

## GLOBALIZATION OF AGRICULTURAL MACHINERY PRODUCTION THROUGH INTERNATIONAL JOINT VENTURE

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### ABSTRACT

The increasing need for agricultural machinery production and its globalization through international joint ventures are discussed in this paper. Examples of joint businesses for the overseas manufacturing of farm machinery are given and problems are pointed out. Overseas production of automobiles is illustrated through a few examples and suggestions are made for farm machinery production. Measures to be taken to promote global production of agricultural machinery through international joint ventures are mentioned.

### INTRODUCTION

The increase in world's population and changes in food patterns are stimulating the greater production of food. This situation will result in strong demand for an increase in farm machinery production in the future.

There were 1,350 million ha of arable land in the world in 1990 (FAO,1991). If 0.7 kW power is assumed necessary to cultivate one ha of arable land, 945 million kW of power will be needed for full mechanization of the world's current land. There are 26.544 million tractors in the world (Table 1). If a tractor (other than garden tractors) is powered with an average of 20 kW, then the total farm tractor power becomes 538 million kW - 57% of the full amount demanded. As an example of small- scale farming, however, Japanese farmers are now using almost 7 kW power for 1 ha (Shinnorin-sha, 1992). Since small farming is predominant throughout the world, and if 3kW power is assumed necessary for 1ha, only 13% of mechanization in terms of power have been achieved.

Tractors sold on the world market in 1990 numbered about 680 thousand units (Table 2), which was 2.5% of all tractors in use (FAO,1991). In 1988, the tractors purchased and registered in the world were 1,237 thousand units (AEA, 1988), 4.7% of the total number in use. Considering the average durability of tractors, this figure indicates a low tractor production level.

Increase in the number of tractors and harvester-threshers in use worldwide has decreased since the latter half of the 1980's especially since 1989 (Table 1). This

is mainly due to the agricultural recession in developed countries.

The globalization of the world's economy is now prevailing because of the following tendencies;

- 1) globalization of the money market
- 2) development of information technology
- 3) reduction of transportation costs
- 4) primary use of English as the common international language
- 5) global environmental problems.

In many industries, the globalization of production has been promoted; in the automobile industry, for example, assembling and parts manufacturing overseas are now common, and no company can survive any longer without developing worldwide.

The agricultural machinery industry is also shifting to more worldwide activities; overseas production and international contracts are becoming more numerous.

This tendency is stimulating the global production of agricultural commodities and will be further accelerated by the GATT-Uruguay Round. The inter-regional trade in the world is not enough especially in European and in the Pacific Regions as shown in Fig.1, and will be promoted in the future as a part of the globalization.

## OVERSEAS PRODUCTION OF AGRICULTURAL MACHINERY

Farm machinery production through an overseas joint venture between A and B may be motivated by one or more of the following;

For A:

- 1) To cope with restrictions on imports; many countries restrict the importation of completed products or impose a high import tax. Assembly factories are the main measures taken to cope with these restrictions.
- 2) To reduce labor costs; lower overseas wages some times attract a company to shift from domestic production.
- 3) Trade balancing demands overseas production in some cases.
- 4) The tax system in some countries is more advantageous than in the home country.
- 5) To adjust production load and thereby increase production efficiency of the overall enterprise.
- 6) The possibility of selling the technical know-how.
- 7) To cooperate with a foreign company and thus offset a recognized weakness.

For B:

- 1) More job opportunities.
- 2) Better machinery can be produced.
- 3) Faster than developing independently.

- 4) Better production system.
- 5) Chances to export to other countries.
- 6) Enhancement of capital stock.
- 7) To improve infrastructure of the society.

One example is that of the Kubota Corporation (Sahara, 1992): Kubota produces US\$ 2.5 billion of agricultural machinery in its domestic factories annually, and about US\$ 250 million in overseas factories (10% of its domestic production). Seventy-five percent of the domestic production is for the domestic market and 25% is for the overseas market, while machinery produced overseas is almost all for use overseas.

In 1960, Kubota started manufacturing diesel engines and power tillers in Brazil; manufacturing of cast-iron for use in the parts of these products was begun at the same time. Thereafter, Kubota also began manufacturing farm machinery in Taiwan, Thailand, USA, Spain, Germany and other countries.

The production of horizontal diesel engines began in Indonesia in 1973 and 10 models from 3.3 kW to 20 kW diesel engines and power tillers which were developed locally are now manufactured there. The total demand for diesel engines for farm use in Indonesia including boat is about 60,000–80,000 units annually. Half of this number, 40,000 units is manufactured in Indonesia by two companies. The production volume per company is consequently about 20,000 units, which makes it difficult to justify a large investment for mass production.

