap Torque Tester
Capacitance Meter
Circuits for Abnormal Tests
Contact Force Tester
Copper Analyzer
Current Meter
Current Source
Drip Test Apparatus
Endurance Test Apparatus
Facility for Short Circuit Test
Filter Circuit
Flexible Rule
Frequency Generator
Gauges
Glow Wire Test Apparatus
Grounding Continuity Tester
Handhold Spray Test Device
Hot Mandrel Apparatus
Humidity Chamber
Impedances
Insulation Resistance Meter
Lamp Cap Gauges
Lamp Test Rack
Leakage Current Tester
Life Test Rack
Linear Scale
Low Range Voltmeter
Lumen Tester
Measuring Microscope
Mechanical Tumbling Barrel
Milli-Voltmeter
Needle Flame Test Set
or other Dimension Gauge
Oscilloscope
Peak Voltage Meter
Pendulum Impact Test
Photometer
Photometric Integrated Sphere
Power Factor Meter
Pull Tester

(to be continued)

Chart 8-2 List of Testing Equipment for Electric Product (3/6)

Group II : Lump and Relted Equipment (2)	
Reference Ballast	
Resistance Meter	
Resistors	
Round Nose Micrometer Caliper	
Standard Lamps	
Standard Test Enclosure	
Standard Test Probe	
Starting Test Circuit	
Steel Plates	
Storage Oscilloscope	
Substitution Resistors	
Surge Voltage Source	
Temp. Oven	
Test Box & Test Hoods	
Test Cap	
Test Circuit	
Test Circuit w/Specified Lamps	
Test Gauges, IEC 61-1: Sheet 7006-21	
Test Hoods	
Test Impedances	
Test Lamp Caps	
Thermal Recorder	
Thickness Gauge	
Thread Gauge	
Time Measuring Device	
Torque Meter	
Tumbling Barrel	
Variable Power Supply	
Vibration Test System	
Voltmeter	
Wave Analyzer	
Addtitional Estimate Cost	240.4

Group III : Batteries and Cells	
Ampere-hour Capacity Tester	
Atomic Absorption Spectrophotometer	
Beaker and Glass Stirrer	
Discharge Capacity Tester	
High Rate Discharge Tester	
Hydrometer	
Reserve Capacity Tester	
Sample Preparation Apparatus	
Addtitional Estimate Cost	15.0

Chart 8-2 List of Testing Equipment for Electric Product (4/6)

Group IV : Electric Wiring Device	
Abrupt Removals Test Setup	
AC Power Supply	
Accelerated Aging Tester (oxygen Bomb)	
Apparatus for Alloy	
Artificial Weathering Apparatus (UV Light source w/water spray)	
Busbar Assembly	
Circuit Breaker Tester	
Compression Tester	
Continuity Tester	
Current Transducer	
Depth Gauge	
Dummy Load	
Fault Current Tester	
Flat Probe	
Flexible Tape Measure	
Fumehood	
High Current Source	
Hole Gauge	
Inductive Load	
Interrupting Current Test Assembly	
Jig for Overload Test Cycles	
Mandrel (13mm dia. 0)	
Mechanical Endurance Tester	
On-Off Cycle Apparatus	
Overload Current Source	
Overload Test Apparatus	
Resistive Load	
Screw Thread Gauge	
Softening Point Apparatus	
Stainless Steel Plates	
Surface Area Measuring Apparatus	
Test Weight	
Torque Spanner/Tester	
Tracking Test Set	
Tungsten Lamp Loads	
Vicat Softening Apparatus	
Volume Resistivity Tester	
Water Spray Tester	
Addtitional Estimate Cost	198.7

Chart 8-2 List of Testing Equipment for Electric Product (5/6)

Group V : Cooking and Heating Appliances	
250 gram sphere with Rockwell Hardness of 100	
Aluminum Pan	
Cord Endurance Tester I	
Dial Surface Gauge	
Dimensional Measurement Machine	
Endurance Cycle Tester	
Feeler Gauge	
Flatness Gauge	
Force Gauge	
Glass Thermometer with Stopper	
LPG Burner (0.5mm nozzle)	
Make and Break Test Circuit	
Shock Test Apparatus	
Standard Aluminum Pans	
Test Finger with Force Indicator	
Thermal Shock Test	
Three Point Support	
Addtitional Estimate Cost	46.1

Chart 8-2 List of Testing Equipment for Electric Product (6/6)

Group VI : Electric Fans	
Accelerated Aging Apparatus	
Air Velocity Meter	
Analytic Balance	
Anechoic Room	
Cable Flexing Test Apparatus	
Calorimeter Room	
Draw/Receive Cycle Apparatus	
Drop Test Apparatus	
Flexural Testing Machine	
Flow Meters	
Gas Supply	
Hose Flexing Test Apparatus	
Hydrostatic Pressure Test Set	
Hydrostatic Tester	
Inclined Base Plate for Stability	
Irod Impact Tester	
Make and Break Apparatus for Switch and Time Switch	
Milliammeter	
Noise Measuring Equipment	
Non-contact Tachometer	
Overflow Test Apparatus	
Oxygen Bomb	
Pouring Test Apparatus	
Pressure Measuring Apparatus	
Push/Pull Test Gauge	
Rain Test Apparatus	
Rel Humidity Meter	
Salt Spray Test Apparatus	
Simulated Window Frame	
Standard Test Finger	
Steel Ball for Impact Test	
Test Chamber	
Test Clothes	
Test Loads/Weights	
Thermometer	
Tubing Thickness Gauge	
Watthour Meter	
Wattmeter	
Weight of Zinc Analyzer	
Withstand Voltage Lest Set	
Test Heaters	
Addtitional Estimate Cost	359.1
Grand Total (Group I+II+III+IV+V+VI)	924.0

Chart 8-3 Training Program for Quality System Assessors

First Year	Training I (3 months)	Training focusing on the SNI certification system; outline of the Certification System, Approval procedures, general aspects of the role of the Technical Institution, its philosophy, inspection etiquette, practical aspects of factory inspection. In conjunction with the above evaluation of candidate suitability is to be carried out.
	Training II (3 months)	Trainees will participate in the follow up inspections forming part of the product certificate under the supervision of experienced factory inspectors. This course aims at achieving an understanding of the main points of factory inspection.
	Training III (3 months)	Trainees will carry out the follow up inspections forming part of the product certificate under the supervision of experienced factory assessors. The aim of the course is the assimilation of factory inspection expertise.
	Training IV (3 months)	Trainees will carry out certification tests of finished products under the supervision of experienced testing personnel at an accredited testing laboratory. The aim of the course is to gain understanding of actual product testing and through this to grasp the detailed aspects of product standards.
Second Year	Field Training I (6 months)	Trainees will carry out the follow up inspections forming part of the product certificate by themselves.
	Training V (3 months)	Trainees will participate in the follow up inspections forming part of the quality system certificate under the supervision of experienced factory assessors. This course aims at achieving an understanding of the main points of factory assessment.
	Training VI (3 months)	Trainees will carry out the follow up inspections forming part of the quality system certificate under the supervision of experienced factory assessors. The aim of the course is the assimilation of factory assessment expertise.
Third Year	Field Training II (6 months)	Trainees will carry out the follow up inspections forming part of the quality system certificate by themselves.
	Training VII (3 months)	Trainees will participate in the initial factory assessment forming part of the product certificate under the supervision of experienced factory assessors. The aim of the course is to gain an understanding of the main points of such factory assessment.
	Training VIII (3 months)	Trainees will carry out the initial inspections forming part of the product certificate under the supervision of experienced factory assessors. The aim of the course is the assimilation of factory assessment expertise.
Fourth Year	Field Training III (6 months)	Trainees will carry out the initial factory inspections forming part of the product certificate as one of members of inspection team.
	Training IX (3 months)	Trainees will carry out the factory assessment inspections forming part of the quality system certificate under the supervision of experienced factory assessors. The aim of this course is to assimilate the expertise of such factory assessment.
	Training X (3 months)	Trainees will carry out the initial factory inspection part of the quality system certificate as one of members of inspection team.

9 Suggestion for Implementation Plan

9.1 Implementation Plan

9.1.1 Implementation plan and steps

Implementation steps and the estimated period required for implementation in each program are indicated in Chapter 8. It should be reiterated that the promotion of industrial standardization and quality control will provide one of the most important technological bases that allow sustainable growth for the Indonesian industries. To this end, complete implementation of the proposed programs is highly recommended.

Limited availability of human and financial resources, however, may necessitate focused and selective implementation of some programs. Some of these programs require preceding legislative procedures, while other programs are necessary to be implemented in precedence to others, and others require a long preparation period and the earlier startup.

Chart 9-1 shows the suggested implementation plan taking into account the above factors[1]. The plan assumes that all the programs will be implemented.

9.1.2 Overall coordination/monitoring system

An organizational structure recommended for the preparation and implementation of individual programs is indicated in each program. The programs are closely related with each other, so their coordinated implementation with individual programs is critical in producing a successful result. To this end, an organization should be established to monitor the overall progress, make adjustment, support and make recommendations as required, or execute program improvement. By virtue of DSN's function as a coordinative body of national standardization, it inevitably becomes a primary candidate. However, in consideration of the fact that 1) DSN does not have sufficient resources to function as a secretariat, 2) many programs cover industry sectors and as such, the leadership by MOI's bureaus is expected, and 3) PUSTAN, MOI is best equipped for the purpose, in terms of manpower and organization, compared to other ministries. MOI should provide aggressive support for the coordination and monitoring, with DSN organizing a committee for it, at the level of national standardization and quality control promotion.

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1) Chart 9-1 shows the steps up to completion of the preparation period or start of operation only in the case of development programs, while it includes initial steps only in the case of programs with recurring steps.

Chart 9-1: Suggested Implementation Plan

Order of precedence	Year :	1st	2nd	3rd	4th	5th
	Program 1: Introduction of certification program for automotive replacement safety parts					
5	1) Study & selection of automotive replacement parts					
	2) Development of standards for the parts					
	3) Development of testing/inspection system for the scheme					
	4) Start of operation of the certification scheme					
	Program 2: Introduction of safety mark certification program for home electrical appliances					
3	1) Selection of home appliances for the certification					
	2) R&D and development of standards for the appliances					
	3) Legislative preparation for the regulation (*)					
	4) Development of testing/inspection system for the scheme					
	5) Start of operation of the certification scheme					
	Program 3: Development & dissemination of quality system certification scheme specifically designed for SMEs					
3	1) Design of QC system suitable for SMEs					
	2) Organizational setup for promotion of the system					
	3) Start of operation of the certification scheme					
	Program 4: Establishment of registration scheme of quality system consultant					
3	1) Setting required qualification for registration					
	2) Preparation for operation of the scheme					
	3) Start of operation of the scheme					
	Program 5: Establishment of certification scheme for quality control officer in factory					
3	1) Setting qualification for the QC officer					
	2) Establishing detail procedure for operation of the scheme					
	3) Preparation of training course for the candidates					
	4) Preparation for the certification examination					
	5) Start of the scheme operation					
	Program 6: Preparation for rationalization of standards development process					
1	1) Reaching consensus on scope of standardization project					
	2) Legislative preparation for simplification of standards development					
	3) Change in organizational setup w/delegation of authority					
	4) Establishment of operational procedure					
	5) Completion of the preparation for rationalization					
	Program 7: Establishment of an organization for enhancing standardization and quality control					
2	1) Formulation of a prospectus and an operation plan					
	2) Establishment of the organization					
	Program 8: Diversification of standards drafting process for increased involvement of industry					
3	1) Consensus on increased adoption of int'l & foreign standards					
	2) Promotion of QC					
	3) Encouragement of association standards and involvement of industry					
	Program 9: Increase in public confidence on product certification system					
3	1) Change in the scope of system to limit to voluntary certification					
	2) Review of the items based on the above					
	3) Revision of testing labo accreditation scheme					
	4) Training program for quality system certification assessors					
	Program 10: Promotion of international mutual recognition of certification system					
4	1) Review of the existing system based on ISO/IEC system					
	2) Complete operation of the system according to the above guideline					
	3) Joint assessment and mutual surveillance w/foreign certification body					

9.1.3 Foreign technical support

These programs are assumed to be implemented by the existing organizations with existing facilities and manpower, as they might be reorganized, expanded or improved. The effect and efficiency of executing these programs can be maximized by obtaining the collaboration of industry sectors and the academic community. In Indonesia, however, industry sectors have insufficient experience in standardization and quality control promotion, and do not have sufficient key personnel that can manage the proposed programs and their implementation. Alternatively, reference to overseas experience in undertaking the similar programs, and obtaining support of experienced foreign experts will be effective, particularly in the following areas:

1) **Program 1:** Introduction of certification program for automotive replacement safety parts

   Reference to foreign experience in the selection of products to be certified, and establishment of standards (e.g. "Quality Automotive Parts Certification Scheme" by JAPA (Japan Automotive Parts Dealers Association), and Transportation Ministerial Decrees of Japan regarding safety standards for vehicles, etc.)

2) **Program 2:** Introduction of safety mark certification program for home electrical appliances

   a) Reference to foreign experience in the selection of products to be certified, and establishment of safety standards (e.g. "Electrical Appliance and Material Control Law" of Japan, and IECEE–CB Scheme, etc.)

   b) Technological transfer regarding design and operation training of testing/inspection laboratory for the certification

3) **Program 3:** Development and dissemination of quality system certification scheme specifically designed for small–and medium–sized enterprises

   Reference to foreign experience in development of the system (e.g. QIP (Quality Improvement Practice) in Malaysia, dissemination of TQM among SMEs in Japan, etc.)

4) **Program 7:** Establishment of a system for enhancement of dissemination of standardization and QC promotion

   Reference to foreign experience regarding the activities and financial performance of similar organizations/systems (e.g. Japanese Standards Association, etc.)

5) **Program 9:** Increase in public confidence on product certification system, and **Program 10:** Promotion of international mutual recognition of certification system

   Technological transfer regarding review of the existing system and its improvement to ensure complete implementation

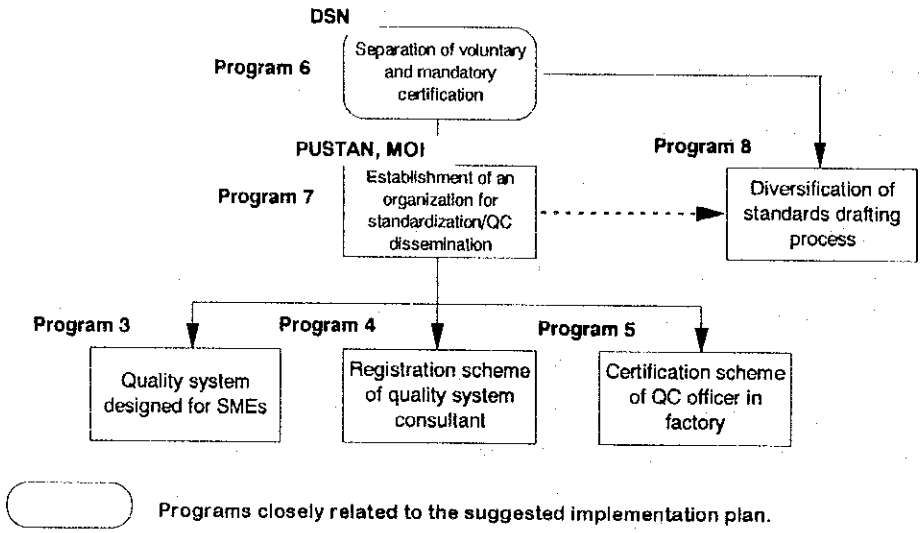
9.1.4 Suggested plan for integrated implementation of the programs

Following recommends integrated implementation plans of the above programs in consideration of the it relationship, and the possible organizational setup for implementation. It consists of two plans. Both of these integrated implementation plan assume the precedent implementation of Program 6.

