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UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

WORLD-WIDE STUDY OF THE AGRICULTURAL MACHINERY INDUSTRY

APPENDIX*

Profiles of the major agricultural machinery manufacturers

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Profiles of the major agricultural machinery manufacturers

Profiles of the major agricultural machinery manufacturers

1. INTRODUCTION

Profiles of the major agricultural machinery manufacturers

1. INTRODUCTION

This survey was organized by UNIDO and undertaken by Business International S.A. in co-operation with major manufacturers of agricultural machinery in order to explore the main future trends of the agricultural machinery industry.

This report presents the interview results of eight of the world's largest agricultural machinery manufacturers. The interviews have been summarized according to five major topics:

(1) global market and production trends;
(2) international diversification trends;
(3) corporate product diversification
(4) corporate policy and strategies for developing countries;
(5) technological trends and potential innovations in agricultural mechanization.

The combined corporate turnover of these eight companies amounted to $45 billion in 1978, with a turnover in agricultural machinery of $14 billion. Their estimated agricultural tractor plant capacities amount to approximately 720,000 tractors annually (70 per cent of the total production of developed market economy countries).

Seven of the eight companies under consideration produce construction or industrial equipment in addition to agricultural machinery and two also manufacture trucks and buses while one produces automobiles. Five companies are further involved in the production of non-motorized equipment.

The headquarters of five companies are in North America, two are in Europe and one is in Japan. Only one does not have a factory manufacturing or assembling agricultural machinery in developing or European planned economy countries. The distribution of their subsidiaries in these countries by main geographical regions is as follows:

- six in Latin America (Argentina, Brazil, Mexico, Venezuela)
- four in Australasia (Australia, New Zealand)
- four in the Middle East and Indian subcontinent (India, (Iran, Pakistan, Turkey)
- three in the Far East (Indonesia, Japan, Malaysia, Thailand)
- three in the European planned economy countries (Bulgaria, Poland, Romania, Yugoslavia).

A statistical profile of the eight companies interviewed is presented on page 6.

STATISTICAL PROFILE OF COMPANIES INTERVIEWED

Profile number	HQ location	T/O total ($ bil)	T/O Ag mach ($ bil)	Annual production Tractors ('000 units)	Location of intern'l manufacture/assembly								Ag mach products*			Other motorized machinery**				Nonmotorized production
					NA	Eur	LA	FE	AF	ME	Aus	EE	Tr	H	Imp	Auto	Con/Ind	Eng	Gard	
1	NA	8.9	1.958(1)	75	x	x	-	-	-	-	-	-	x	-	x	-	x	-	-	chem, petroleum, shipbuilding, etc.
2	NA	2.9	2.215(2)	135	x	x	x	x	x	x	x	x	x	x	x	-	x	x	-	none
3	NA	4.2	3.300	100	x	x	x	-	-	-	x	-	x	x	x	-	x	-	x	none
4	EUR	2.2	1.001	50	-	x	x	-	x	-	-	x	x	x	x	x	x	x	-	elect, mach tooling, etc.
5	NA	6.6	2.500	120	x	x	x	x	-	x	x	-	x	x	x	x	x	x	-	turbo machinery
6	JAP	2.3	1.700	120	x	-	x	x	-	x	x	-	x	x	x	-	-	-	x	iron piping, castings
7	EUR	16.0	0.750	90	x	x	x	-	x	x	-	x	x	x	x	x	x	x	x	energy, steel, electronics, etc.
8	NA	1.5	0.545	30	x	-	-	-	-	-	-	-	x	x	x	-	x	x	x	electrical, power, process equipment
8	5 NA 2 EUR 1 JAP	44.6	13.969	720	7	6	6	3	3	4	4	3	8	7	8	3	7	5	4	

(1) Includes construction machinery
(2) " " "
* Tr = tractor; H = harvester; Imp = implements
** Automotive, construction/industrial, engines, gardening

Profiles of the major agricultural

machinery manufacturers

2. SUMMARY AND CONCLUSIONS

2. SUMMARY AND CONCLUSIONS

Almost all company representatives interviewed agreed that the market trends in agricultural machinery during the past 10 years were slightly increasing or static. Most growth has been in the developing countries due to increased mechanization, although this has been sharply inhibited by poor financial conditions and political instability.

In the developed markets, unit sales have been declining but there has been a strong tendency toward higher horsepower engines and more sophisticated driver comforts.

Growth in the developing markets has generally been in the 60-100 hp range with a concentration around 50-60 hp. In the developed countries, growth has been in the above-80 hp to 200 hp range, although in North America recent developments in the below-30 hp class have been seen.

Future growth is expected to increase slightly, at a slower rate than previously, or remain static on a global basis. Developed-country markets will continue the present trend, and growth in the developing markets will probably begin to slow down. Some large developing markets such as Brazil, Pakistan and Turkey will reach saturation and become replacement markets.

Most companies described industry trends as being "rationalized" - fewer manufacturers and plants producing more specialized products. Plant productivity and capacities are thought to be increasing, but in most cases they are being underutilized because of the current market slowdown.

There was some disagreement concerning the tendency toward subcontracting, although all agreed that certain items such as cabs and front-drive axles (both new technological innovations) have been mainly subcontracted because it is cheaper. The larger, more integrated companies tended to deny the use of subcontractors, while the more specialized admitted they have a significant number of components made for them.

International Diversification Trends

There was unanimity that the developing markets were growing more quickly than developed-country markets. The majority felt that unit sales were 1-4 percentage points higher in developing countries, but a few felt the rate was higher - e.g. 5-10 percentage points.