In Thailand Kubota started the manufacturing of diesel engines in 1980 and is now producing 120,000 annually: 4 models of engines from 5.5 to 8.8 kW as well as power tillers which were developed in Thailand. The total demand for diesel engines in Thailand was 60,000 units per year in the 1970's, expanded to 100,000 units as power tillers became popular in 1980's, and is now up to 150,000–170,000 units per year. The greatest reason for the successful development of production in Thailand can be attributed to the management ability of the Thai partner and its management policy of giving first priority to quality. QC(Quality Control)-circles and other QC-activities are practiced very actively in the Thai factory and the activity level is almost the same as that in Japan. Kubota is now cooperating with its venture partner in development and manufacturing of less mechanized fields in Thailand, while continuing to produce engines and tillers.

Satake Corporation is running a joint venture in the name of STH with the CP Group which is one of the biggest companies in Thailand. Satake and CPG invested 51 and 49% of initial capital respectively. STH with employees of about 50 is manufacturing rice miller, rice husker, conveyer and selling them in Thailand and exporting to North America, South and Central America and Japan. The annual sale is about US\$2.7 millions. The lower wage in Thailand is certainly a big advantage to the venture, but employees often leave the company after they

trained.

The problems in overseas manufacturing of agricultural machinery are diverse but can be summarized as follows;

- 1) A large investment by both parties to the venture is generally required and great burden is placed on them when production volume is not large enough.
- 2) The venture partner usually seeks wide ranging technical transfers which increase the investment and pose more obstacles.
- 3) Political and economical stability is sometimes not dependable. A steady government policy is of great importance.
- 4) Overseas manufacturing of farm machinery requires the support of quite a broad group of industries which sometimes do not exist in the region.
- 5) Technical transfer in a venture is often interrupted by the system of rotating personnel and also by the leave of trained employee.
- 6) The transferee usually wishes as many technics as possible to be transferred at one time, but this is almost impossible to do, and step by step transfer is necessary as the quality of the products manufactured is confirmed.
- 7) The most appropriate models of harvesters and other field equipment require study and research of local needs. This means that development must be done near the market for the products to be developed.

## OVERSEAS PRODUCTION BY OTHER INDUSTRIES

Some examples of overseas automobile production are examined below to get some hints for the farm machinery industry.

### A) Cooperation of Indian National Company MARUTI and Japanese Company SUZUKI

MARUTI was founded by the Government of India in 1981 with technical cooperation by the Japanese motor company SUZUKI with the goal of producing 100,000 cars by 1987. MARUTI is now producing 105,000 low fuel consumption cars annually for domestic consumption and also for export to Hungary, Poland, France and UK. Each MARUTI employee now manufactures 30 cars per year, which is 3 times more than the second largest automobile manufacturer in India. This figure of 30 is higher than that of Europe:18 and USA:22 and is only exceeded by that of Japan:50. The added value by one employee is R.520,000 which is 2.5 times more than the second most productive Indian motor company. The capital investment of SUZUKI to MARUTI was set at 26 to 40% and began with 26%.

An Indian Senior Officer pointed out (Chatterjee,1990) that the main reason for this success was the introduction of Japanese style management philosophy which features: 1)trust, 2)subtlety and 3)intimacy. These features led to the following management policy; a)a lifelong employment system, b)a seniority system, c)non

specialization or broader speciality, d) a training system, e) decision making by organization, f) harmony with others, and g) a commitment to management by each employee through a unit organization like QC(Quality Control) circle.

#### B) Overseas Manufacturing of Car Parts

Ten car parts factories in North America (8 in USA, 1 in Canada and 1 in Mexico) are listed in Table 3 to illustrate the present state of overseas production in this field (Abo et al,1991). Three of these are joint ventures and specialized in certain parts such as pressed plates, brakes or seats, and sell them to US automobile companies and the following car assembling factories invested in partly by Japanese companies; AA: not a joint venture, 6,500 employees(350 Japanese) producing 360,000 cars and engines per year with an investment of US\$1,846mil., AI: joint venture with 1,800 employees (121 Japanese) producing 240,000 cars and trucks per year with an investment of US\$500mil., AH: joint venture in Canada with 997 employees (61 Japanese) producing 200,000 cars and trucks per year with an investment of CA\$500mil..

These car parts factories are characterized by: 1) production facilities which are exactly the same as those in Japan, 2) strict quality control and 3) Japanese style management; about half of them seem to have some margin of profit.