The main theme of the first integrated implementation plan is increased involvement of industry in standard development and enhancement of dissemination of standardization and quality control. The plan is to implement in an integrated manner Programs 3, 4, 5, 7, and 8 in addition to Program 6. The plan may be undertaken mostly by the existing organizations with existing facilities and manpower, but with reorganization and expansion/improvement if necessary.

Following shows the programs included and the relationships among them in the plan.

Chart 9-2: Suggested Plan for Integrated Implementation (1)



The implementating steps of the plan are as follows:

Chart 9-3: Suggested Plan for Integrated Implementation (1) -Implementation Steps-

Year :	1st	2nd	3rd	4th	5th
Program 3: Development & dissemination of quality system certification scheme specifically designed for SMEs					
1) Design of QC system suitable for SMEs					
2) Organizational setup for promotion of the system					
3) Start of operation of the certification scheme					
Program 4: Establishment of registration scheme of quality system consultant					
1) Setting required qualification for registration					
2) Preparation for operation of the scheme					
3) Start of operation of the scheme					
Program 5: Establishment of certification scheme for quality control officer in factory					
1) Setting qualification for the QC officer					
2) Establishing detail procedure for operation of the scheme					
3) Preparation of training course for the candidates					
4) Preparation for the certification examination					
5) Start of the scheme operation					
Program 6: Preparation for rationalization of standards development process					
1) Reaching consensus on scope of standardization project					
2) Legislative preparation for simplification of standards development					
3) Change in organizational setup w/delegation of authority					
4) Establishment of operational procedure					
5) Completion of the preparation for rationalization					
Program 7: Establishment of an organization for enhancing standardization and quality control					
1) Formulation of a prospectus and an operation plan					
2) Establishment of the organization					
Program 8: Diversification of standards drafting process for increased involvement of industry					
1) Consensus on increased adoption of int'l & foreign standards					
2) Promotion of QC					
3) Encouragement of association standards and involvement of industry					

The second implementation plan is the program group, the main target of which is to ensure public confidence on standardization project and certification system through their complete implementation, and to realize international mutual recognition of the certification system. It focuses on Programs 2, 9 and 10 assuming Program 6 as a precedent program[2]. The plan is the one for which technological transfer from the experienced foreign countries is effective if available, though the existing organizations, facilities and manpower are the essential factors for their successful implementation.

The following shows the programs involved and the relationships among them. For the effective promotion of standardization and quality control in the industrial sector

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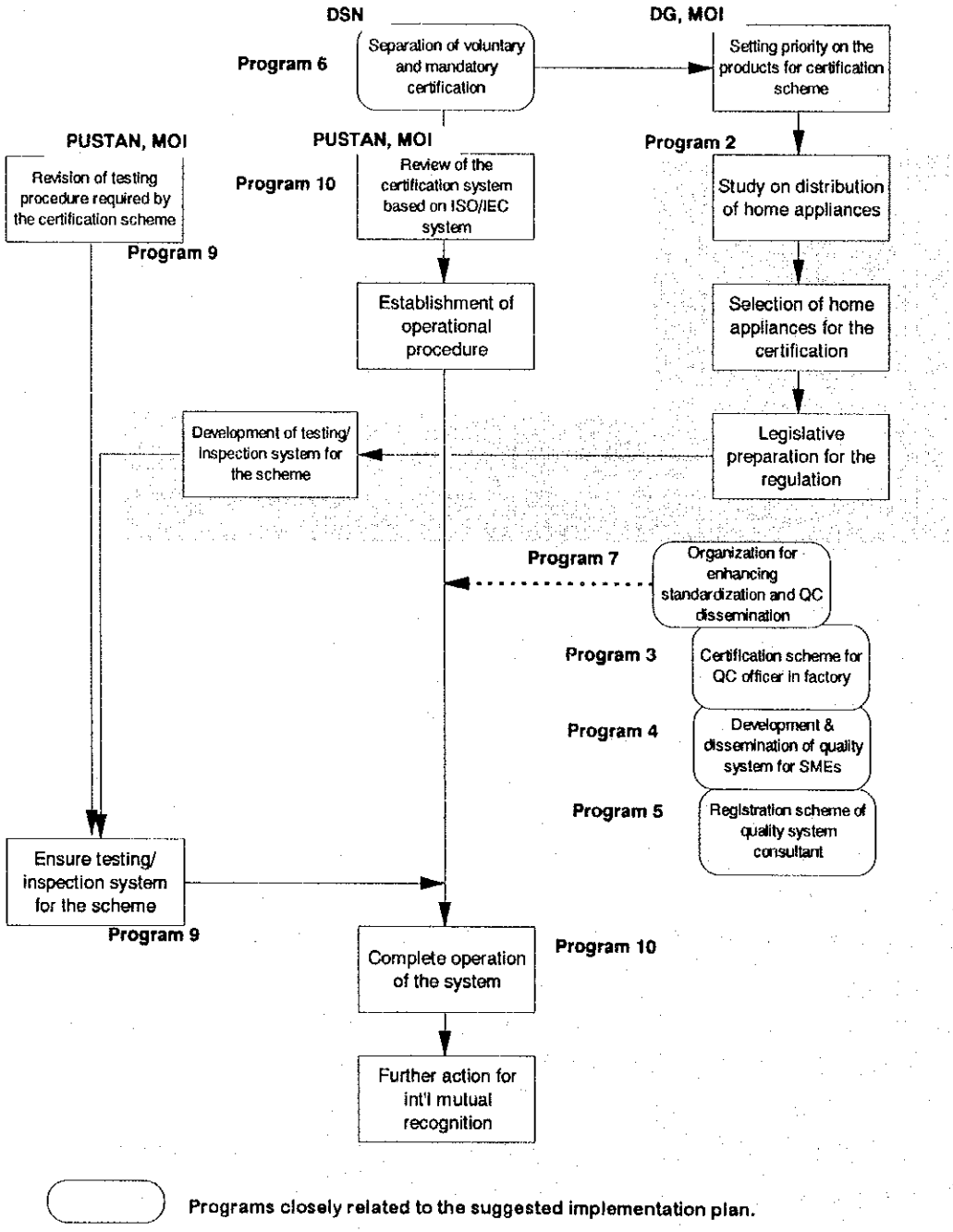
2) Program 1 was excluded from these plan since it requires study on distribution of automotive parts, and analysis of automotive accident statistics in advance. Further, the program is expected to be implemented in a manner similar to Program 2.

through implementation of this program group, implementation of other programs designed to promote quality control, becomes indispensable.

Chart 9-4: Suggested Plan for Integrated Implementation (2)



The implementating steps of the second integrated implementation plan are as follows:

Chart 9-5: Suggested Plan for Integrated Implementation (2) -Implementation Steps-

Year :	1st	2nd	3rd	4th	5th
Program 2: Introduction of safety mark certification program for home electrical appliances					
1) Selection of home appliances for the certification					
2) R&D and development of standards for the appliances					
3) Legislative preparation for the regulation (*)					
4) Development of testing/inspection system for the scheme					
5) Start of operation of the certification scheme					
Program 6: Preparation for rationalization of standards development process					
1) Reaching consensus on scope of standardization project					
2) Legislative preparation for simplification of standards development					
3) Change in organizational setup w/delegation of authority					
4) Establishment of operational procedure					
5) Completion of the preparation for rationalization					
Program 9: Increase in public confidence on product certification system					
1) Change in the scope of system to limit to voluntary certification					
2) Review of the items based on the above					
3) Revision of testing labo accreditation scheme					
4) Training program for quality system certification assessors					
Program 10: Promotion of international mutual recognition of certification system					
1) Review of the existing system based on ISO/IEC system					
2) Complete operation of the system according to the above guideline					
3) Joint assessment and mutual surveillance w/foreign certification body					

9.2 Implementation Plans by Related Organization

The following shows implementation plans by the major related organizations. The implementation plan of DSN is related to the standardization project at a national level and the implementation plan of PUSTAN, MOI covers standardization and quality control promotion in the industry sector. Also, implementation plans by Directorate Generals of MOI are assumed to be implemented in each of the subsectors of their responsibility with close cooperation of the relevant industry.

Chart 9-6: Suggested Implementation Plan for DSN

Year :	1st	2nd	3rd	4th	5th
Program 6: Preparation for rationalization of standards development process					
1) Reaching consensus on scope of standardization project					
2) Legislative preparation for simplification of standards development					
3) Change in organizational setup w/delegation of authority					
4) Establishment of operational procedure					
5) Completion of the preparation for rationalization					
Program 7: Establishment of an organization for enhancing standardization and quality control					
1) Formulation of a prospectus and an operation plan					
2) Formalities of the establishment					
3) Establishment of the organization					
Program 8: Diversification of standards drafting process for increased involvement of industry					
1) Consensus on increased adoption of int'l & foreign standards					
Program 9: Increase in public confidence on product certification system					
1) Change in the scope of system to limit to voluntary certification					
2) Revision of testing labo accreditation scheme					
3) Establishment of same procedure guideline among ministries					
Program 10: Promotion of international mutual recognition of certification system					
1) Review of the existing system based on ISO/IEC system					
2) Joint assessment and mutual surveillance w/foreign certification body					

Chart 9-7: Suggested Implementation Plan for PUSTAN

Year :	1st	2nd	3rd	4th	5th
Program 1: Introduction of certification program for automotive replacement safety parts					
1) Development of standards for the parts					
2) Request for R&D for development of safety standards					
3) Revision of testing labo accreditation scheme					
Study & selection of automotive replacement parts					
Legislative preparation for the regulation (*)					
Start of operation of the certification scheme					
Program 2: Introduction of safety mark certification program for home electrical appliances					
1) Development of standards for the parts					
2) Request for R&D for development of safety standards					
3) Revision of testing labo accreditation scheme					
Selection of automotive replacement parts					
Legislative preparation for the regulation (*)					
Start of operation of the certification scheme					
Program 3: Development & dissemination of quality system certification scheme specifically designed for SMEs					
1) Design of QC system suitable for SMEs					
2) Organizational setup for promotion of the system					
3) Start of operation of the certification scheme					
Program 4: Establishment of registration scheme of quality system consultant					
1) Setting required qualification for registration					
2) Preparation for operation of the scheme					
3) Start of operation of the scheme					
Program 5: Establishment of certification scheme for quality control officer in factory					
1) Setting qualification for the QC officer					
2) Establishing detail procedure for operation of the scheme					
3) Preparation of training course for the candidates					
4) Preparation for the certification examination					
5) Start of the scheme operation					
Program 6: Preparation for rationalization of standards development process					
1) Reaching consensus on scope of standardization project					
2) Legislative preparation for simplification of standards development					
3) Change in organizational setup w/delegation of authority					
4) Establishment of operational procedure					
5) Completion of the preparation for rationalization					
Program 7: Establishment of an organization for enhancing standardization and quality control					
1) Formulation of a prospectus and an operation plan					
2) Formalities of the establishment					
3) Establishment of the organization					
Program 8: Diversification of standards drafting process for increased involvement of industry					
1) Consensus on increased adoption of Int'l & foreign standards					
2) Promotion of QC					
3) Encouragement of association standards					
4) Increased involvement of industry in standards development					
Program 9: Increase in public confidence on product certification system					
1) Change in the scope of system to limit to voluntary certification					
2) Review of the items based on the above					
3) Revision of testing labo accreditation scheme					
4) Establishment of same procedure guideline among ministries					
5) Training program for quality system certification assessors					
Program 10: Promotion of international mutual recognition of certification system					
1) Review of the existing system based on ISO/IEC system					
2) Complete operation of the system according to the above guideline					
3) Joint assessment and mutual surveillance w/foreign certification body					

Note: Shaded items denote actions to be undertaken by other organizations.

Chart 9-8: Suggested Implementation Plan for the Proposed Dissemination Organization of Standardization and QC

Year :	1st	2nd	3rd	4th	5th
Program 3: Development & dissemination of quality system certification scheme specifically designed for SMEs					
1) Design of QC system suitable for SMEs					
2) Organizational setup for promotion of the system					
3) Start of operation of the certification scheme					
Program 4: Establishment of registration scheme of quality system consultant					
1) Setting required qualification for registration					
2) Preparation for operation of the scheme					
3) Start of operation of the scheme					
Program 5: Establishment of certification scheme for quality control officer in factory					
1) Setting qualification for the QC officer					
2) Establishing detail procedure for operation of the scheme					
3) Preparation of training course for the candidates					
4) Preparation for the certification examination					
5) Start of the scheme operation					
Program 7: Establishment of an organization for enhancing standardization and quality control					
Establishment of the organization					
Program 8: Diversification of standards drafting process for increased involvement of industry					
1) Promotion of QC					
2) Encouragement of association standards					

Note: Shaded items denote actions to be undertaken by other organizations.

Chart 9-9: Suggested Implementation Plan for BPPI & Testing Institutes

Year :	1st	2nd	3rd	4th	5th
Program 1: Introduction of certification program for automotive replacement safety parts					
1) R&D required for development of safety standards					
2) Development of testing/inspection system for the scheme					
Selection of parts for the certification					
Development of standards for the parts					
Start of operation of the certification scheme					
Program 2: Introduction of safety mark certification program for home electrical appliances					
1) R&D required for development of safety standards					
2) Development of testing/inspection system for the scheme					
Selection of products for the certification					
Development of standards for the products					
Start of operation of the certification scheme					

Note: Shaded items denote actions to be undertaken by other organizations.