Again, all agreed there was no need for completely new product types or innovations; adaptation of the existing product range was sufficient. These alterations included cab replacement by a saddle seat, waterproof clutch and brake housing for wet farming conditions, and other minor changes. Some commented that older models of the existing line of tractors were ideally suited.

The manufacturers all commented negatively on current discussions about producing a small, inexpensive tractor for the needs of developing countries. The general argument was that the basic tractor now available could not be simplified without making it ineffective in most developing-country conditions. The saddle seat, 60-80 hp with four-speed transmission and a three-point hydraulic hitch system with brakes, was the minimum required and all major manufacturers provided such a model. Further, one manufacturer who produced a special, very simple model claimed that there was absolutely no interest in the developing countries - they all wanted the most technically advanced, comfortable machines.

Most claimed that implements required the most radical modifications from one environmental condition to another. Whether special adaptations or modifications proved economical depended on the cost/turnover potential.

Most manufacturers said they were diversifying their product line in agricultural machinery. Many stated that while adding new product types and models, they were rationalizing their full range of products by weeding out slow-moving, low-demand items. Almost all claimed they were trying to increase interchangeability of components and accrue benefits from rationalizing production-line and tooling costs.

Most companies are diversified outside agricultural machinery and have construction and industrial equipment lines. Many of the companies diversified into these areas a number of years ago because of the basic similarity between the diesel agricultural tractor and the basic construction or industrial equipment tractor - and they foresaw growth in these areas. One company recently divested part of its interest in construction and industrial equipment to specialize more in the specific products where it is strongest. Another company recently invested heavily in the construction equipment field by buying another company.

All, however, denied that they were now actively seeking diversification opportunities or that they would do so in the future. When confronted with the question: "In view of the decline in the agricultural machinery market, do you intend to diversify into other areas?" most companies said they didn't feel that the market forecast was that bearish. One company said they had such faith in the future market they were about to announce a new production plant for agricultural machinery in Europe for export worldwide. All explained that while unit sales were declining in the developed markets, higher-priced units with greater horsepower and more sophisticated technology were in demand.

While all companies have tried to rationalize their production-line and tooling costs by working toward component interchangeability, most claimed it was extremely difficult given the sophisticated features of each product in the agricultural, construction and industrial equipment lines. Diversification has led to separate lines and more or less separate componentry because of this factor. Diversification has, in most cases, helped broaden the product range and produced distribution and marketing advantages.

Corporate Policy and Strategies for Developing-Country Markets

All agreed that the most rational development phases were the classical ones as follows: export of completely built units, then partly knocked-down units (PKDs), then completely knocked-down units (CKDs) and finally some form of local manufacture. Companies were unanimous in stating that if they had the choice, they would export completely built units from their domestic production plants to developing-country markets. They considered this the most economical way to operate in order to achieve economies of scale.

Most companies said they chose to produce in developing countries because otherwise they might lose an already established market to a competitor. This followed on government announcements of their desire for local production, thus opening the possibilities to all manufacturers.

Corporate criteria for local developing-country manufacture include: market size; local availability of components; financing facilities both for themselves and their clients; labor supply, both skilled and unskilled; stable economic and political conditions; and protection from competitive imports.

Minimum unit production requirements are difficult for most companies to specify since they claim the economics vary from country to country. The average, however, is about 10,000 tractors annually.

Most companies felt that exports would be desirable but should not be counted on in determining the feasibility of local production. Local content requirements are generally considered unrealistic but vary considerably from country to country.

Cited obstacles to successful local production are, in general, the lack of those same points given above as criteria for local manufacture.

The consensus was that most companies are expanding their own domestic production capabilities first to meet export demands, afterward providing local production capabilities.

Companies are unanimous in stating that their main strategy in developing their export markets was to provide an effective parts and maintenance service for all country markets. Many said they were actively trying to develop regional service and parts depots to supply smaller country markets. These, along with knowing the markets and the persons responsible for purchases, were considered the keys to expanding their presence in the developing-country markets.

Technology

Tractor manufacturers were generally in agreement about the shortcomings of agricultural tractors used in developing countries. Almost all agreed that the sophisticated driver comforts

demanded in the developed countries are an unnecessary expense for the developing countries. At the same time, all agreed that the smaller, simpler model built especially for developing countries would have disadvantages in terms of cost and application. The ideal, demanded by developing countries, was a durable, reliable and relatively uncomplicated tractor, simple to operate and maintain.

Most manufacturers said they were striving for this ideal although simple adjustments, such as removal of cabs and the utilization of saddle seats, waterproof clutch and brake housing and other modifications are at present the only economically feasible alterations for developing-market needs.

All agreed that innovations or technological changes in agricultural production would bring about only evolutionary and not revolutionary changes. Some mentioned that chemical substitution was possible, obviating mechanical tillage or land preparation, but this was far in the future, i.e. in 20-30 years.

Most mechanical changes in the next 10-20 years were seen to be adaptations of the present models, with no new mechanical system envisaged. Hybridization will probably produce crop strains that will be more resistant to disease and infestation. Mechanical changes in harvesting will also come about because of hybrid developments in crop stand and uniformity of height.

The transfer of technology to developing countries will not be greatly affected, say most companies. New technological innovations will not have a great impact on developing systems, mainly because the major emphasis in the developing countries should be on passing from traditional methods and mentalities to modern agricultural production. The mechanization techniques now available will be best utilized.