#### C) Hints from the Experiences of the Car Industries

Agricultural machinery differs from that for the automobile in various points;

- 1) Agricultural machinery is affected by local conditions of a crop, field and climate, and can be diverse in style and performance.
- 2) More varieties in size and types.
- 3) Production volume is usually lower.
- 4) Tractors have other implements attached, unlike cars.
- 5) Power is stressed more than speed in farm machinery.
- 6) Total cost is usually more important than time-saving features.

There are, however, many resemblances between tractors and automobiles, and we inferred the following from examples of the overseas production of the car industry;

- 1) A thorough investigation beforehand and complete preparation is essential to initiate a joint venture.
- 2) A management policy dedicated to the manufacture of high quality products.
- 3) Adaptability of employees including management staff to a new system introduced.
- 4) If the broad spectrum of a joint business is difficult to achieve because of the gaps between the two sides, limited business arrangement such as parts manufacturing may be preferable.
- 5) Parts production also needs a scale of merit.

## ISSUES INVOLVED IN OVERSEAS PRODUCTION BY JOINT VENTURE AND COUNTERMEASURES

Overseas production can be justified only when technologies exist to make it more advantageous than production by local industries. The following issues must be also solved in one way or another:

1. Disparity in the motivation of both sides:
  - 1) Capital investment.
  - 2) Domestic demands and potential for export.
  - 3) Production facilities.
  - 4) Range of new technology to be introduced in production.
  - 5) Sharing of the profit.
2. Differences in the situations of the two sides.
  - 1) Production system.
  - 2) Design.
  - 3) Management policy.
  - 4) Sales system.
  - 5) Service and repair.
3. Range of cooperation.
  - 1) Production items.
  - 2) Capital investment.
  - 3) Personnel.
  - 4) Management.
4. Method of technical transfer.
  - 1) Range of technical transfer.
  - 2) Previous survey and test to introduce technology.
  - 3) Protection of intellectual properties.
5. Mutual understanding.
  - 1) Discussion in a common language.
  - 2) Interpretation of contract.
  - 3) Development and patents.

Countermeasures or policies to solve the above points are;

1. Of mutual benefit to both sides.
2. Realization of the differences and adjusting for them.
3. Limiting the range of cooperation to avoid serious obstacles.
4. Technical transfer to make local production profitable.
5. Protection system for the intellectual properties related to technology transfer.

## CONCLUSIONS

Agricultural machinery production by international ventures is becoming increasingly necessary with the tendency toward the globalization of world economy. Measures to promote overseas production include; 1) cooperation based on mutual benefit, 2) complete advance feasibility study and planning, 3) stable local economy and strong management policy, 4) elaborate technological transfer and 5) evaluation and protection of intellectual property.

## REFERENCES

1. Abo, T. et al. 1991. Japanese Production System in America. Toyo-Keizai-shinpo, Tokyo
2. AEA (Agricultural Engineers Association). 1989. AEA Data Book 1978-1988. AEA, UK
3. Chatterjee, B. 1990. Japanese Management. Simul Press, Tokyo
4. FAO. 1991-1979. Production Yearbook 1991-1979, FAO, Rome
5. FAO. 1991. Trade Yearbook 1991, FAO, Rome
6. Hattori, T. 1988. Development of Management in Korea. Bunshin-do, Tokyo
7. JETRO. 1989. International Business Strategies p.33, JETRO, Tokyo
8. Sahara, K. 1992. The Actual State of Technical Transfer in Kubota Corp. Presentation in the Regional Forum of Club of Bologna, 1992, Bangkok
9. Shinnorin-sha. 1993. Agricultural Machinery Yearbook 1993, Shinnorin-sha, Tokyo

Table 1 Tractors and harvester-threshers in use in the world

Year	Tractor (units)		Harvester threshers (units)	
	In use	Annual increase	In use	Annual increase
1978	20,282,083	-	3,253,462	-
1979	20,897,087	615,004	3,385,507	132,045
1980	21,741,730	844,643	3,532,048	146,541
1981	22,066,064	324,334	3,603,334	71,286
1982	22,985,788	919,724	3,702,513	99,179
1983	23,462,816	477,028	3,760,512	57,999
1984	24,247,296	784,480	3,819,665	59,153
1985	24,923,184	675,888	3,912,678	93,013
1986	25,155,680	232,496	3,956,505	43,827
1987	25,524,448	368,768	3,975,611	19,106
1988	26,064,336	539,888	4,004,097	28,486
1989	26,405,280	340,944	3,979,006	-25,091
1990	26,544,464	139,184	3,979,103	97