Chart 9-10: Suggested Implementation Plan for Directorate Generals, MOI

Year :	1st	2nd	3rd	4th	5th
Program 1: Introduction of certification program for automotive replacement safety parts					
1) Study on market of automotive replacement parts					
2) Selection of parts for the certification					
3) Legislative preparation for the regulation (*)					
4) Start of operation of the certification scheme					
Development of standards for the parts					
R&D required for development of safety standards					
Development of testing/inspection system for the scheme					
Program 2: Introduction of safety mark certification program for home electrical appliances					
1) Selection of the products for certification					
2) Legislative preparation for the regulation (*)					
3) Start of operation of the certification scheme					
Development of standards for the parts					
R&D required for development of safety standards					
Development of testing/inspection system for the scheme					
Program 3: Development & dissemination of quality system certification scheme specifically designed for SM					
1) Organizational setup for promotion of the system					
Design of QC system suitable for SMEs					
Start of operation of the certification scheme					
Program 5: Establishment of certification scheme for quality control officer in factory					
Setting qualification for the QC officer					
Establishing detail procedure for operation of the scheme					
Preparation of training course for the candidates					
Preparation for the certification examination					
Start of the scheme operation					
Program 9-10: Establishment of an organization for enhancing standardization and quality control					
Formulation of a prospectus and an operation plan					
Establishment of the organization					
Program 8: Diversification of standards drafting process for increased involvement of industry					
Promotion of QC					
Encouragement of association standards					
Increased involvement of industry in standards development					
Program 9: Increase in public confidence on product certification system					
Review of the certification items					
Training program for quality system certification assessors					

Note: Shaded items denote actions to be undertaken by other organizations.

ANNEXES

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Annex 1: Needs for Promotion of Industrial Standardization and Quality Control in Selected Industrial Sub-sectors

1 Automobile and Automotive Parts Industries

As seen in many other developing countries, the development of the automobile industry symbolizes industrial development in Indonesia, and has been given the highest priority in government policy since the very early phase of its industrialization efforts. In fact, the industry has been benefiting from the government's intensive promotion drives, unprecedented in other industries.

The automotive industry in Indonesia has been fostered under the "Deletion Program" which represents the country's core of localization policy since 1974. The policy achieved significant results in development and nurturing of automobile related industries. Today, however, the industry faces higher production cost which is a negative consequence of import substitution. Also significant is the adverse effect of the strong government-led promotion of automobile-related industries within a short period of time. Future development of the automobile industry hinges upon the success of its efforts to overcome higher production costs and in developing international competitiveness to meet demand growth and serve the emerging ASEAN free market.

1.1 Development of the Automobile Industry in Indonesia

1.1.1 Historical development of the automobile industry

The first phase of development in the history of the automobile industry dates back to 1927, when GM completed an assembly plant in northern Jakarta with an annual production capacity of 6,000 units, the third in Asia next to Japan and India. The second phase commenced after the country's independence. Import dealers and assembly companies mainly consisting of local capital, emerged in the first half of the 1950s. The assembly companies were originally established as joint ventures with foreign companies and were then subject to gradual "Indonesiadization." This move discouraged foreign investors to increase their levels of participation in the industry. Coupled with concurrent economic recession and a serious shortage of foreign currency, the assembly industry dwindled.

The automobile industry in its present form has emerged in the third phase of development that started in the late 1960s. In fact, the industry had to reconstruct itself from the deteriorated infrastructure, consisting of aged assembly facilities, car import dealers, and poorly equipped factories. Then, assembly production grew rapidly as old plants were renovated, and SKD were converted to CKD lines. Since 1971, annual production grew at an average of 25% to reach 212,000 units in 1981, the first peak level.

In fact, the number of vehicles assembled in the country exceeded for the first time the number of complete cars imported in 1971.

After 1981, domestic demand plummeted due to the decline in crude oil prices. Between 1983 and 1988, annual unit sales dropped to 150,000, a 30% down from the peak level.

In 1989, demand started to surge with economic recovery with annual sales reaching 275,000 units in 1990 (See Chart A1-1-1). In 1995, a growth pattern up to July is expected to keep its momentum anticipating a record annual sales of 300,000 units.

It should be noted that the following two factors have contributed greatly to the successful growth of the automobile industry in the country after 1969, as well as in shaping its characteristics:

(1) Government-led protection and promotion (import substitution) measures of automobile industries

(2) Investment by foreign automakers, particularly Japanese automobile companies, and their cooperation in the government's promotional policy

1.1.2 Import substitution policy of the automobile industry in Indonesia

1.1.2.1 Localization of industry assembly for automobiles

The country's automobile localization policy is roughly divided into two stages; the assembly industry's import substitution for complete automobiles which started from 1969 and, the "Deletion Program" from 1974.

The government took series of policy measures to promote the shift from mere importation of complete cars to domestic assembly, that proceeded in the following sequence:

(1) To limit imports by sole agents to complete cars or CKD only, not SKD. (Joint Order of Minister of Commerce Order No.4 and Minister of Industry Order No.15 dated January 16, 1969);

(2) To ban imports of complete commercial vehicles to Java. (Minister of Commerce Order No.61 dated April 1, 1969);

(3) To ban imports of complete commercial vehicles to Sumatra (Minister of Commerce Order No.129A in June 1969);

(4) To ban imports of used cars to Java and Sumatra (Minister of Commerce Order in April 1970); and

(5) To ban imports of all types of complete cars to the entire country. (Minister of Industry Order No.25 dated January 22, 1974).

As a result, complete car imports were legally banned in 1974. Nevertheless, domestic assembly production exceeded complete car imports in 1971 because of high tariff on the latter[1].

1.1.2.2 Localization of automotive parts

The localization policy for automotive parts was introduced for commercial vehicles in 1976 as a step following import substitution at the assembly level.

The Ministry of Industry announced "Decision on duty to use locally produced parts for assembly of commercial vehicles"(Minister of Commerce Order No.307 dated on 2 August, 1976) and presented the "Deletion Program" which was accompanied by a list and schedule of localization, starting from paintings, tires and batteries (standardized parts) in 1977, and ending in 1984 with functional components such as engines. Though the order was suspended in 1978 due to sluggish oil demand between the first and second booms, the program retained its original stance concerning the localization policy on parts that is being pursued to date. Then in 1979 when the economy made an upturn, the previous Minister of Industry Order was again enforced with modification of some provisions.

Under such policy in 1980, the government required the industry to increase the use of locally produced parts on a stepwise basis, starting from 10 items including paintings, shock absorbers, plastic and rubber components. Through localization efforts based on technology transfer that was proceeded in line with the ministerial order, the initial target was mostly accomplished by 1981. Two factors contributed to the success: (1) the first target covered standard components in which production capacities, including those of Japanese-affiliated companies, have already started up, and (2) the domestic market was in the middle of rapid expansion.

Then the move towards compulsory application of locally made functional components was initiated in 1984. This was reflected by the fact that local production of functional components ramped up in the early 1980s: chassis frames in 1980 (a local company), brake devices in 1981 (local companies), rear axles (local companies) and engines (a joint venture) in 1982.

In summary, the localization policy proceeded steadfastly driven by long-term market expansion, albeit occasional setbacks resulted in relief, modification or postponement. It became close to the completion stage under the Minister of Industry Order No.34 of 1987.

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1) As introduced between 1967 and 1968, tariff rates on complete cars were 260% (passenger cars) and 20–230% (commercial vehicles), very unfavorable against 65% (passenger cars) and 5–43% (commercial vehicles) for CKD imports.

The order was considered to be the final version of the localization program that set the completion of the localization process in 1991, covering 187 items and accomplishing "full manufacturing."

1.2 Industrial Structure

1.2.1 Important roles of Japanese automobile and parts manufacturers

Complete car imports in the 1960s and earlier were dominated by U.S. and European cars. Then, Japanese automakers increased their presence in the early 1970s when the domestic assembly capacity built up, leading to the now commanding and dominant share in the market.

In fact, the share of Japanese cars in domestic assembly grew rapidly over a relatively short period of time, from 31% in 1970 to 72% in 1975, and 93% in 1990. A similar trend can be seen in the parts supply sector. Encouraged by expanded market shares, Japanese manufacturers established local joint ventures specializing in stamping work and welding of body parts. Basically, Japanese suppliers followed automakers who steadily established local production bases. In the process, direct investment increased and more importantly, technology transfer expanded. It is a fact that 8 out of 9 engine factories which were established in response to localization requirements are owned by Japanese manufacturers. Thus, Japanese automobile and parts manufacturers have been playing a critical role in development of the Indonesian automobile industry as a major provider of capital and production technology that are essential elements in the promotion of local production of automotive parts.

Originally, the Indonesian automobile industry emerged from imports of U.S. and European cars. At that time the Japanese automobile industry still had to develop international competitiveness. Then a structural shift seems to have occurred since U.S. and European automakers did not consider Indonesia as a strategic market, and thus were reluctant to participate in localization efforts (See Chart A1-1-2).

1.2.2 Development of company groups by local and foreign capital

At present, automobile production in Indonesia is carried out by company groups that are formed through foreign and local capital. In many cases, these company groups consist of sole agents of local capital, assembly companies, body press companies, and components suppliers including engines. The sole agents are primarily responsible for imports of parts and raw materials, procurement of locally available parts, and sales and marketing of complete cars. The assembly company assembles cars for different

manufacturers by using parts furnished by sole agents. The assembly companies are also owned by local capital and are mainly engaged in assembly and painting. Such production arrangement is called the divisional company system. The system is said to have originated from the government's policy fostering local companies in automobile sales and, assembly by excluding foreign capital. Company groups related to production of functional parts for commercial vehicles, as formed by foreign automakers and local companies, are summarized in Chart A1-1-3.

Sole agents forming the core of each group are classified into two types by their origin. One consist of dealers of imported American and European cars, and the other include companies which entered the business by obtaining distributorship of Japanese automobiles in the 1970s. As mentioned earlier, the former group lost its share partly due to the reluctance of European and U.S. automakers in participating in the localization process. As a result, local company groups involved in the automobile business were reduced to only a few, all belonging to the latter category.

More importantly, local automobile companies have started to emphasize efficient management by integrating production and sales companies. At the same time, the government has shifted its policy objective from restriction on foreign investment to encouragement of productivity. These policy changes have given rise to the move toward integration of divisional companies that have been established according to the stage of sales network and the production process (e.g., body press or engine) into a single joint venture company handling one production system for the entire process. Thus, the new industrial structure combining the upstream and downstream operations, which have traditionally been taken care of by different companies, is about to emerge. The move is considered an industrial restructuring by local group companies for their future development.

1.2.3 Investment by Japanese-affiliated suppliers and emergence of the local supporting industry

As pointed out earlier, sole agents are responsible for procurement of automotive parts used by their assembly manufacturers. Parts not locally available, equipment and materials needed for localization are imported from parent companies of foreign partners. Generic and standard parts, such as tires, battery, wheels, and paintings, are obtained from local companies, mainly Japanese-affiliated companies, while functional parts such as body panels, engines, and steering are procured from suppliers in the same company group. Propeller shafts, brakes, clutches, and transmissions are purchased from local companies

(See Chart A1-1-4).

To meet such demand, Japanese suppliers have been actively investing in the country to establish their own production bases. While these companies are captive suppliers of large manufacturers in Japan, they supply their products freely in Indonesia regardless of their relationship back home.

Furthermore, Japanese companies are investing in the foundry and forging industries. Metalworking subcontracts related to automotive parts are mostly ordered from Japanese-affiliated companies, except for some parts of simple design.

1.3 Major Issues Related to Development of the Automotive Parts Industry

1.3.1 Basic approach to localization of automotive parts

Localization, as it has progressed steadfastly, resulted to higher costs, and high domestic prices surfacing as a major problem[2]. The relatively high prices of Indonesian cars seem to have been attributed to the following factors:

(1) High production costs due to flexible production required to supply a variety of cars in a relatively limited domestic market: In particular, resultant cost disadvantages for press, welding and machining processes that would otherwise enjoy scale of economy.
(2) High import costs of materials and parts: Most of materials (accounting for 70-80% of total cost) are still dependent upon imports. Then import costs have increased due to the rise of the yen and the fall of rupiah.
(3) Low productivity and high percentage of defects in production of local parts (insufficient dissemination of TQC, as discussed in detail later), including waste of materials associated with domestic procurement (lack of appropriate standards, as discussed in detail later): While localization reduces import costs, additional cost impacts more than compensate for such saving.
(4) Pricing in the closed market: In a closed market, a manufacturer having a special process or supplying a functional component can enjoy a monopolistic position due to a fairly limited number of competitors. Suppliers can control the market by setting prices freely. Their customers, assembly manufacturers who are also free from intensive price competition, tend to accept high prices.

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[2] Store prices of locally assembled cars are said to be 2.6 times those in Japan for standard cars and 1.4 times for mini-vans. On other hand, prices of automotive parts are generally 20% more than those available in Japan, with some variation between types of parts.

To lower prices of locally produced cars given the above factors, efforts should be undertaken in several areas. First of all, competition needs to be induced among manufacturers in order to promote cost reduction and quality improvement. Secondly, effective measures should be taken to encourage volume production by manufacturers. To this end, various institutional changes are called for including export and import practices and procedures, and taxation systems, to allow automakers operating in ASEAN, Japan, and other Asian countries to perceive tangible benefits from exports and complementary supply of parts among neighboring countries. The third area is the establishment of industrial standards that will become the basis for developing the metalworking industry instilling cost competitiveness and quality assurance capability, thereby accomplishing integrated production and cost reduction.

The previous localization policy has focused on increasing localization rate. In doing so, it has selectively promoted the industries and subsectors that are relatively easy to foster. On the other hand, the policy was weak in nurturing the development of the metalworking industry that requires effective investment and advanced technology, such as machining, casting, forging, and die casting. This shortcoming should be and can be overcome. It is time to pursue the new policy direction, aimed at producing 500,000 vehicles by the year 2000. The future localization policy should be steered to market expansion by reducing automobile prices, introducing competition in price and quality among suppliers, fostering the metalworking industry, securing availability of raw materials from local industries, establishing industrial standards, and promoting standardization that are invariably related to the above efforts, and the development of the industry-wide TQC system based on education and dissemination of quality control techniques and practices. These drives are essential in the take-off to the economy s sustainable growth as envisaged by PJP II.

1.3.2 Exports of automotive parts toward international production sharing

Exports of automotive parts were limited in variety as well as in quantity up until 1989 when initiatives were taken by Japanese automakers within the framework of establishing complementary relationship between various types of parts.

In that year, Toyota Astra Motor started to export engines for its flagship model "Kijan" to Malaysia, and transferred production of the engines (including machining and block casting operations) from Japan, then followed by its export to Japan.

Daihatsu started exports of CKD parts for subcompact cars to Malaysia. The company plans to export CKD parts in the near future and is reportedly considering engine exports

as well. Mitsubishi has been involved in establishing a complementary supply system covering ASEAN countries from very early. It has been exporting press parts made in Indonesia to the region since 1988 and started exports of truck frames from Gemala Kempa Daya to Japan.

While the Indonesian government still maintains its priority on localization policy over complementary supply of automotive parts, Japanese automobile and automotive parts manufacturers have already started such a new export arrangement based on their perceived positioning of Indonesia within the context of production sharing that goes beyond ASEAN and covers Asia including Japan.