The development of a standard mechanical model specifically designed for developing countries was not thought feasible by most manufacturers. Because of the widely varying conditions in developing countries, what would be efficient in some would be inefficient in others. Wet farming conditions in the Far East call for smaller, four-wheel-drive tractors, while dry farming conditions in the Middle East and Africa call for more power and durability.

New mechanical systems are feasible only in some of the ultramodern, highly organized agricultural projects such as those in Sudan. These conditions, however, are unique and not applicable to other agricultural requirements in the developing world.

How Agricultural Machinery Manufacturers Look at Developing-Country Markets

It is clear from the results of the study that agricultural machinery manufacturers look solely at developing-country markets as important marketing opportunities for goods produced mainly for developed-country needs in their domestic production sites.

No manufacturers said they considered developing-country markets as economically sound production or even assembly possibilities. They all felt they were being pushed or pressured into local assembly or manufacture by government policies. These policies were generally described as local content sourcing requirements that initiated competitive moves to produce or assemble locally. Most companies felt these local content requirements were usually unreasonably high given the level of industrial infrastructure and component supply capabilities.

Although most companies said it was impossible to generalize on minimum annual tractor production requirements for developing-country markets, they agreed that most successful operations demanded at least 10,000 units annually. To really justify the costs and irregularities of producing in developing-country markets, over 20,000 would be a more realistic minimum.

Because of the instabilities of past developing-country economic communities, the concept of regional cooperation in manufacturing components for agricultural machinery serving an extended regional market was considered totally utopian and unfeasible.

The idea of producing a small, simplified universal tractor for developing countries was considered by all manufacturers to be contrary both to requirements and to developing-country demands. Three of the eight manufacturers had been either contributors of knowhow or had actually produced such a tractor prototype. They claimed that it did not fulfill the basic agricultural requirements and that it was a marketing failure because their clients (both public and private) in developing countries did not want the less sophisticated version.

The ultimate factor in the failure of the concept was the lack of interest in the developing-country markets and not the inability of the manufacturers to produce a suitable design and product at an economical price.

Most manufacturers said they felt that development of agricultural mechanization could best be aided by government-sponsored training programs to raise the level of maintenance and driver knowhow. The second most important step was the

development of regional storage and maintenance depots for the distribution and repair of machinery and parts.

Efforts at removing these obstacles could be aided by machinery manufacturers, but the impetus and underlying support had to be provided by developing-country government organizations or cooperatives.