Source: FAO Production Yearbook 1979-1991

Table 2 Number of tractors in 1990

	In use 10 <sup>3</sup> units	Imports 10 <sup>3</sup> units	Exports 10 <sup>3</sup> units
World	26.544	686	633
Africa	563	34	0
North & Central America	5.818	172	62
South America	1.123	8	9
Asia	5.586	67	137
Europe	10.427	381	371
Oceania	415	20	4
USSR	2.609	2	52
Developed all	21.304	569	594
Developing all	5.240	116	396

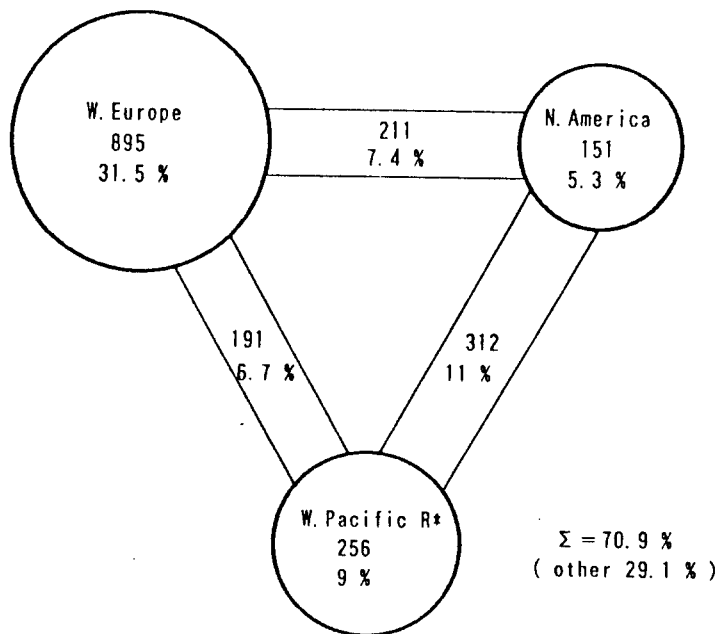
Source: FAO Trade Yearbook 1991



Table 3 Outline of automobile parts factories

Factory*	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AU
Location	Tennessee	Tennessee	Kentucky	Michigan	Michigan	Kentucky	Illinois	Michigan	Canada	Mexico
Operation began	Feb. 1984	Feb. 1985	Feb. 1986	July, 1986	Jun. 1987	May, 1988	Aug. 1988	Sep. 1988	Apr. 1989	Jun. 1983
State of ownership	1: Shared by 2 subsidiary companies	1: Japanese head office 100%	1: Japanese head office 100%	1: subsidiary company 100%	1: Japanese head office 85%, trading companies/banks 15%	1: half Japan and half USA company	1: Japanese head office 100%, invested in by 16 companies	1: Japanese head office 100%	1: Japanese head office 65%, USA company 35%	1: USA subsidiary company 100%
1: Independent J: Joint										
Employee	663	411	82	800	210	138	243	140	90	1700
Proceeds	\$138m.	\$46m.	\$14m.	\$288m.	\$102m.	\$15m.	\$17m.	\$36m.	C \$8m.	-
Series*	AB series	AB series	AB series	AC/AE series	Independent	Independent	AF series	AD series	Independent	Independent
Clients	AB, AI, AD, AD USA companies	AB	AB, AA	Japanese origin factories except AB, USA companies	USA companies	USA companies, AA, AI	AF	AD	AH	Japanese origin factories, USA companies
Main products	air conditioning systems, condensers, evaporators, radiators, etc.	plastic material, meters	wiper motors automatic velocity controllers	car heaters, radiators, car air conditioning units, condensers, evaporators	plates, sub-assemblies	brakes	plates	seats	seats	wire harnesses

NOTE: According to on site investigation of these factories, SERIES means the relations between Japanese head office and the assembly maker.  
 The Proceeds item values in 1989 were acquired with an additional survey.  
 \*These abbreviations indicate names of companies (See Ref. No. 1)  
 Source: Tetsuo Abo, Hiroshi Itagaki, Kunio Kamiyama, Tetsuji Kawamura, Hiroshi Kumon, 1991, "America ni ikiru nihonteki seisan sisutemu": P. 138



\* Asian NEIS, ASEAN, AUS, NJ, J, CH.

Fig.1 World's regional and inter regional trade in 1988 (Ref. 5)