Nevertheless, even if such exports are intended to promote production sharing within a company group, one thing remains unchanged. Indonesian products must have international competitiveness in terms of price and quality, without which efforts of Japanese automakers and automotive parts manufacturers will never become a reality. At present, Indonesia offers international competitiveness in limited types of parts. In essence, it is the efforts of local industries and Japanese manufacturers which can transform the character of automotive parts industry in the country to enjoy the protected marketplace.

1.3.3 After market

Although there is no detailed information on the size of the after market in Indonesia, its steady expansion is visible from the viewpoint of increase in car ownership (See Chart A1-1-5). On the other hand, along with the increase in car ownership, various problems in relation to the usage of automobiles (such as safety in operation, maintenance and inspection requirements) and companies and services related thereto are clearly emerging.

With the increase in the number of automobile users, the above factors become a national issue and require immediate attention in policy measures.

There are two major routes for distribution of automotive parts in the after market. One is the distribution of components through service networks (through sales offices, manufacturer's own service shops, parts centers and sales agents) established for sales of own models, which are often incorporated as captives. The other is through specialty components manufacturers which have established their own channel and sell them through parts distributors, sales offices and service shops. They are not captive and operate independently. In this case, there are several other channels; (1) specialized parts makers distribute the same components as they supply to automobile manufacturer under their own brand through parts distributors and sale offices, and (2) distribution of copied or pirated components, and distribution of accessories not related with original specifications of automobile manufacturer. At the end of the second distribution channel,

there are many small service shops which are unable to meet requirements for automobile manufacturers. In these service shops, due to intensive competition on service fees, they are interested in price rather than quality when using repair parts, and in many cases they decide which type of parts to be used for repair. For them, copied or pirated components are cheap in price and provide a high margin compared to genuine parts prompting them to use these. Naturally, these components are not necessarily good in quality. In particular, components related to safety, those with risk to damage other equipment and those with short life, must be regulated properly (recommendation or requirement of SNI certification) for the interests of consumer safety, assurance of safe drive, environmental protection and improvement of driving manner.

On the other hand, service shops range from those with high level of technology certified by automobile manufacturers to small ones with a low level of service technique. As servicing of automobiles is carried out with charge, repair shops are expected to have a certain level of technique and possess desired equipment, as well as service quality in business in order to ensure that repair will be undertaken in an appropriate and responsible manner. For this purpose, the government may have to provide adequate guidance for repair shops in due course.

In addition, users are required to operate and maintain automobiles with responsibility and in a safe manner, and for this purpose, the legal system should be developed to clearly define inspection and maintenance standards (detail is to be decided by automobile manufacturer) to comply with, together with the devise for enforcement.

Under these circumstances, it is increasingly becoming difficult to secure safe driving of motor vehicles that amount to 10 million units including motorcycles (of which passenger cars, trucks, and buses total 3 million units). Simply, road construction (including highways) does not keep pace with the rapid increase in the number of vehicles (300,000 units annually). In particular, there is a risk of serious accident caused by a poorly maintained vehicle. If it occurs during high speed driving on a highway, the vehicle will cause a serious and extensive damage to life and property. To allow a motor vehicle to fully meet the user's needs, including safety, while providing maximum practicable capability and performance, production of a quality car is undoubtedly most important. Equally important is proper maintenance during use (as instructed by automakers). Without it, product quality, no matter how high it is at the time of manufacturing, cannot be maintained for a sufficient period of time to provide the user with benefits. A combination of good quality control by the manufacturer , proper use and maintenance after sales creates a true value of automobiles to their users. Quality control does not end when a product is completed at factory, it has to be reflected in customer satisfaction. To maximize its effect, quality control system must be established through

integrated practices that include all the necessary actions ensuring proper functioning of the automobiles after sales, including customer maintenance. Automobiles are valuable assets for users and used in diverse ways by the public. Thus, they are expected to function properly anytime and anywhere for designed purposes. Only then, can the user obtain benefits expected from his investment that could lead to further investment, and spurring the movement of people and goods at a national scale. Smooth movement of people and goods depends upon reliability. In particular, the transportation system that carries people and goods safely and securely does not exist nor develop without it. Automobiles capable of running at high levels of safety and reliability, therefore, are essential to the system. Now that Indonesia has reached a stage of capably producing automobiles locally of good quality, the major issue now is how to use them effectively for the system. A public transportation service company, for instance, is already giving its highest priority to the maintenance of their business vehicles (buses). Since specialized service mechanics are in extreme shortage, the public transportation service company requests from manufacturers maintenance training at the time of purchase, until it establishes its own training facilities and material to train in-house service personnel. Nevertheless, the example of providing latest and in-house maintenance training is very rare. It is most likely that most users do not practice proper maintenance for their cars explaining why they have become unserviceable before the lapse of their design life. Although automakers train service personnel for their own cars and parts, it is still far from meeting manpower requirements for proper maintenance of a large number of vehicles.

Clearly, national training institutes for automobile mechanics are in urgent need. One possibility is for MIDC that has basic facilities and equipment to be converted into a training facility by adding some resources.

Repair parts, imitation parts and other poor quality products can be excluded from the market by affixing the SNI mark to those maintained in conformity with standards. This way, a sizable and stable market can be developed for repair parts, in addition to OEM products, thus contributing to growth of parts demand. Legal specifications required for car maintenance shops may be considered according to actual needs and local conditions, assuming that service personnel trained in the said facility will be able to perform proper maintenance service using genuine parts.

1.4 Need for Promotion of Standardization and Quality Control

1.4.1 Current situation of standardization and quality control

1.4.1.1 Use of standards

Various standards are used by automakers and parts manufacturers. Automakers in

Indonesia are mostly Japanese-affiliated, and they have internal standards based on JIS or JASO. They also order parts according to their designated standards. Suppliers often use JIS making it virtually an internal standard. For suppliers specializing in stamping work or machining, and using materials furnished by their customers, they are required to comply with JIS for their technical standards. On the other hand, suppliers who buy locally produced materials sometimes face difficulty in finding exact properties of the materials (since it is not known which standards they comply with). As a result, time is wasted and supply of parts is delayed. It seems that the industry as a whole is presumably suffering a sizable loss.

(1) Japanese-affiliated parts manufacturers

They use JIS and JASO as internal standards. Most customers are Japanese-affiliated automakers thus not posing a problem. On the other hand, orders from non-Japanese automakers has to be handled in accordance with internal standards, but customer-designated standards sometimes must be complied with, depending upon the quantity of order, or the importance of a particular customer. Japanese suppliers are recently selling their products to foreign automakers, enabling Japanese-affiliated suppliers in Indonesia to serve non-Japanese manufacturers on the basis of expertise and experience of their parent companies. As a result, they are rarely concerned with SII or SNI, coupled by the fact that customers do not have much interest in Indonesian standards. SII, however, is used for some parts (spark plugs, filters, and radiators). In turn, Japanese-affiliated suppliers require their subcontractors to comply with JIS, with the product drawings prepared based on JIS.

(2) Local suppliers

Local suppliers, either directly dealing with Japanese automakers or subcontractors of Japanese-affiliated suppliers, are required to understand JIS/JASO-based drawings. Thus, JIS and JASO are standards they mainly use and rely on. In addition, materials are normally furnished by customers, so that suppliers are rarely required to find materials according to SNI. This explains the lack of market acceptance of SNI.

On the other hand, potential needs for SNI marking seem to exist in raw materials. As pointed out above, most of raw materials are furnished by customers, however, local suppliers have to procure them from various sources. Again, there is often no way of knowing what standards a particular material comply with, requiring much time and effort in finding proper materials. If the industry as a whole is taken into account, the problem causes considerable waste and disturbance in the smooth flow of parts. If the

situation remains intact and local materials are increasingly used in future, the industry will face a major obstacle for growth and eventually raise product costs.

To deal with the problem, the industry should positively respond to the government's request of establishing SNI and participate in development of standards with awareness as to what type of standard will be needed and useful for the industry. In the process, it is desirable that GIAMM (Indonesian Automotive Parts and Components Industries Association) should initiate discussion under leadership of GAIKINDO (Automobile Industry Association) and participation of IATO (Automobile Technology Association), experts and scholars (if possible, special subcommittees in various fields are established). Once consensus is reached within the industry, GIAMM or GAIKINDO may propose draft standards to the government. This way, SNI that is really needed and useful for the auto-parts industry will be developed to effectively help in raising the industry's status.

1.4.1.2 Role of standards

Standards used in industries facing rapid technological advancement, such as the automobile industry, are expected to keep abreast with the development of industrial technology in general, and flexible enough to make quick and effective response. This naturally requires two types of standards, one that has reached high levels of completion and versatility, and the other that is in the process of development which is being refined through field application. While the former has major elements of national standards, the latter is used as standards of industrial association, either voluntary or compulsory. The latter allows technological progress with the industry's intent reflected easily and quickly. In fact, availability of voluntary industrial standards that reflect the industry's intent and are officially accepted will contribute greatly to vitalization of the industry. Note that voluntary standards should be established through more simple procedures, and those related to other industries at present or in the future should be recognized by the responsible government agency as industry-wide standards and upgraded to superior standards. In this case, the relevant government agency is required to control such superior standards only as part of SNI.

This approach, however, requires the industry leader (for instance, GAIKINDO or GIAMM) to show strong leadership in securing consensus among member companies depending on the understanding and cooperation of member companies.

1.4.1.3 Certification system

In the automotive industry, automotive parts are not required to comply with mandatory standards except for type certification for complete automobiles, while SNI

marks are provided for certain parts (spark plugs, filters, radiators, and wheel rims) as voluntary certification. Nevertheless, SNI marks seem not to be valued properly probably because of the lack of advertisement to the industry as well as customers. In the future, it is important to expand the certification system in the after market.

Regarding components, SNI has been established as a method for measuring output of automobile use engines, and SNI-certified horsepower for automobile use engines. It was established under the government's initiative and is said to be the only successful case of industrial leadership of GAIKINDO and GIAMM under participation of IATO and experts. Although the entire process took more than 2 years, more efficient management of the basic approach is expected to reduce this period, and it can be used for the rule making process for "industrial standards."

Certification of the quality control system under ISO 9000 has not been used by automakers who adopt the quality assurance system of their parent companies. The same is true among exported products. At present, parts exports are dominated by Japanese-affiliated automakers within the framework of the complementary supply arrangement in Asia. Since their parent companies are not actively pushing for the ISO 9000 certification, its value still has not been recognized.

Some of leading Japanese-affiliated suppliers have obtained certification, but automakers do not recognize its importance since they accept parts according to their own quality standards. In any case, it is conceivable that the need for ISO 9000 will arise as suppliers boost their exports or as certification is increasingly adopted by the automotive industry.

1.4.1.4 Quality control systems of individual companies

(1) Automobile manufacturers

Automobile manufacturers adopt field-proven quality control systems of their parent companies. Company standards, as well as technology and work standards are established and practiced, while quality control techniques have reached TQC levels. In addition, they are required to provide education for their large labor force, which creates heavy burdens on them including language problems related to preparation of training materials.

However, they are forced to provide education for their labor force depending on their efforts considering the importance of quality control in their daily production activities.

Suppliers directly delivering products to automakers are required by their customers to establish quality control systems to ensure stable quality, in addition to conformity

with specifications for final products. This is done in the form of quality agreement or inspection agreement as stipulated in parts supply contract. Such agreement normally sets forth the agreed methods for quality control, by which automakers check the quality system, as well as the data if the system is operated in conformity with the methods and other requirements, or whether quality is within control limits, by means of periodical or spot inspection. All in all, it is a logical choice for automakers to demand parts and components to achieve the same level of quality as their own products in order to maintain their product image.

(2) Quality control system of Japanese-affiliated suppliers

As seen in the above automakers, suppliers adopt the quality control system established by their parent companies. Since they are required to consider local conditions peculiar to Indonesia, their quality control systems are more adaptive than that of parent companies. Basically, they can obtain guidance and assistance from their parent companies without asking any help from automakers, and their quality control techniques have reached a TQC level. To maintain the quality level, they have annual education plans that include training at their parent companies in addition to in-house education. Parent companies sometimes send experts for instruction.

They are audited by executive officers of their parent companies, at least once per year, and are involved in improvement of quality control.

(3) Quality control system of local suppliers

Local suppliers range from top-class component manufacturers to subcontractors of parts suppliers. Their quality control systems are also operated at different levels according to the role of each manufacturer (e.g., organization and manpower).

Overall, there is common recognition among suppliers, regardless of their hierarchical levels, that quality is one of the most important control items, directly or indirectly as long as they supply parts to automakers.

Local suppliers directly supplying parts to automakers (including component manufacturers) are strongly affected by the attitude of their customers and have opportunities to receive assistance from them. In some cases, they send their staff to parent companies of customers for training (particularly at the time of introducing a new product). They conduct internal education as required, and are making conscious efforts to improve quality in an attempt to avoid claim from customers. A set of quality control techniques meeting general demand is applied, and they seemingly have reached a level emulating that of Japanese-affiliated suppliers. Although some component manufacturers are using PCs (including software) to analyze quality control data, they

tend to render insufficient analysis and understanding of causal relations between the analytical results and the actual status of in-process quality control.

Finally, subcontractors of local suppliers that supply parts to automakers receive instruction and guidance only when a quality problem arises.

Chart 1 Quality Control Status of 28 Companies Surveyed

Rank	Organization		Implementation		Education/guidance	
	(A)	(B)	(A)	(B)	(A)	(B)
1) Rank A	8	5	4	0	4	3
2) Rank B	1	4	1	8	5	7
3) Rank C	1	6	4	6	0	3
4) Rank D	0	3	1	4	1	5

Notes: 1) (A) Large-sized companies; (B) Small-and medium-sized companies
2) Unit: Number of companies under each rank.
The evaluation criteria used is as follows:

Evaluation criteria for the above ranking.

Rank	Organization	Implementation	Education/guidance
1) Rank A	Complete QC organization and unified corporate policy	Analysis of cause for abnormality and implementation of corrective measures by using proper control methods	Sufficient education in quality and quantity
2) Rank B	QC organization without accountability	Control charts used, but insufficient analysis of abnormality and corrective measures	Ongoing education requiring improvement
3) Rank C	Undeveloped organization	Undeveloped process control techniques	Acceptable at present due to education
4) Rank D	Low quality awareness	Limited to detection of abnormality by inspection	Need recognized, no opportunity

1.4.2 The Japanese and international standards system, and state of development of standards in Indonesia

1.4.2.1 Standards related to automobiles and automobile parts, and parts processing

Standards related to automobiles and automobile parts may be classified as follows.

1) Standards for assuring required quality for parts needed for users and repair shops, concerned with assuring safety of the vehicle itself, and protection of the society.

2) Standards for assuring interchangeability and quality of automobile parts.
3) Standards not specifically related to automobiles, but related to materials that may be used in other industries, methods of testing, units, glossary of terms, etc.
4) Standards not specifically related to automobiles, but related to required quality that may be used in other industries.