Profiles of the major agricultural

machinery manufacturers

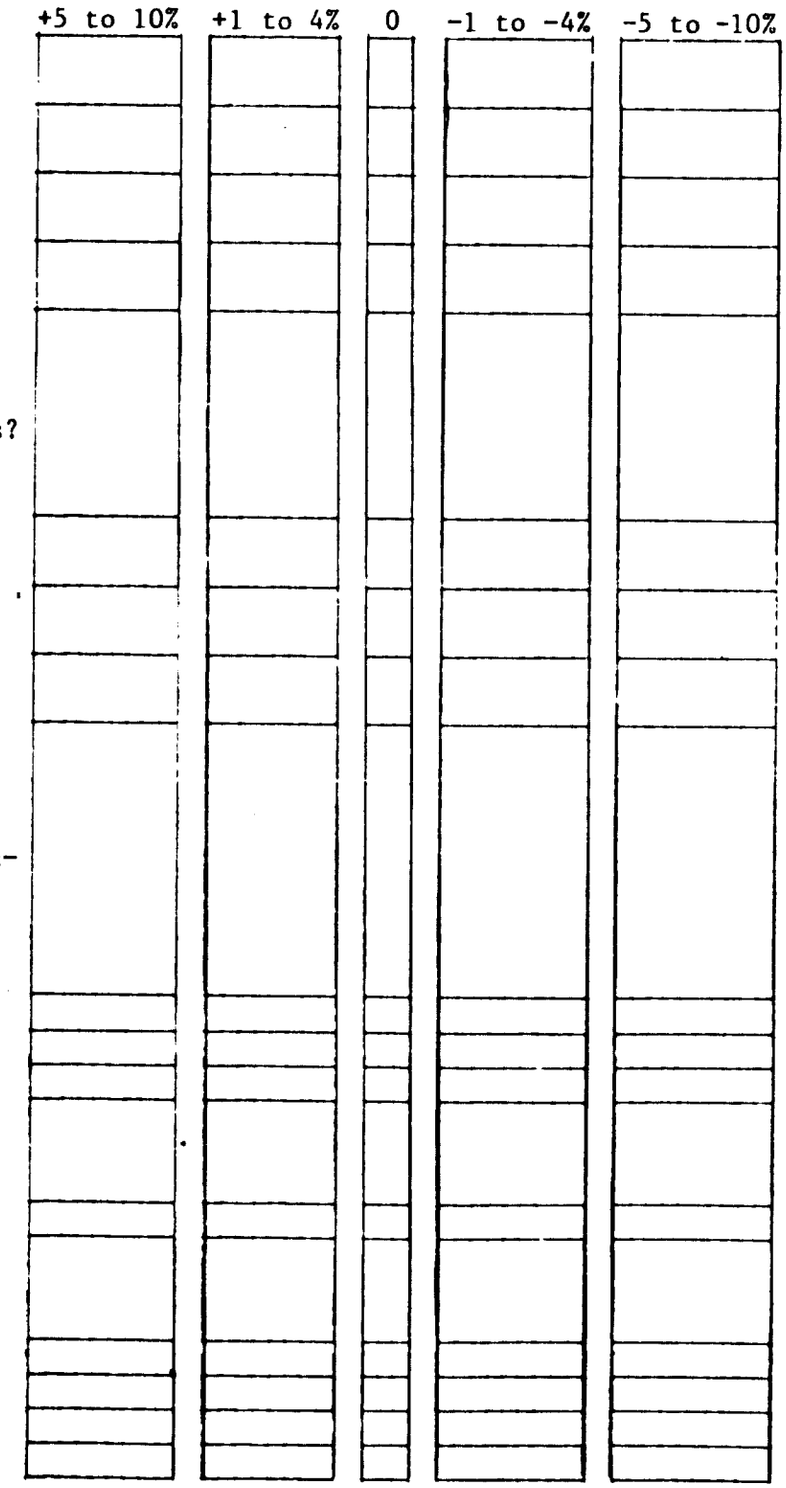
3. QUESTIONNAIRE

Global market and production trends

1. What global trends in the agricultural machinery market have you identified from historical experience and data over the past 10 years for the following categories?

1a. What do you forecast for the next 10 years?

2. Which product types/ models are most affected and how?



3. How would you characterize industrial production trends in the Agricultural machinery sector in terms of the following:

	increasing	static	decreasing
a. Number of factories producing ag. mach.			
b. number of manufacturers producing			
c. productivity per factory			
d. number of products per category			
- tractors			
- combines			
--implements			

3a. How do you account for the increase or decrease of certain product categories?

- tractors

- combines/harvestors

- implements

4. How important has the tendency been to sub-contract part of the manufacturing process due to increasing technological complexities?

very _____
moderately _____
not at all _____

4a. If important, has this tendency been more significant in the production of:

motors/engine units _____
precision tooling _____
electrical assemblies _____
hydraulic systems _____
others

5. Given the present industrial production trends described in question 3, do you feel that they favor:

a. the creation of a new range of products/models? ___yes ___ no

b. or, a rationalization of existing product types? __yes ___ no

International diversification trends

6. What is your analysis of demand trends in the developing markets as compared to the industrialized markets of North America and Europe?

the developing markets are growing:
___ faster ___1 to 4% ___5 to 9% ___10 to 15% ___+
___ same
___ slower ___-1 to -4% ___-5 to -9% ___-10 to -15% ___-

Which product categories/model types are demanded most in developing markets (describe the general agricultural conditions for each)?

	category/model	general agricultural conditions
tractors	_____	_____
	_____	_____
	_____	_____
harvestors	_____	_____
	_____	_____
	_____	_____
implements	_____	_____
	_____	_____
	_____	_____
	_____	_____

7. Assuming a significantly increasing demand in the developing country markets, do they require new product types and/or production approaches?

_____yes _____no

7a. If yes, what degree of change is generally called for?

_____innovative (ie completely new products and/or processes)
_____modifying (major changes in existing products)
_____adaptive (slight alterations in existing products)

Give examples of changes if possible:

7b. What type of product or production changes are most often called for in developing countries: (give descriptive examples)

7c. Which product categories demand the most radical changes for developing countries?

product category	type of change with examples if possible
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

7d. Are these modifications economically feasible? yes no

Corporate product diversification

8. Is your company diversifying its production within the agricultural machinery sector? _____ yes _____ no

8a. If yes, in which direction is diversification being pursued?

_____ toward new product types within agricultural machinery sector?
_____ toward new agricultural machinery for heretofore non-mechanized functions?
_____ toward component standarization/unification for easier adaptablity to related non-agricultural products?
_____ toward integrating the manufacture of components/parts?

8b. Are you diversifying production to related product categories outside of the agricultural machinery sector? ____ yes ____ no
List briefly which categories:

9. In your opinion, which product categories are most easily adopted to diversification within or outside of the agricultural machinery sector? (please explain why)

10. If you have diversified outside of agricultural machinery, how has this diversification affected your:

- production line techniques? _____
- range of products? _____
- the development of new markets? _____

Corporate policy and strategies for developing country markets

11. What do you feel are the optimum rational development steps in the developing country markets from the export of built-up units to local production?

note to interviewer: the classical development phases most often accepted in the sector are 1) export of completely built-up units, 2) export of partly knocked down (PKDs) with partial local assembly, 3) export of completely knocked down (CKDs) 4) local manufacturing (prompt with these phases if necessary)

12. Which phase level do you feel is optimum both because of local market conditions (limitations) and because of your corporate financial criteria in most developing country markets. (explain or give specific examples)?

13. Which developing couhtry markets presently meet your corporate criteria for establishing local production? (list in order of priority and describe why; include least developed countries where already producing):

country	major criteria they fulfill

14. What are your criteria for establishing local production? (please list in order of importance)

15. How many production units constitute your minimum requirements for establishing local production?

product category	minimum no. of units

16. In considering the feasibility of local manufacture, do you believe that exports are _____desireable _____not desireable _____of possible interest but should not be counted on in determing wheter to establish or not?

17. Decisions to invest in the developing countries are generally;
_____ based on your own rational feasibility studies and initiative,
_____ based on government pressures, or
_____ based on other factors (describe)

(please give examples)

18. What, in general, are the developing country local content requirements?

Are these realistic _____yes ____no given local supply conditions and levels of industrialization? (give examples)

19. Which, in your opinion, are the major obstacles to the successful establishment of local production?

20. How would you rank the following potential obstacles to local productio

_____lack of a stable, productive labor force
_____lack of trained (trainable) technically qualified personnel
_____lack of minimum levels of market demand
_____lack of available financing
_____lack of locally sourced materials (raw, semi- or finished)
_____others (please list)

21. What do you consider to be the first positive steps in improving the environment in developing country markets to the level where local production is feasible?