In each country, such standards are officially and privately used as guideline and/or regulation.

1.4.2.2 Standards in Japan

Basic concepts of standards related to automobiles are shown in relevant laws related to road transport in Japan. Details are provided in ministerial directives of Ministry of Transport and government ordinance issued in conjunction with the laws.

On the basis of these fundamental principles, safety regulations for road vehicles related to construction and equipment of automobiles are set forth in the Road Vehicles Act. Technical standards have been prepared for these safety regulations, and make up the basis of standards for motor vehicles in Japan.

Among them, industrial standards, that are applicable to industrial production in general, are stipulated in Japanese Industrial Standards (JIS). There also are Japanese Automobile Standards (JASO), that have been adopted by the industry to assure interchangeability and to supplement JIS. When a JASO standard is deemed suitable for general use for industrial products, recommendation is made to include it in the JIS.

Japanese automobile makers have their own internal standards, on which basis they procure parts and materials, perform assembly work, and conduct interim and final inspection and testing. These internal standards are written in such a way as to clear the safety regulations mentioned above. In their preparation, reference has been made to JIS and JASO standards, that may be quoted or included in the internal standards. These have been refined and improved in the course of carrying out quality control programs. That is, in the process of improvement, each company has incorporated the results of productivity improvement, stabilization of quality, and reduction of costs in their internal standards.

Each manufacturer has also given particular attention to strict quality control for safety-related parts in particular, for those parts that are the objective of safety regulations on the basis of the Road Vehicles Act.

1.4.3 Needs and orientation of standardization and quality control

1.4.3.1 Introduction

For the following reasons, the necessity of standardization and quality control in the automobile and automobile parts industries has special importance.

1) Necessity to ensure traffic safety.
2) By raising the level of that part of the industry for which the parts industry produces , a contribution to overall elevation of industry is made.
3) A contribution is made in the improvement of efficiency of the economy, through rationalization of production of important components.
4) By these means, a contribution can be made to the promotion of industry (and promotion of exports) by raising the external (market) evaluation of the Indonesian automobile and parts industries.

In order to attain the above objectives there is need to develop the following in the context of standardization and quality control.

1) Improvement of the vehicle inspection system as justified from the viewpoint of traffic safety, or improvement of product certification for parts.
2) Improvement of standards for the purpose of elevating industrial technology.
3) Establishing the basis for "appropriate quality control" with the purpose of diffusing appropriate quality control, and improving the means whereby it is diffused.
4) Improvement of testing and inspection systems as needed for promotion of standardization and quality control.

1.4.3.2 Improvement of certification systems

What is necessary in studying the improvement of certification systems are 1) the certification system that is needed in order to ensure transport safety, and 2) certification related to the diffusion of quality control.

Two methods are conceivable for certification to assure transport safety. One is the system for certifying products related to transport safety, that is presently in use and should be further improved. At present automobile glass, seat belts, helmets and LPG devices undergo mandatory inspection for certification. As stated above, low-quality and in some cases inadequate parts are being sold in the replacement market. It is necessary to consider this in the system to include replacement parts. It is thus necessary for the mandatory standards to be effective to improve the testing and inspection system, so that it can accommodate mandatory inspection. If this cannot be accomplished at an early date,

an initiative should be made by developing standards for parts by the industrial association and in providing certification for parts adhering to the standards, thereby improving consumer awareness.

The other direction would be to ensure transport safety in line with improving and expanding the existing vehicle inspection system for commercial vehicles (buses, trucks, taxis). In order to accomplish this, it is first necessary to improve the motor vehicle repair standards (improving them in keeping with the actual situation in industry) and laws or regulations concerning the vehicle inspection system, as well as to improve the arrangements for the inspections themselves. Just improving the arrangements, however, will not guarantee easy functioning of the system. It is necessary at the same time to improve the capabilities of repair shops to do inspections, and for that, it is necessary to have an accreditation system with which repair shops mechanics can qualify as mentioned above. Need also exists for research into the actual causes of accidents.

Certification with regard to quality control should be standardized not only on the basis of quality control level for parts makers that are already being accepted as qualified vendors of parts to assemblers, but also with reference to other companies. As a quality control certification system conforming to ISO 9000 Series, it should provide direction for quality control among companies that thus far have been left out of the linkage process in the automobile industry.

In the future, automobile assemblers will adopt ISO 9000 Series to a greater extent, and the increase in exports of Indonesian automobiles and parts will lead to greater recognition of the need for ISO 9000 Series. In addition, it can be expected that the number of certified companies will increase.

1.4.3.3 Directions for standard development

What is required of the development of standardization are:

(1) Standards that can contribute to elevating the level of industrial technology.
(2) Standards that are needed for improvement of the certification systems.
   a) Those related to certification systems for transport safety
   b) Those related to quality control system certification

There are two types in the first group (1) of standards.

1) Standards that reflect the level of technological development of the country and seek newly standardized technology.
2) Standards that are already recognized internationally, and are being widely used to improve efficiency in industry, and which are needed to be introduced and diffused

into the country.

The first type, in industrially advanced countries, has undergone many improvements in keeping with the pace of technological development. But in Indonesia s automobile and automobile parts industries, almost all the technology has been developed and brought in from overseas, and the country has not yet arrived at the stage at which it can undertake its own development predicated on domestic conditions. Further, at the stage where the percentage of importation of parts is high, and with just the start at exports, quality and specifications required in the domestic and international markets are no different. Thus, in a situation where each individual automobile manufacturer not only applies its own standards on what it assembles but also similarly exerts control over purchases, it is not perceived that there is need concerning the product to adopt international standards as Indonesian standards, or to develop new standards. Of course it is necessary to address this if it were to pursue internationalization. Therefore under present conditions, introduction of foreign and international standards and national standards in Indonesia, conforming to their conditions is needed. The independent development of standard raises the fear that disorder may be created in industry and the distributive sector. What is of course necessary in this field, although at the present time its necessity is not great, is to start preparing for the relevant systems so that it will be possible to cooperate with the industry for development of standards once it becomes necessary to undertake technological development in keeping with conditions specific to Indonesia.

The second type includes many standards that are already in use in industry, and whose adoption in Indonesia is desirable particularly, international and foreign standards (including in the latter sector standards) as Indonesian standards for use by the industry. The following are representative of this type.

1) Standards related to marks, glossary of terms, units, classifications, etc.
2) Basic technical standards for raw materials, processed materials, heat treatment, surface treatment, etc.
3) Standards related to basic engineering of design and production for standard parts, standard shapes, dimensional accuracy, etc.
4) Standards related to methods of testing, analysis, measurement and inspection of raw materials, products, intermediate products etc.
5) Standards related to products technology for quality, function, performance etc.

Regarding the second group (2), the following are among other components that have

been discussed already.

1) Standards and regulations that are necessary as basis for regulating or guiding determination of reference related to transport safety, consumer protection, environmental preservation, and so on.
2) Standards that reflect the quality control systems in use in the parts industry at present, but are somewhat modified from the standpoint of the ISO 9000 Series.

1.4.3.4 Dissemination of standards and the certification system

Standards related to necessary basic technology for elevating the technological level of industry, such as standards related to testing and analysis, while contributing in raising technological levels as they are put into practice over and over again, also create the need to revise them. It will be effective to attain this to prepare materials for use at seminars, collecting in the materials various international standards and commonly-used standards in industrialized countries (including sector standards if frequently used) that are relevant to the automobile production industry (particularly, metal processing related industry); and to hold seminars as often as necessary to secure understanding of standards and methods for their use.

1.4.3.5 Improvement of quality management

As a measure of further implementing Quality Management effectively, in addition to promoting wider participation in quality control certification schemes, in keeping with the actual situation in the small- and medium-scale business sector, as aforementioned, an important strategy for more effective quality control is via dissemination of greater understanding of the concept of quality control.

In many small- and medium-scale industries there is a lack of comprehension on the difference between inspection work and quality control work. The former is work involving the separation of products that passed quality control and those that do not, whereas the latter is work for the purpose of enabling continuous, stable production of good products. What must be emphasized as being necessary is the Check and Action parts of the Deming Circle, that is, to do the inspection and to feedback the results in the process. It is necessary to emphasize the creation of an organization or devise an arrangement that will make the feedback process work well. Matters such as these are included in the ISO 9000 Series, and in order to have this concept understood even by companies that have not chosen the ISO 9000 Series, it would be necessary to mount a campaign that demonstrates, this and to establish special educational organization by third party.

1.4.3.6 Need for improvement of testing, inspection and calibration systems

In implementing the above quality control system, an adequate testing and inspection system is essential to support it. Without it, quality control never comes to perfection. At present, measurement required for quality control is conducted properly at all the levels by suppliers, partly due to guidance of automakers. The major concern is whether measuring instruments used for this purpose are calibrated accurately. For proper calibration, visiting calibration service should be conducted at the national level.

(1) Calibration of measuring instruments of Japanese-affiliated suppliers

Partly owing to the guidance of the parent company, Japanese-affiliated suppliers maintain standardized calibration procedures for all the measuring instruments. They make it a rule not to use or purchase measuring instruments that are not calibrated according to these procedures.

(2) Calibration of measurement instruments of local suppliers

They also understand the need for calibration of measuring instruments and actually calibrate all of them by using master instruments kept at each company. The problem lies in calibration of master instruments. So far as master instruments are accurate, calibration can be done accurately. However, master instruments need to be calibrated as well. Unfortunately, these master instruments are imported and cannot be calibrated with accuracy at local organizations. While users of the master instruments feel that the situation may become a problem, they still continue to use them as no notable trouble has occurred. Undoubtedly the users are primarily responsible for maintaining accuracy of the master instruments.-, -Significance of potential problems indicates that public testing institutes should provide some support or assistance in this regard.

1.4.3.7 Need for manpower development and possible measures

Many suppliers (including component manufacturers) receive technology transfer through technical assistance from their customer, and manpower development is on its way in the form of OJT and overseas training. While technical assistance is the most effective method of technology transfer, the approach can only be taken by a handful of large suppliers. Medium and smaller suppliers will need manpower development efforts through third party educational institutes to be newly established.

Chart A1-1-1 Change in Automobile Production in Indonesia

(Unit: Number)

Category of automobile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994(*)	Localization rate
Car other than passenger car											
– Category I	88,612	106,786	109,964	99,168	110,391	161,842	161,093	115,195	131,414	114,330	50%
– Category II	13,141	13,510	11,355	13,125	18,385	27,160	29,829	13,565	21,381	18,279	32%
– Category III	4,563	4,218	4,916	7,040	9,724	17,658	9,953	4,761	7,400	7,930	33%
– Category IV	8,923	4,255	3,821	4,674	3,595	7,092	6,645	9,181	11,561	3,514	20%
– Category V	–	–	160	204	166	481	243	164	250	214	3%
Passenger car	24,199	33,861	29,419	31,981	32,095	57,479	46,974	29,368	31,582	24,541	15%
Total	139,438	162,630	159,635	156,192	174,356	271,712	254,737	172,234	203,588	168,808	
Motor cycle											
– for domestic			248,369	260,256	214,929	403,468	432,071	477,219	571,415	639,830	88.85%
– for import			–	–	21,511	5,604	13,197	11,305	49,670	55,180	
Total			248,369	260,256	236,440	409,072	445,268	488,524	621,085	695,010	

Notes: 1) Category I Gross vehicle weight below 2.5 tons (below 5 tons, from June, 1993)
Category II Gross vehicle weight 2.5 – 9 tons (5 – 10 tons, from June, 1993)
Category III Gross vehicle weight 9 – 24 tons (10 – 24 tons, from June, 1993)
Category IV Multi purpose car
Category V Gross confirmation vehicle weight
2) (*) January through July only.

Source: GAIKINDO

Chart A1-1-2 Present Status of Localization of Automotive Parts in Indonesia (1/2)

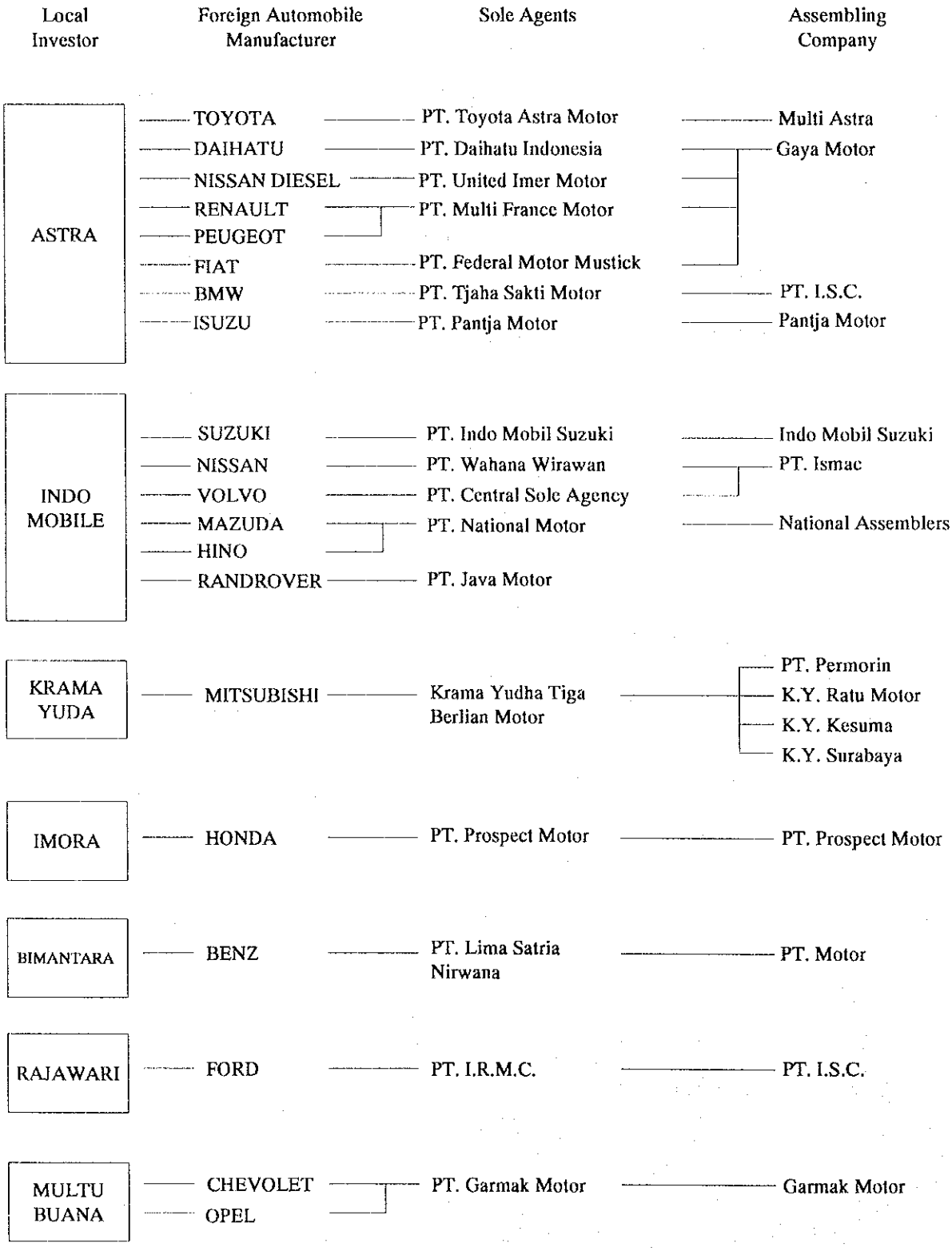
Category	Parts	Rate of Localization (%)
Functional Parts	Engine	29
	Transmission	9
	Drive axle	20
	Steering system	24
	Crutch	22
	Break system	52
	Chassis body	75
	Suspension	38
	Universal component	41
Engine Parts	Air filter	70
	Alternator	10
	Cam shaft	41
	Con rod	41
	Cylinder block	83
	Crank shaft	41
	Fly wheel	94
	Fuel filter	71
	Gasket	71
	Starter	10
	Oil filter	69
	Piston & Piston ring	65
	Radiator	71
	Plug	43
	V-belt	76
	Oil pan	75
	Bearing	32
	Engine support	81
Steering System	Steering column	98
	Steering wheel	76
Crutch System	Pivot	75
	Pressure plate	19
	Torsion spring	75
	Facing	85
Break System	Lining	79
	Shoe	75
	Drum	88
Chassis Body	Body Panel	77
	Cross menber	99
	Door	79
	Hood	77
	Fender	77
	Floor	78
	Side menber	79
	Side Rail	94
Suspension System	Front spring	75
	Rear spring	78
	Shock absorber	55
	Wheel hub	78
	Front hub	98

Chart A1-1-2 Present Status of Localization of Automotive Parts in Indonesia (2/2)

Category	Parts	Rate of Localization (%)
Universal Component	Battery	79
	Tube	55
	Bumper	76
	Fuel tank	43
	Horn	66
	Mirror	74
	Muffler	43
	Plastic parts	80
	Rubber parts	77
	Safety glass	99
	Sheet	41
	Tire	92
	Wheel	77
	Window regulator	54
	Harness	56
	Floor mat	79
	Head lining	86
	Door trim	82
	Sun visor	80
	Arm rest	77
	Safety belt	27
	Oil seal	27
	Tool set	82
	U-bolt	75

Source: GAIKINDO

Chart A1-1-3 Sales/Production/Investment Scheme by Local Investments and Foreign Automobile Manufacturer



Source: GAIKINDO

Chart A1-1-4 Local Production of Functional Components for Commercial Vehicles by Investor Group

Local investor group	ASTRA				INDO MOBIL			KRAMA YUDA	IMORA	BIMANTRA
Foreign automobile manufacturer	Toyota	Daihatu	Nissan Diesel	Isuzu	Suzuki	Mazuda	Hino	Mitsubishi	Honda	Benz
Assembler	MA	GYM	GYM	PJM	IMU	NAA	NAA	KYR	PSM	GYM
Engine	TAM	DI	PDP	MII	ISI	MIM	HIM	MKY	HPE	SEI
Rear body	TAM	DI	--	--	ISI	MIM	HIM	MKY	IH	--
Chassis frame	GKD	GKD	GKD	--	n.a.	--	GKD	(GKD)	--	--
Rear axle & propeller shaft	IGP	IGP	IGP	IGP	IGP	IGP	IGP	(IGP)	--	IGP
Brake system	TDW	TDW	TDW	TDW	CHN	TDW	TDW	TDW	CHN	n.a.
Clutch system	DSP	DCI	DCI	--	DCI	DCI	n.a.	DCI	--	DCI
Transmission	WEP	WEP	WEP	WEP	IWG	IWG	WEP	WEP	--	--

Notes: 1) [ ] : J/V with foreign automobile ( ) : Technical cooperation automobile -- : Import n.a. : Not available

Other companies are under local investment scheme

Sources: Compiled by Study Team on the basis of information from interview survey, and Norio Mihira and Yuri Sato,

"Industrialization in Indonesia: Results of Fully Covered Industrialization, " (1992: Institutes of Developing Economies, Tokyo), P.P. 354-355.

2) Company abbreviation used;

	Abbreviation	Company name		Abbreviation	Company name
Assembler	MA	PT. MULTI ASTRA	Functional parts manufacturer	GKD	PT. GEMALA KEMPA DAYA
	GYM	PT. GAYA MOTOR		MKY	PT. MITSUBISHI KRAMA YUDHA
	PJM	PT. PANJA MOTOR		SEI	PT. STAR ENGINE INDONESIA
	IMU	PT. INDO MOBIL UTAMA		HPE	PT. HONDA PROSPECT ENGINE
	NAA	PT. NATIONAL ASSEMBLER		IGP	PT. INTI GANDA PERDANA
	KYR	PT. KRAMA YUDA RATU MOTORS		TDW	PT. TRI DHARMA WISESA
	PSM	PT. PROSPECT MOTOR		DCI	PT. DAIKIN CLUTCH INDONESIA
				WEP	PT. WAHANA EKA PARAMITRA
				IWG	PT. INTINDO WAHANA GEMILANG
				PDP	PT. PANDU DAYATAMA PATRIA
				ISI	PT. INDOMOBIL SUZUKI INTERNATIONAL
				MII	PT. MESIN ISUZU INDONESIA

Chart A1-1-5 Total No. of Automobile in Indonesia 1989 - 1993

Type	1989	1990	1991	1992	1993
Car	1,174,241	1,293,835	1,485,947	1,574,806	1,676,781
Track	937,293	1,009,357	1,055,260	1,106,037	1,113,104
Bus	431,981	468,631	399,841	407,848	441,478
Motor cycle	5,700,481	6,078,916	6,289,693	6,804,046	7,005,706
Total	8,243,996	8,850,739	9,230,741	9,892,737	10,237,069

Source: GAIKINDO

2 Agricultural Machinery Subsector

2.1 Agricultural Machinery Subsector in Indonesia

2.1.1 General outline

The agricultural machinery industry in Indonesia can be classified into three categories according to type of equipment and use: engines, used as primary movers for farming machines and irrigation pumps; farming machines, including hand tractors, mini-tractors, and threshers; and irrigation pumps.

The industry emerged after the establishment of the Foreign Investment Act in 1967 and the Domestic Investment Act in 1968, which attracted foreign and domestic investors. As imports of foreign technology grew, joint ventures with foreign companies and companies funded by local capital were established. Today, 85 companies are registered with the Ministry of Industry as agricultural machinery makers. Most of them are located in Java.

In Indonesia, abundant supply of farming population and the lack of farm road networks have been discouraging the use of such large farming machines in rice cultivation, as large tractors, rice planters, combined harvesters, and reaper binders, and these are not locally produced. At present, most widely produced farming machines are hand tractors for cultivation.

30HP (25KW) or smaller horizontal diesel engines are produced, and used for farming machines. Centrifugal pumps are produced for irrigation purpose.

Indonesia exports irrigation pumps, tractors, rice hullers and rice polisher to various countries including Singapore, Vietnam, Malaysia, and Tanzania. On the other hand, diesel engines, pumps, hand tractors, rice milling units are imported from China, Singapore, Hong Kong, South Korea, Taiwan, Australia, and Japan.

2.1.2 Industry size

(1) Production

Based on data published by the Ministry of Industry, agricultural machinery production trends in Indonesia over the recent 5 years (1989 – 1993) are shown in Chart A1-2-1. 25 – 375KW (30 – 500HP) diesel engines are mainly used for power generation and boats, rather than agricultural machinery. The value of production of remaining 8 items amounted to Rp. 149.9 billion in 1992 and Rp. 168.5 billion in 1993, up by 168% and 188%, respectively, from Rp. 89.4 billion based on the average annual

output between 1989 and 1990 (the average figure was used because some items showed large variation during the two years)

(2) Number of enterprises and employment

85 agricultural machinery makers are registered with the Ministry of Industry. This figure does not include small enterprises located in rural regions.

18 companies are registered as manufacturers of 500HP (375KW) or less diesel engines, as shown in Chart A1-2-2. Of total, 13 are registered manufacturers of 30HP or smaller diesel engines that are used as prime movers for agricultural machinery. It should be noted, however, that 7 companies have not started commercial production according to record. In addition, one company does not produce diesel engines. Thus, only 5 companies actually produce 30HP or less diesel engines.

42 companies are registered to produce a variety of farming machines (Chart A1-2-3). 24 are registered as manufacturers of hand tractors, but only 11 are actually engaged in commercial production. 3 are registered as mini-tractor makers, and 2 are active; 10 out of 13 registered companies actually manufacture threshers; 11 out of 12 for rice hullers; 7 out of 10, rice milling units; 7 out of 8, polishers; and 5 out of 7, dryers. One manufacturer of transplanters and harvesters is registered. Finally, 21 companies are registered as manufacturers of other agricultural machinery including hand sprayers, seed processing plants, and agricultural machinery components and spare parts. At present, 13 companies are engaged in commercial production, and 8 are not.

29 companies are registered as irrigation pump makers, as shown in Chart A1-2-4, and 12 are in commercial production.

There are no statistical data on employment in the agricultural machinery subsector.

(3) Geographical distribution

Most of the 85 agricultural machinery makers registered with the Ministry of Industry are located in Java. Regional breakdown shows that 30.6% are situated in Jakarta, 29.5% in West Java, 17.6% in East Java, 7.0% in Central Java, 5.9% in North Sumatra, 2.4% in Yogyakarta, 2.4% in Lampung, and 1.2% each in North Celebes, Southeast Celebes, Aceh, and Riau.

It should be noted, however, that 5 manufacturers of 30HP or smaller diesel engines are relatively evenly distributed within Java, partly because of government guidance at the time of their establishment; 2 companies in East Java, 1 in Central Java, and 2 in West Java.

2.1.3 Major markets and domestic supply and demand situation

(1) Domestic supply

MOI's data are presented in Charts A1-2-1 - A1-2-4 exhibiting registered production capacity by type of agricultural machinery, production capacity of manufacturers in operation, actual production trends, and production growth rates. Note that the growth rates have been calculated by comparing the 1993 output and the average annual output between 1989 and 1990 (which is used because some items show large variation during the two years).

Rice milling units showed the highest growth at 383% in terms of actual output, followed by polishers (237.7%), irrigation pumps (166.2%), threshers (128.2%), mini-tractors (111.8%), diesel engines (59.4%), and hand tractors (23.9%). Rice hullers remained more or less unchanged (0.3%).

As mentioned earlier, all the manufacturers registered with the Ministry of Industry are not necessarily engaged in actual production. In fact, the ratio of production capacity of manufacturers in operation to registered capacity is fairly low for most of the product categories, 51% for diesel engines, 55% for dryers, 61% for irrigation pumps, and 67% for hand tractors. (see Chart 1 for detail)

Also, the ratio of the 1993 output to production capacity of manufacturers in operation is 57% for polishers, 53% for diesel engines, and 28% or less for other items.

Chart 1 Production Capacity, Actual Output and Growth Rate by Product Item

Item	Production Capacity (Registered) ①	Production Capacity (Those in operation) ②	(②/①)	Actual Output (1993) ③	(③/②)	(1989/90 average) ④	Growth Rate (%) ⑤(③-④/④)
Diesel Engine (Less 25kW)	262,400	133,000	(51%)	71,000	(53%)	44,531	59.4
Hand Tractor	62,075	41,425	(67%)	9,350	(23%)	7,546	23.9
Mini Tractor	2,650	2,500	(94%)	36	(1%)	17	111.8
Thresher	6,484	5,234	(81%)	1,431	(27%)	627	128.2
Huller	6,850	6,770	(99%)	1,511	(22%)	1,506	0.3
Rice Milling	6,930	6,174	(89%)	1,560	(25%)	323	383.0
Polisher	2,119	2,019	(95%)	1,155	(57%)	342	237.7
Dryer	445	245	(55%)	-		-	-
Transplanter	150	150	(100%)	-		-	-
Harvester	150	150	(100%)	-		-	-
Separator	1,650	1,490	(90%)	-		-	-
Irrigation Pump	395,540	239,750	(61%)	66,857	(28%)	25,119	166.2

(2) Export

Statistical data on exports and imports of agricultural machinery for 4 years between 1989 and 1992 are shown in Chart A1-2-5. While pumps, tractors, rice hullers/rice

polishers were exported every year, rice milling units were exported in 1989 and threshers in 1990 only. Pump exports grew each year after 1990, and amounted to approximately US$7.61 million in 1992. Tractor exports reached a record US$165,000 in 1990 and have been remaining at a US$30,000 level thereafter. Similarly, exports of rice hullers/rice polishers culminated at approximately US$355,000 in 1990 and declined thereafter, only US$3,540 in 1992. Major importing countries of Indonesia's agricultural machinery include Singapore, Vietnam, Malaysia, Tanzania, and Japan.

(3) Import

Indonesia imports pumps, diesel engines, hand-tractors, and rice milling units each year during the four year period. In particular, the value of exports exceeded US$100 million for pumps and diesel engines, amounting to US$141,370,000 and US$131,680,000 in 1992, respectively. On the other hand, imports of hand-tractors and rice milling units amounted to US$1,330,000 and US$1,760,000 in 1992, respectively. Major exporting countries include China, Singapore, Hong Kong, Taiwan, Australia, and Japan.

The demand and supply situation related to 30HP or smaller diesel engines in Indonesia is outlined as follows.

First , annual demand is estimated at 120,000 units, of which 70,000 – 80,000 units are used as prime movers for agricultural machinery, and the remaining units as power sources for other machineries including small fishing boats, concrete agitators, and generators. Capacity-wise, 20HP or smaller diesel engines are mainly used in agricultural machinery, while 20HP or larger ones for small fishing boats.

Recently, low-cost diesel engines are imported from China in large quantities estimated at around 50,000 units annually on the basis of domestic demand and production figures. In addition, some companies import components from China for local assembly to boost actual imports to above 60,000 units. It should be noted, however, that the Chinese products are mainly used as power sources for fixed type equipment and machinery, including irrigation pumps concrete agitators, and generators because they are heavy in weight, produce significant vibration, and often break down. They are not widely used for self-propelled equipment, such as hand-tractors and small fishing boats.

2.1.4 Procurement of raw materials

Procurement sources of major components and materials by product item are

summarized as follows.