22. How, in general, is your company expanding to meet increased demand in the developing country markets?

- by increasing production capacity in existing home country factories_____. Which product categories are affected?

- by installing new factories in the developed countries which benefit from the economies of existing operations _____. Which product categories?

- by installing new factories in the developing countries_____. With which product categories?

- the increased demand in developing countries coupled with stagnating decreasing demand in the developed countries does not warrant increasing capacity_____.

23. What marketing strategies have you identified as essential to the successful development of developing country markets? (please list in order of importance)

24. What do you feel are the major obstacles to the successful marketing of your agricultural machinery in developing countries? (please list in order of importance)

25. What are the most important measures to be taken in improving these inhibitions?

26. Does your company presently produce products which are specifically designed for developing country markets____yes ____no?

If yes, which products and which countries?

Do you plan to begin or add new products in the near future?
____yes_____no. Which products for which countries?

A. Statistical section

Table 1: Corporate structure and operation in figures

	1955	1960	1965	1970	1975	1978
Employees:						
- of which salaried:						
in country of origin						
- of which employed:						
in developed countries						
in developing countries						
Number of production sites:						
- in home country						
- in developed countries						
- in developing countries:						
in Africa						
in Latin America						
in the Middle East						
in the Far East						
Number of subcontractors:						
- mechanical						
- electrical						
- others 1/						
Structure of purchases (expressed in % of total purchases)						
- minerals, metals						
- semi or finished manufactured metal components						
- metal parts and other mechanical pieces						
- electrical machines and supplies						
- chemical products and derivatives						
- plastic products						

1/ Specify in which branch if the number of subcontractors is significant

Table 2: Corporate role in the total agricultural machinery sector

	1955	1960	1965	1970	1975	1978
1. Turnover of products within the sector						
2. Turnover of products outside the sector						
3. Percentage of turnover represented by sales to home country						
4. Percentage of turnover which exports represent						
5. Investments in: - tractors - machines (harvesters, etc., which are self-powered) - fixed equipment						
6. Workers in: - tractors - machines - fixed equipment						

Table 3: Produot line development
(commencement date 1/ of manufacture and number of units produced)

	1955	1960	1965	1970	1975	1978
Tractors: - 35 hp - between 35-60 hp - from 60 to 90 hp - 90 hp Machines: - harvesters - soil preparation equipment - seeders, fertilizers - transport - balers Implements: 2/ - equipment for processing harvested produce - irrigation equipment - storage equipment - breeding equipment - dairy equipment						

1/ Specify commencement date

2/ Specify the type of material

Table 4: Production diversification
(in percentage of turnover)

	1955	1960	1965	1970	1975	1978
In the agricultural machinery sector:						
Percentage of turnover by different product categories:						
- tractors (wheeled and tracted)						
- powered machines						
- fixed equipment						
Outside the sector:						
Percentage of turnover represented by sales of products outside the sector:						
- public works machinery						
- capital goods						
- automobiles						
- others 1/						

Table 5: Internationalisation of production

	1955	1960	1965	1970	1975	1978
1. Percentage of turnover realized by exports (see table 2)						
2. Percentage of turnover realized by total exports and broken down by categories						
3. Percentage of turnover represented by:						
- tractors						
- machines						
- fixed equipment						
4. Percentage of turnover broken down by geographical zones:						
- Africa						
- Latin America						
- Near East						
- Middle East						
- Europe						
5. Percentage of turnover represented by foreign trade broken down by the individual production sites						

Profiles of the major agricultural

machinery manufacturers

4. RESULTS OF INTERVIEWS

Company Number 1

General Description

This company is a US-owned and -headquartered manufacturer of agricultural tractors, with activity in the fields of oil exploration, gas and chemicals, automotive accessories, packaging equipment and construction equipment.

The company makes agricultural tractors in North America and Europe. It manufactures agricultural and construction equipment in a total of 22 plants and produces approximately 75,000 tractors annually.

In 1978, total corporate turnover was $8.9 billion. Agricultural and construction machinery turnover was $1.9 billion.

General Comments About the Interview

Interviews were conducted at both US and European headquarters. The managing director, research manager and director of planning were very cooperative in answering the interviewer's questions.

Since the company is more concentrated in the production of tractors than in other agricultural equipment, most interview comments pertain to tractors, although some opinions and experiences were offered about harvesters and implements.

Company Number 1

Global Market and Production Trends

Q 1 General trends: Farm mechanization is steadily increasing in developing countries and is becoming more sophisticated in the developed countries.

In the developing-country markets, mechanization is replacing the traditional labor-intensive farming methods. In the Far East there is a trend toward low horsepower, four-wheel-drive tractors. In Africa and South America there is a trend toward higher horsepower. This growth in mechanization, however, is severely restricted by the lack of money to pay for agricultural machinery in hard currency.

In the developed countries in North America and Europe, unit sales of tractors are declining but increasing in the over-100 hp category. While unit tractor sales are declining in Central and Northern Europe, there is a growth in unit sales in Portugal, Spain and Greece due to increased mechanization.

The trend in product changes in the developed-country markets includes greater sophistication in driver comfort. Cab features such as air conditioning, stereo, sound insulation and smoothness are in demand in these markets. In addition, there is a present trend toward four-wheel-drive tractors in both the four-wheel-equal models and the smaller-front-wheel models. In France, the four-wheel-drive tractor now represents 18% of the market.

Company Number 1

Tractor sales over the past 10 years have been increasing by 4-5% annually. A word of caution, however, must be added in that the recent growth in the developing-country markets has slowed considerably. Turkey, for example, was producing locally 40,000 units annually five years ago. At present it is down to 2-3,000 units. Production in Brazil and Venezuela has also slowed considerably. The global market is now growing at 2-3% annually because of this tendency.

Q 1a In order to forecast future growth correctly, some very important factors such as fuel availability and cost must be taken into consideration. If present conditions continue to prevail, the company foresees a relatively slow global rate of growth. North America and Europe will decline slightly and other world markets will grow. The growth in the developing-country markets, however, will be slower than in the past due to the saturation of markets such as Brazil, Pakistan and Turkey. These markets will become primarily replacement markets, as have Europe and North America.

Q 2 Product category growth is foreseen to be in the 60-100 hp tractor range in the developing-country markets, between 80-200 hp in Europe, in the below-30 hp category in the US/Canada and in small tractors with four-wheel drive in the Far East.

Q 3 Industrial production trends in the agricultural machinery sector can best be described as moving toward rationalization. In both the number of manufacturers and of product categories, the industry is becoming more concentrated. A number of established manufacturers are dropping out of the market. For

Company Number 1

example, a German company manufacturing about 15,000 units annually recently dropped its line of tractors and agricultural equipment from its relatively integrated product assortment. Another multinational company recently concentrated its production of harvesters in one of its European plants and its tractors in another, dropping all other lines in these factories.

Plow manufacturers once proliferated in both the developing and developed spheres. Now the manufacture of these products is down to one or two major brands. The plow product is now more universal and standardized rather than highly segmented for each specific condition, as it used to be.

Q 4 There has been a trend toward subcontracting due to the increased degree of technological sophistication and industrial concentration. Almost all companies are now subcontracting the manufacture of cabs because they have become very complex and can best be manufactured outside. At present, cabs represent 16-20% of the total cost of a tractor.

Engines for combines are almost all manufactured by Perkins and therefore are rarely manufactured by the combine producer. Drive shafts for implements and front axles for front-wheel drive are usually subcontracted. The electrical systems for implement monitoring units are almost all produced outside. These are used heavily in potato harvesting, precision seed drills and grain combine harvesters.

It is felt that as these innovations become more standardized and important in terms of market share, the trend will be toward manufacturing within the producers' product lines

Company Number 1

rather than subcontracting. Some items, however - such as electrical systems - are beyond the resources of most manufacturers.

Q 5 The tendencies of rationalization and concentration in the industry will favor to some extent new product models employing electronic technologies, harvesting and implement monitoring systems, and guidance systems. However, the existing range of product types will be rationalized, i.e. obsolescent models will be dropped and slow-moving products weeded out.

International Diversification Trends

Q 6 Developing markets are growing in unit demand at about three percentage points faster than the developed markets. This is because the markets of North America and Europe are nearly saturated; that is, the number of farms is decreasing while the unit size is increasing. The developed markets are requiring higher horsepower tractors. These developed markets, while stagnating or actually declining in number of tractors sold, are increasing in value due to the increases in horsepower and technological sophistication.

The 40-80 hp range of tractors are in most demand in the developing markets, but the trend toward higher horsepower is expected to follow the developed-market tendencies.

Q 7 No new product types and/or production approaches are seen to be necessary for the developing countries.

Company Number 1

Q 7a/b/c/d Only adaptive changes, such as flotation tires or watertight brake and clutch housings, are called for in wet farming conditions.

Corporate Product Diversification

Q 8 The company is not diversifying its production within the agricultural machinery sector. It is consolidating its product line and staying in what it is strong in; that is, the above-100 horsepower tractor line with four-wheel and two-wheel drive. However, it has diversified production internationally.

Q 8a In its rationalization program, it is trying to simplify parts and components for easier adaptability.

Q 8b The company is already part of a large, diversified holding company. In addition, it recently diversified into the construction equipment industry by acquiring a European manufacturer. Company officials felt it was a growth industry and that through this acquisition they could broaden their production and distribution bases.

Q 9 The transition from agricultural tractor to construction tractor is the most logical first step in diversification.

Q 10 Diversification has not greatly affected production line techniques, although some economies of scale are enjoyed because of a larger purchasing power base. It has certainly

Company Number 1

broadened the product range and helped in the marketing and distribution of the full line. Through their acquisition, their international production and marketing base was broadened and consequently helped in the development of new market opportunities.

Corporate Policy and Strategies for Developing-Country Markets

Q 11 Policy-makers believe that the classical development phases, from the export of completely built units to PKDs, CKDs and finally to some form of manufacturing with local content is the optimum way to grow. However, they do not believe that many developing-country markets, other than Brazil or Mexico, justify local manufacturing on pure economic and economy-of-scale considerations.

Q 12 The export of completely built units to developing countries is the optimum level of operation for almost all developing countries.

Q 13 Mexico and Brazil meet their criteria.

Q 14 Criteria for local manufacture:

1) Does the government demand it or is it a question of losing an already established export market to a competitor who is willing to produce locally (usually at a loss)?

2) Does market volume meet minimum turnover requirements? These depend upon the product line, tractor size and various cost factors.