(1) Diesel engines

1) Components which are produced locally as common parts
   Springs, ball bearings (existence of some makers)
2) Components whose raw materials are procured and machined locally
   a) Casting parts: Flywheels, gear cases, pulleys, crank case covers, main bearing cases, gear case covers, water hoppers, air cleaner flanges, muffler flanges, piston rings (some makers), and cylinder liners (some makers)
   b) Press parts: Fuel tanks, mufflers, radiators, and bonnets
   c) Forging parts: Gears
3) Components whose raw materials are imported from Japan and other countries and are machined locally
   a) Casting parts: crank cases, cylinder heads, cylinder liners (some makers)
4) Components which are machined outside the country and imported
   a) Forging parts: Crank shafts, cam shafts, connecting rods, valves, tappets
5) Components which are imported as built
   Injection pumps, nozzle holders, trochoid pumps, air cleaners, pistons, and oil seals

More detailed findings are summarized as follows:

1) Some companies import crank cases, cylinder heads, and other castings from various countries including Korea, Taiwan, and China.
2) Although at the stage of trial manufacturing , some companies plan to manufacture single-cylinder horizontal crank cases, three-cylinder vertical cylinder blocks, and ductile cast iron-made crank shafts and connecting rods.
3) Companies procuring castings of simple construction from the Ceper district in Klaten in following the government's SME promotion policy, are troubled by quality problems.

(2) Agricultural machinery

Most components and parts are locally produced, and the localization rate for all the manufacturers is close to 100%. Imported are some of steel materials that require quenching, and cold-rolled steel products (SPCC).

(3) Irrigation pumps

While some enterprises use imported bearings, most components and materials are locally produced. The localization rate is nearly 100% for all the manufacturers.

2.1.5 Production structure

(1) Ownership

1) Of 5 diesel engine manufacturers currently in operation, three companies are joint ventures with Japanese companies, one is a state-owned enterprise receiving technical assistance from a German company, and another one is a Chinese-affiliated company. The latter is only a Chinese-affiliated company currently in production among 9 registered companies including PT. Done Feng Indo Jaya.

2) There are manufacturers of agricultural machinery and irrigation pumps who operate joint ventures with Japanese and other foreign companies; or receive technical assistance from them. Nevertheless, their number is small compared to other areas, particularly automotive and household appliance industries.

(2) Production technology

1) All of the five diesel engine manufacturers use foreign technology for production and have sufficient production equipment as well as quality control, inspection and testing equipment. In particular, two leading manufacturers, PT. Yanmar Diesel Indonesia and PT. Kubota Indonesia, were established in 1972 and, are using production equipment and systems widely used in Japan around that time.

2) As for agricultural machinery and irrigation pumps, joint ventures with Japanese and other foreign companies have modern buildings and equipment with well-planned layout, where quality control is practiced satisfactorily. In particular, joint ventures with Japanese companies and those receiving technical assistance from Japanese companies have developed, and are manufacturing hand-tractors with simplified designs adjusted to local conditions.

On the other hand, indigenous enterprises have been expanding their capacities with increase in production, but are rather operating with disorderly facility and equipment layout. Large enterprises manufacture products under their own brands having their own inspection and testing equipment, and check equipment performance whenever process or a component is changed. On the other hand, small enterprises mostly produce imitations of foreign products and their quality control is less than satisfactory.

2.1.6 Major issues facing the agricultural machinery industry

As pointed out earlier, Indonesia has recently been importing very cheap horizontal diesel engines and irrigation pumps in large quantities from China. Although they have various quality problems such as heavy weight and frequent failure, the Chinese products

are popular among low-income users who prefer price to quality. For the industry to have international competitiveness, it is important to increase productivity and reduce production costs. However, the smallness of the domestic market impedes such efforts.

Issues related to each of the above subsectors are summarized as follows:

(1) Diesel engine subsector

The major challenge for this subsector is to minimize production costs while maintaining the current levels of quality. To this end, the following measures are required:

1) Further promotion of local procurement of components and raw materials

Companies who have previously made localization efforts in response to the government's Deletion Program are now voluntarily stepping up the localization process. Yet, ongoing procurement of components and raw materials from local sources are facing various quality and technical problems, making the need for fostering subcontractors increasingly important. Also, conscientious efforts to procure crank cases and cylinder heads from local sources, under cooperation of the casting industry, are called for.

2) Establishing the mutual assistance system in parts supply with neighboring countries

Some companies are already importing components for crank cases and cylinder heads from China, Korea, and Taiwan. To achieve significant cost reduction, the industry is expected to pursue economy of scale by establishing a mutual support system with counterpart industries in neighboring Asian countries whose strength lies on their specialization of particular parts and components.

Rather than insisting on local procurement or in-house production of every component.

3) Further quality control drives

For this subsector, it is increasingly important to reduce the fraction of defects and boost production yield.

(2) Agricultural machinery subsector

Demand for agricultural equipment including hand-tractors and rice milling units has been on the rise, and is expected to continue in future. As for product design, robust and simplified models suitable for local conditions have been developed. Also, localization has reached nearly 100%.

The major challenge is therefore to boost capacity utilization rates to meet future demand. Several companies have already started to add new facilities and equipment and modify facility layout.

(3) Irrigation pump subsector

Principal components of irrigation pumps are castings, including bodies and impellers. Whereas some companies operate their own foundry shops for the purpose of securing reliable quality levels for castings, many still procure them from outside sources. However, procured products show a higher rejection rate resulting to higher production cost. To minimize the fraction of defects for castings and maintain reliable quality levels, further quality control drives are essential.

2.2 Need for Promotion of Standardization and Quality Control

2.2.1 Standards for the agricultural machinery industry and proliferation in Indonesia

In Japan, standards related to agricultural machinery are set forth in General Machinery (B) and Automobile (D) of JIS. As of the end of FY1993, there are 13 standards in the field of internal combustion engine, 29 in agricultural machinery, 21 in pumps, and 10 in the field of tractors for agriculture. Recently, Japan participated in international standardization activity and is promoting harmonization with ISO, and other international standards in view of boosting imports through the further opening of its market.

On the other hand, SNI covering the agricultural machinery industry amounts to 33 in Agricultural Equipment and Machinery (SNI 02) and 41 in Harvesting, After Harvesting and Preservation Equipment (SNI 02), as of January 1994. And in General Machines (SNI 05), 3 standards in engine, 4 in pumps and 3 in machines for agricultural work are established.

As seen in JIS, SNI can be classified into 3 categories according to their nature and application: product standards such as plough edges and harrow edges; method standards such as performance test of rice shedder, and performance test of rice separator of sieving type; and basic standards such as symbols for agricultural tractors and machinery. Comparing symbols for control units of agricultural machinery in JIS (B9126) with those in "Tractor, Machinery for Agricultural and Forestry, Powered Lawn and Garden Equipment – Symbols for Operator Control and Other Displays – Part 1: Common Symbols (SNI 02–3133–1992)," "Symbols for Agricultural Tractors and Machinery – Part 2 (SNI 02–3134–1992)," 33 symbols are set forth in JIS, compared to 68 in SNI. Both the

JIS and SNI standards are established in line with ISO, and have many common elements.

In establishing SNI related to agricultural equipment, ALSINTANI (Asosiasi Perusahaan Alat dan Mesin Pert Anian Indonesia: Association of Indonesian Agricultural Machineries) is involved in technical discussions by sending its representative to the technical committee.

Trade organizations related to the industry like, ABI (Asosiasi Motor Bakar Indonesia: Association of Indonesian Internal Combustion Engine Manufacturers), AIPSI (Asosiasi Industri Pompa Seluruh Indonesia: Association of Indonesian Pump Industries), and ALSINTANI, do not have their own standards.

2.2.2 Current use of standards at individual companies

Joint ventures with Japanese companies, and local companies receiving technical assistance from foreign companies or obtaining license from them, primarily rely on industrial standards of trade partners for design, manufacture, procurement, and inspection, such as JIS and DIN. Other local companies frequently use JIS. A large number of SNI/SII related to agricultural machinery is established, but they are rarely used in practice.

SNI/SII partially applies to standard components and materials that are locally produced, and foreign standards such as JIS are frequently used, as seen in products.

Diesel engines are manufactured in accordance with JIS, and upon completion, they are often certified by SNI/SII marking. SNI/SII is similar to JIS in this area, and no significant problem is reported.

2.2.3 Expectation for promotion of standardization, and major issues

Major issues pointed out by GAMMA (Gabungan Asosiasi Perusahaan Pen Gerjaan Logam Dan Mesin Indonesia: Federation of Indonesian Metal Works & Machinery Industries) and its member organizations are summarized as follows:

(1) In the middle of the shift from SII to SNI, we are not sure about which standard should apply.

(2) SNI/SII does not have standards for indication of dimensions. Instead, we follow ISO, JIS, and drawings that use centimeters or inches, which sometimes are confusing.

(3) SNI/SII publications are not available at bookstores. Trade associations do not have any.

(4) While JIS is very widely used, they are not translated to Indonesian. JIS publications in English are very expensive and cannot be understood by many people. The language problem is not limited to standards, but to technical publications at large. There are very few publications in Indonesian, which is one obstacle to industrial development at the

field level.

As pointed out earlier, manufacturers mostly use JIS and other foreign standards as well as international standards, so that few demands have been heard about the need or expectation for SNI.

2.2.4 Availability of testing and inspection system

2.2.4.1 In-house testing and inspection system

Joint ventures with Japanese companies, local companies receiving technical assistance from foreign companies, and large local enterprises have their own quality control equipment as well as inspection and testing equipment to check product performance. They conduct performance tests for all the products, e.g., assembled diesel engines, hand-tractors, and pumps, together with in-process quality check. Also, when a process or a component is changed, they check quality and performance using sample equipment or product before starting volume production.

Small-and-medium-sized manufacturers conduct dimensional and external appearance inspections in process, but many of them do not have sufficient testing equipment.

All the manufacturers conduct acceptance inspection on procured components and raw materials, with varying degree. Standard parts, such as bolts, springs, and bearings, and steel materials are checked against their invoices. Machined components and press working components are checked for dimensional accuracy and external appearance by using randomly selected samples, and inspection records are well maintained. Any rejected project is returned to its manufacturer with a test report. Castings supplied by small-and-medium-sized enterprises whose quality is unreliable are subject to 100% inspection on external appearance and dimensions. Note that variation of casting quality serves to impact as an additional cost.

Calibration and certification of mostly Japan-made testing equipment and measuring instruments at Japanese joint venture companies are done periodically by experts sent by Japanese manufacturers or by their service centers in Singapore. Some companies maintain in-house standards such as block gauges and micrometers that are certified by MIDC, and use them for calibration and check of ordinarily used testing equipment and is then affixed with an in-house certification mark.

Local companies, particularly large corporations, chiefly rely on calibration and certification services of the member organizations of JNK (Jarring National Calibrate: National Calibration Network).

2.2.4.2 Outside testing and inspection system

(1) Testing organizations related to agricultural equipment

A government organization providing inspection and testing services for agricultural machinery is BBP ALSINTAN (Balai Besar Pengenbangan Alat dan Mesin Pertanian: Center for Development of Agricultural Engineering) under the Agency for Agricultural Research and Development, the Ministry of Agriculture (Bandan Penelitian dan Pengen Bangan Pertanian Departemen Pertanian). The center was established in 1985 as ATA-220 Project under the technical assistance of JICA, and its primary purpose is to conduct research and development on agricultural machinery and implements suitable for Indonesia. Later, it was reorganized under its present name.

As of the end of 1994, the center employs 116 people. Its major activities include technical analysis and information collection for mechanization of agriculture in Indonesia, the development and improvement of agricultural machinery, as well as testing and evaluation.

In Indonesia, Law 12/1992 Concerning Plant Cultivation Systems (Undang-Undang Indonesia Nomor 12 Tahun 1992 Tentang Sistem Budidaya Tanaman: UU 12/92) requires tools and machinery used for cultivation of plants be tested before being out into the market, under Article 43, Section 3 "Tools and Machinery," Chapter 4 "Production Equipment." The center conducts tests required by the law, and issues test reports to the government and applicants. In practice, however, the test is requested only when manufacturers are required to do so, e.g., the tender procedure for government procurement. It performed 8 tests in 1993 and 19 in 1994. The test is conducted in accordance with RNAM Test Code and Procedure established by Regional Network for Agricultural Machinery of Economic and Social Commission for Asia and Pacific (ESCAP) as well as SNI.

(2) Certification organizations for testing and inspection equipment

Companies that are not capable of calibrating their own measuring instruments, including micrometers, commission calibration and certification services to any of the member organizations of JNK. However, these organizations are reputed for charging high cost and a long period of time involved for its service. Many small-and-medium-sized enterprises do not receive certification for their measuring instruments.

2.3 Need for Improvement of the Certification System

2.3.1 General structure of the certification system in the agricultural machinery industry

In Indonesia, products bearing the SII/SNI mark are classified into those subject to mandatory certification and those having voluntary certification.

There are 2 SIIs related to the agricultural machinery industry that require mandatory certification, as follows:

(1) SII. 0697-82: Performance Test of Alternating Engine Power for General Use
(2) SII. 1008-84: performance Test of Centrifugal Pump

According to PUSUTAN's documents, two companies, PT. Kubota Indonesia and PT. Yammar Diesel Indonesia, are certified under (1) above (actually, PT.Tri Ranta Diesel Indonesia is also certified under this category in addition to these two). Certification under (2) above is issued to two companies, CV.Pabrik Mesin Guntur, PT. Agrindo. and PT.Tri Ratna Diesel Indonesia.

On the other hand, the following three standards apply to voluntary certification of agricultural machinery:

(1) SII. 0198-83: Insecticide Sprayer
(2) SII. 1025-84: Performance Test of Corn Miller
(3) SII. 1945-86: Toothed Sickle

Certification under the first standard is issued to four companies, PT. Golden Agin, PT. Vantin Prima, PT. Agrindo, and PT. Telaga Sewu, while one company obtains certification under each of the remaining two standards, Sinar Teknik Indonesia and Agri Industri, respectively. Note that PT.Boma Bisma Indra obtains ISO 9000 certification but does not have SII/SNI certification.

2.3.2 Current use of certification by enterprises

Companies that have SII certification affix the SII mark to their products only when required to do so, e.g., products for government procurement.

Also, most enterprises are unaware of the shift from the SII marking to the SNI marking system, which reflects the lack of the advertisement for such change, as well as the lack of interest among enterprises.

2.3.3 Expectations for improvement of the certification system, and major issues

As pointed out earlier, the SII certification system has various problems related to its actual operation, as follows:

(1) There are manufacturers who make products subject to mandatory certification without obtaining one.
(2) Not many manufacturers who obtain certification affix the SII mark to their products, even in the case of mandatory certification.
(3) The shift to the SNI marking system is not known to most manufacturers, including those having the SII mark.

In Indonesia, users tend to purchase products on the basis of price, rather than quality. As a result, there is no incentive for manufacturers to affix the SII mark, explaining why they use the mark only when required to do so, e.g., products supplied to the government. Clearly, the government should exert efforts in making the SII/SNI certification system known to the public, particularly among industries, by advertising the need and value of the SII/SNI mark to general consumers, and by strictly requiring manufacturers to use the SII/SNI mark on products subject to mandatory certification. In particular, the lack of knowledge about the shift to the SNI marking system among most enterprises suggests of the government's unsatisfactory effort to advertise it. The government must pursue more vigorous efforts, including advertisement on newspapers and other effective measures.