Company Number 1

Q 15 Minimum requirements depend upon the availability and pricing of local components. A minimum of 5,000 tractors in one country may be expanded to 10,000 in another because of local cost conditions.

Q 16 Exports are desirable when considering the feasibility of local manufacture because of economies of scale, but they should not be counted on, i.e. the local market must justify the operation since export markets are too uncertain.

Q 17 Decisions to invest in developing countries are generally based on local content requirements. The decision to expand into Brazil was based on economics. Some government pressures were exerted to produce locally by demanding 50% local content.

Q 18 Local content requirements vary considerably from country to country. In Brazil it is 50% and this is considered reasonable. However, 10% in some countries would be considered unreasonable because of the lack of local materials.

Q 19 The following are considered the major obstacles to the successful establishment of local production:

1) lack of political and economic stability

2) lack of a large enough market potential

Company Number 1

Q 20 Obstacles are ranked as follows:

1) lack of minimum levels of market demand

2) lack of available financing (both for customers and themselves)

3) lack of locally sourced materials

4 & 5) lack of a stable, productive labor force and of technically qualified personnel

Q 21 Regional cooperation agreements such as the Andean Pact, in which the countries agree on cooperative sourcing, credit, financing, protected markets, etc., is seen to be a positive step toward improving the feasibility of producing agricultural machinery locally in the developing countries.

Q 22 In addition to production facilities in Mexico and Brazil, the company is expanding production in North America and Europe to meet increasing demand in the developing-country markets.

Q 23 The company sees the development of a services and parts network coordinated with its domestic operations as an essential factor in building developing-country markets.

Q 24/25/26 The major obstacle to developing an effective service and parts network is the lack of sufficient sales and market size. The company does not manufacture products specifically for developing-country markets, nor does it plan to do so in the future. However, it has been supplying rigid-frame, 10-year-old models with some adaptations for developing-country needs.

Company Number 1

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 Other than simplifying the tractor now used in the industrialized countries and eliminating the sophisticated cab and driver comfort features, they believe that this tractor has very few shortcomings for use in the developing countries.

They have a policy of producing a less sophisticated, straddle-type-seat tractor with some other minor modifications for developing countries, depending on local conditions. For example, they have developed waterproof brake and clutch housings for use in wet conditions in the Far East.

However, they feel radical changes for the developing country are unnecessary and needlessly expensive. While diesel engines are sensitive and require injectors to be replaced regularly, with some upkeep, they feel a non-diesel model would cost too much to run.

Because of the wide variety of farming conditions in developing countries, a modified, standardized system would not be advantageous. What is required in the Far East in wet farming conditions is not compatible and efficient in dry-land farming zones in Africa and the Middle East.

Q 28 They foresee developments in the minimum tillage or "no-till" techniques in the developed countries - under which contour plowing is not needed and fuel is saved. Chemicals are used for defoliation, followed by direct seeding. The question

Company Number 1

is: Is it better to risk environmental damage or use up irreplaceable petroleum products?

Other innovations in the field of genetics and hybrid technology are foreseen in the future. These will improve harvesting efficiency and will also increase the number of crops that can be mechanically harvested. This is especially true of rice harvesting.

Other innovations now being introduced that will profoundly change mechanization are the rotary harvester and whole-crop harvesting methods. The rotary harvester reduces the problems involved in harvesting crops on hillsides and is especially efficient in dry-land conditions, where the crops are straight and erect. Using the whole-crop harvesting method, the whole stalk is uprooted or cut and processed in factories. If adopted, this would change fundamentally the present agricultural system.

Q 29 In general, agricultural changes are adopted slowly and cautiously and come about in an evolutionary rather than revolutionary way. As such, technological innovations tend to be adaptations and modifications rather than completely new systems.

Q 30 Adaptation and modification will take place over an extended period of time.

Q 31 The transfer of technology to the developing countries will not be greatly affected because of the evolutionary nature of changes. Because of the widely varying types of agricultural

Company Number 1

conditions in developing countries, this cannot be generalized. The company's approach is to develop techniques to meet the specific needs of each market, to the extent that they are economically feasible. There are other major problems to be considered in the transfer of technology to developing countries, beyond the question of mere agricultural efficiency, such as the effect of mechanization on employment and traditional ways. If you replace a water buffalo with a tractor, you must then consider the question of where you get milk.

Q 32 A standard mechanical model designed especially for the developing countries is not considered feasible, mainly because of the tremendously different agricultural systems and soil conditions. The small, four-wheel-drive tractor designed for use in rice paddies in the Far East is not adequate for dry-land farming in Africa or the Middle East, where larger plots are more prevalent, and where land clearing and deep plowing require more power. Minimum tillage techniques or whole-crop harvesting might equalize some of these differences, but it is doubtful that the impact will be sufficient to reduce the varying needs of different agricultural situations. Large, highly organized agricultural projects, as in Sudan, may indeed develop whole new agricultural procedures, but their requirements will certainly be at variance with wet farming procedures in the Far East.

Q 33 Some less significant implements or parts may be manufactured and supplied on a pool basis in developing countries, although the record of cooperation on similar projects is not encouraging.

Company Number 2

General Description

This is a North American-owned manufacturer of farm and industrial machinery, diesel engines and construction equipment.

Farm and industrial machinery and diesel engines are manufactured or assembled in almost all regions of the world. There are 90 factories in 30 countries, producing or assembling agricultural equipment. These facilities manufacture approximately 135,000 tractors and 11,600 combines annually.