2.4 Need for Promotion of Quality Control

2.4.1 Current level of quality control

2.4.1.1 Quality control system

Joint ventures with Japanese companies, local companies receiving technical assistance from foreign companies, and large corporations mostly adopt some elements of the Japanese-style quality control system including TQC and QC circle activities and suggestion program. Some of them have good organizational setup, including QC departments. Nevertheless, while many companies post employee suggestions and improvement results within their premise, few use SQC techniques including control charts.

Many of the smaller companies manufacture imitations of foreign products but do not

have sufficient quality control equipment and organization.

2.4.1.2 Manpower training

Many joint ventures with Japanese companies send staff and workers to parent companies in Japan for training. Some have in-house training centers to provide quality control education in addition to field training. Also, some training centers are open to college and high school students in local communities they operate.

Furthermore, there are companies that send their staff to overseas quality control seminars and workshops (for instance, JICA seminars in Japan) or invite foreign experts (such as JODC in Japan).

Finally some companies send their employees to national QC competition and QC seminars sponsored by Pustan and other organizations.

2.4.1.3 Company standards

Large companies and local companies receiving technical assistance from foreign companies have developed which use their own standards for acceptance inspection, production, product inspection, and other operations. Some are posting work instruction sheets near the assembly lines by using forms containing easy-to-understand illustrations and checkpoints. This practice shows the effort of managers and staff in allowing their field workers to raise concerns about standardization, and demonstrate that they use the standards for field operations, and not simply to mire in file cabinets as often occurring in the standardization process. On the other hand, a few small size company has its own standards.

2.4.1.4 Others

A very few Indonesian-language textbooks and reference materials are available in the fields of quality control, standardization, and skills training, becoming one of obstacles to the improvement of production techniques and quality control activities.

2.4.2 Major issues related to quality control

It is strongly felt that joint ventures with Japanese companies, local companies receiving technical assistance from foreign companies, and large corporations and their management are highly aware of the need for quality control.

Most of them promote quality control activities with full participation of employees, including QC circle activity and suggestion program. At the same time, much less companies adopt SQC techniques such as control charts in their daily production activity.

On the other hand, some of small-and-medium-sized enterprises of local capital seem to place priority on price over quality.

It is generally believed that consumers in Indonesia tend to buy products based on price, rather than quality. To reverse the trend, manufacturers and their managers are expected to follow quality-comes-first attitude. This would change consumer's attitude toward quality consciousness, albeit gradually.

To produce products with international competitiveness, companies must have the ability to monitor quality status quickly and accurately, notify any problem to previous and subsequent processes, identify causes for defect and other quality problems, and devise and implement proper corrective measures. SQC techniques hold the key to such total quality control system and need to be incorporated in daily operation. For this purpose, companies must train and produce staff with expert knowledge on quality control who can act as major advocates, in addition to the concern of managers and workers.

Chart A1-2-1 Production of Agricultural Machine and Equipment (1989 - 1993)

Item		1989	1990	1991	1992	1993
1. Diesel Engine	- Unit	41,062	48,000	79,354	71,000	71,000
Less 25 kW	- Value (million Rp.)	57,265	71,072	105,913	104,239	113,621
2. Diesel Engine	- Unit	3,283	1,660	1,800	500	1,750
25 - 375 kW	- Value (million Rp.)	34,528	3,848	3,981	1,327	32,360
3. Hand Tractor	- Unit	5,533	9,559	10,000	9,350	9,350
	- Value (million Rp.)	8,878	16,250	18,000	18,513	20,179
4. Mini Tractor	- Unit	14	20	27	36	36
	- Value (million Rp.)	202	302	421	730	795
5. Irrigation Pump	- Unit	6,728	43,510	45,000	55,174	66,857
	- Value (million Rp.)	4,268	15,574	16,000	21,790	28,502
6. Rice Milling	- Unit	301	344	1,097	1,300	1,560
	- Value (million Rp.)	344	1,097	1,100	1,434	1,876
7. Huller	- Unit	1,263	1,748	2,000	1,511	1,511
	- Value (million Rp.)	1,096	1,027	1,147	953	1,039
8. Thresher	- Unit	826	427	571	1,431	1,431
	- Value (million Rp.)	410	416	562	1,550	1,689
9. Polisher	- Unit	362	665	950	1,050	1,155
	- Value (million Rp.)	252	431	572	695	834

Source: Directorate of Machine Equipment & Engineering Industries, MOI

Chart A1-2-2 Capacity and Production of Diesel Engines (1992/1993)
- Non Automotive -

(Unit: Number/Year)

Firm			Capacity	Production	
			1992	1992	1993
1. PT. ADI PERKASA BUANA					
	Less 30 HP		6,400 *	not produce yet	
2. PT. YANMAR DIESEL INDONESIA					
	Less 30 HP		35,000	23,792	23,144
	31 – 500 HP		26,000	28	–
3. PT. KUBOTA INDONESIA					
	Less 30 HP		35,000	18,189	21,762
4. PT. TRI RATNA DIESEL INDONESIA					
	Less 30 HP		24,000	13,194	9,768
	31 – 500 HP		3,000	–	–
5. PT. BOMA BISMA INDRA					
	Less 30 HP		9,000	–	–
	31 – 500 HP		11,000	310	790
6. PT. DWIKATAMA DIESEL INDUSTRY					
	Less 30 HP		15,000 *	not produce yet	
7. PT. DONG FENG INDO JAYA					
	Less 30 HP		20,000 *	not produce yet	
8. PT. INDOVERSE MACHINERY PURATAMA					
	Less 30 HP		30,000	12,511	8,899
9. PT. ANDHIKA WISESARAYA					
	Less 30 HP		15,000 *	not produce yet	
10. PT. SAHABAT LESTARI IND & TRD.					
	Less 30 HP		20,000 *	not produce yet	
11. PT. POSLIN JAYA					
	Less 30 HP		20,000 *	not produce yet	
12. PT. INTERKHARISMA MATRANUSA					
	Less 30 HP		3,000 *	not produce yet	
13. CV. KARYA HIDUP SENTOSA					
	Less 30 HP		30,000 ☆	(not produce yet)	
14. CV. WIRA MUSTIKA INDAH					
	31 – 500 HP		3,200	–	–
15. PT. MESINDO AGUNDG ENGINEERING					
	31 – 500 HP		3,684	81	–
16. PT. PANDU DAYA TAMA					
	31 – 500 HP		2,000	–	–
17. PT. CUMMINS HARDAYA INDONESIA					
	30 – 500 HP		6,000 *	not produce yet	
18. PT. NATRA RAYA					
	34 – 500 HP		1,650	–	–
Total	Including Mark * & ☆	•Less 30 HP	262,400	67,686	63,573
		•31 – 500 HP	33,134	419	790
	Excluding Mark * & ☆	•Less 30 HP	133,000	67,686	63,573
		•31 – 500 HP	27,134	419	790

Note: Mark * & ☆ show the capacity of not produce yet.

Source: Directorate of Machine Equipment & Engineering Industries, MOI.

Chart A1-2-3 Production Capacity of Agricultural Machine and Equipment (1992)

(Unit: Number/year)

Firm	Hand Tractor	Mini Tractor	Paddy Thresher	Rice Huller	Rice Miling	Rice Polisher	Dryer	Transplanter /Harveste	Separator
1. CV. SURATMAN	25		120				15		
2. PT. FONGSO INDONESIA	200								
3. PT. ARMINDO INTERNATIONAL CORP.	60 *		50 *	80 *					
4. CV. KARYA HINUP SENTOSA	20,000		1,500	2,000	1,500	1,000			
5. CV. ECHO	200			1,000		300			
6. PT. DHARMA RIGOWO INDO DIESEL, LTD.	1,000 *								
7. PT. LINGGA WESTU JAYA	40 *								
8. PT. ANDHIKA WISESARAYA	1,500 *								
9. PT. MULTI PRAYASARINA	2,500 *								
10. PT. BUMI SAMODRA ASIA	5,000 *								
11. PT. KUBOTA INDONESIA	10,000								
12. PT. MITORA TANI NUSANTARA	2,000		200 *	100	100 *	100 *	100 *		
13. PT. YAMINDO	200		3,000	1,500	2,500				
14. PT. OTA PRIMINDO AGUNG	500 *				150 *				
15. PT. FRANKWELL UTAMA JAYA	1,800 *								
16. PT. SURYASASEKAR JAYAMAS	200 *								
17. PT. SHINTA PERDANA & INDUSTRIAL	5,200 *								
18. PT. BHINEKA SWADAYA INTI	3,800	1,000							
19. PT. AGRINDO	500	1,500	100	400	750		150		
20. PT. SAHABAT LESTARI IND & TRD.	850 *	150 *							
21. PT. YANMAR AGURICULTURAL MACHIN	1,000 *				506 *				
22. PT. ANEKA USAHA PERKEBUNAN	1,000 *								
23. PT. PUPUK ISKANDAR MUDA	4,000								
24. PT. INDOVERSE MACHINERY PRATAMA	500		1,000 *		1,000				
25. CV. INDUSTRI NASIONAL, KEMAJUAN			50	350		100			100
26. CV. SAUDARA JAYA			20 Ton	15 Ton			15 Ton		
27. PT. BOMA BISMA INDRA			250		250				
28. PT. KERTA LAKSANA			40	40		40	30		
29. NERACA			24						
30. PT. BUKAKA TEKNIK UTAMA			150	150	150	150		150/150	
31. PT. ADI PERKASA EXABAKTI				1,200					
32. BENGKEL JAYA				30					
33. MERACA					24	12			
34. CV. PABRIK MESIN GUNTAN						417			
35. PT. SUPER ANDALAS STEEL							50		
36. PT. ASP DRYERS INDONESIA							100 *		
37. PT. ADIM HUSTIKA SUN METAL									560
38. PT. ARMINISO INT. CORP.									30
39. PT. INDO LAVAL									50
40. PT. GUNA NUSA UTAMA FABRIKATOR									700
41. PT. WIJAYA PURA									50
42. PT. SETIA MITRA STEEL									160 *
Total *Including Mark *	62,075	2,650	6,484 +	6,850 +	6,930	2,119	445 +	150/150	1,650
*Excluding Mark *	41,425	2,500	5,234 +	6,770 +	6,174	2,019	245 +	150/150	1,490

Note: Mark * shows the capacity of not produce yet.
Mark + shows the extra capacity of indication in Ton.

Source: Direktorat Jenderal Industri Mesin Logam Dasar Dan Elektronika Departemen Perindustrian; December 1992

Chart A1-2-4 Capacity and Production of Irrigation Pump (1992/1993)

(Unit: Number/Year)

Firm	Capacity	Production	
	1992	1992	1993
1. PT. RUHAAK PHALA INDUSTRI			
Axial Flow Pump	1,450	580	638
2. PT. ANEKA POMPA BANDUNG			
Centrifugal Pump	100 *	not produce yet	
3. Fa. BINA SAKTI			
Centrifugal Pump	450 *	not produce yet	
4. CV. SURATMAN			
Centrifugal Pump	450	180	198
5. PT. DWIKA			
Centrifugal Pump	200	80	88
6. PT. GUNA ELEKTRO			
Centrifugal Pump	750	300	330
7. PT. EBARA INDONESIA			
Centrifugal Pump	2,250	900	990
8. BOMA BISMA INDORA			
Centrifugal Pump	2,000	800	880
9 PT. SYDNEY METAL			
Centrifugal Pump	500 *	not produce yet	
10. CV. CIPTA KARYA			
Centrifugal Pump	1,400 *	not produce yet	
11. CV. KARYA HARAPAN			
Centrifugal Pump	3,000 *	not produce yet	
12. PT. CELCO TEKNIK INDUSTRI			
Centrifugal Pump	200 *	not produce yet	
13. PT. IMORA MAKMUR			
Centrifugal Pump	8,000 *	not produce yet	
14. PT. TORISHIMA GUNA INDONESIA			
Centrifugal Pump	300	80	88
15. PT. KAWAMOTO PUMP INDONESIA			
Centrifugal Pump	11,000 *	not produce yet	
16. CV. PABRIK MESIN GUNTUR			
Irrigation Pump	2,250	1,200	1,320
17. PT. MASA JAYA PERKASA			
Centrifugal Pump	100	80	88
18. PT. POMPA GUINARO INDONESIA			
Centrifugal Pump	3,000 *	not produce yet	
19. CV. KARYA HIDUP SENTOSA			
Centrifugal Pump	10,000	3,200	3,520
20. PT. SALCON SAKTI			
Centrifugal Pump	90 *	not produce yet	
21. PT. SUMBER SUJAKA			
Centrifugal Pump	500 *	not produce yet	
22. PT. ARMINDO			
Irrigation Pump	100 *	not produce yet	
23. PT. ANDHIKA WISESARAYA			
Irrigation Pump	40,000 *	not produce yet	
24. PT. INDO BETA MANDRAGUNA			
Centrifugal Pump	3,000 *	not produce yet	
25. PT. ALAM RAYA SEWING MACHINE			
Irrigation Pump	36,000 *	not produce yet	
Centrifugal Pump	18,000 *	not produce yet	
26. PT. FIRMA BINA SAKTI			
Centrifugal Pump	450 *	not produce yet	
27. CV. TJAHA SARI			
Centrifugal Pump	30,000 *	not produce yet	
28. PT. ARSIMELIN MEGAH INDONESIA			
Centrifugal Pump	200,000	18,000	19,900
29. CV. ECHO			
Centrifugal Pump	20,000	–	–
Total · Including Mark *	395,540	25,400	28,040
· Excluding Mark *	239,750	25,400	28,040

Source: Directorate of Machine Equipment & Engineering Industries, MOI.

Chart A1-2-5 Export and Import Volume of Agricultural Machine (1989-1992)

(Export)

(Unit: US$ x 1,000)

Item	1989	1990	1991	1992
1. Pump	1,398.30	1,263.78	3,808.64	7,610.68
2. Rice Milling Unit	1.91	0.00	0.00	0.00
3. Tractor	25.40	164.98	34.09	36.46
4. Paddy Thresher	0.00	9.00	0.00	0.00
5. Rice Huller, Rice Polisher	7.32	355.47	6.21	3.54

Source: Directorate Machine Equipment & Engineering Industries, MOI

(Import)

(Unit: US$ x 1,000)

Item	1989	1990	1991	1992
1. Pump	132,751.14	127,525.22	199,582.08	141,368.46
2. Hand Tractor	4,047.88	4,530.84	1,920.26	1,330.31
3. Diesel	131,748.37	175,208.68	159,393.89	131,676.08
4. Rice Milling Unit	3,375.00	1,997.00	456.00	1,761.26

Source: Directorate of Machine Equipment & Engineering Industries, MOI