In 1978, total corporate turnover was $2.9 billion. Agricultural equipment and tractors for construction applications amounted to $2.2 billion.

General Comments About the Interview

Interviews were conducted at European headquarters. The corporate development director was very cooperative in answering questions on technological trends and potential innovations in agricultural mechanization. Unfortunately, because of time constraints they could not contribute to other sections, although these may be completed later. They will be forwarded when received.

Tractors were the focal point of the interview, although considerable information and commentary was given on harvesters and implements.

Company Number 2

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 Developing countries want agricultural machinery products that are reliable, rugged and simple in design. On the other hand, there is a trend to use an increasing variety of implements that do not lend themselves to simplicity. If the standard, fundamental system of plow and then harrow is maintained, a very simple, low-technology tractor with a hook at the end is sufficient. The more sophisticated implements, however, require powerful tractors with high-technology hydraulics and transmissions.

However, some modifications can be made in the area of driver conveniences. The special deluxe model tractors with very comfortable cabs are not necessary in most developing countries. Simplified models should be offered developing countries without these unnecessary, expensive extras.

Harvesters are considerably more problematic for developing countries, mainly because of the question of replacement of labor. It is theoretically possible to develop more efficient, less complicated harvesters. However, the relatively low number being produced worldwide makes it uneconomical to produce a specialized harvester for specific crop or strain requirements. Ideally, combines designed especially for one crop, such as rice, maize or wheat and their stalk characteristics, would be considerably more efficient. However, the small number of harvesters produced and demanded does not economically allow for the higher design and production costs.

Company Number 2

Implements have no real shortcomings vis-à-vis the developing countries, because they are relatively easy to design and produce economically for each specific condition. These products are generally the first to be produced on a local scale.

Q 28 There are technological innovations forecast in agricultural production that could affect agricultural mechanization, but they are far in the future.

It is theoretically possible to develop chemicals that could remove the need to plow or till the land or to clear the land mechanically. Chemicals could be developed that would adequately aerate and enrich the land and defoliate and control weed development. In this extreme case tractors would not be necessary; aircraft distribution might replace the tractor. It is a question of cost and pollution vs energy conservation. This type of system could be the direction of the future, given all the right factors, although the time necessary for even minimum introduction is at least 20 years.

Other, more minor changes, such as the increased use of already available chemicals, will necessitate more mechanical distribution equipment and adaptation of existing implements. But these changes are not considered major.

Crop hybridization could also affect the mechanical design of harvesters if these changes are made on a sufficiently large scale. If only marginal changes are made, agricultural harvesters cannot be designed economically for these improvements. Japanese rice harvesters have advantages, but they require the mechanization of all functions in order to obtain even-row planting.

Company Number 2

Turbine or steam engines are much too expensive to produce economically, although these innovations would be theoretically more efficient and produce an infinitely variable system of power for the wheels. They would demand completely new transmission designs and gear systems.

Q 29/29a A complete chemical system could obviate the need for mechanized land preparation, in which case the power system would be required for distribution of chemicals instead. This would necessitate a completely new mechanical model.

Hybridization or increased use of chemicals will result in adaptations or modifications of the existing line of equipment.

Q 30 Adaptations and modifications will continue gradually, as in the past. New innovations will not occur before 20 years.

Q 31 The substitution of chemicals for powered mechanized land preparation and tillage would have a tremendous impact on developing countries, but this is much too theoretical and hypothetical to discuss intelligently yet.

Q 32 A standard mechanical tractor model for developing countries is possible on a general and limited scale. Certain developing countries have similar power requirements because of the nature of the agricultural production organization and soil conditions. Turkey, Iran, Pakistan, Libya, Nigeria, Egypt and the Sudan are examples of this. The standard model for these markets

Company Number 2

would not be radically different from that used in developed countries, but would include certain simplified features such as cleaners and precleaners for transmissions in desert climates or waterproof brakes in wet farming systems.

Q 33 A pool of subcontracted supplies for the local manufacture of this standardized model is entirely possible, although there would be major obstacles such as lack of political and economic cooperation between supply sources or technical inabilities to guarantee quality products that meet uniform specifications.

Company Number 3

General Description

The company is a North American-based manufacturer of agricultural, construction and garden equipment.

The company produces agricultural equipment in North America, Europe, Australasia and Latin America. Total annual production of tractors is approximately 100,000. In addition to tractors, the company produces agricultural implements and harvesters.

Total corporate turnover in 1978 was $4.2 billion. Agricultural machinery turnover amounted to $3.3 billion.

General Comments About the Interview

Interviews were conducted in North America and in Europe at corporate and regional headquarters. The director of the market development overseas division and the market planning manager for Europe, the Middle East and Africa were very cooperative concerning the questionnaire.

Trend information was given on a very broad basis and considered the wider view of agricultural production and mechanization. Global trends were given both from the perspective of the total market as well as from the perspective of developed- and developing-country markets.

Company Number 3

Global Market and Production Trends

Q 1/1a/2 This company sees total worldwide tractor sales remaining steady at approximately 1.7 million units per year.

In the developed countries there is a gradually declining market for agricultural machinery because of a reduced area of agricultural production. However, power is increasing at a rate of 1-1.5 hp per unit per year, and food production continues to increase because of higher yields and higher concentration of mechanization (1950s yields averaged 2.5 tons/hectare and now are 4-5 tons/hectare). There are only two growth areas in Europe: Portugal and Greece.

In the less developed countries, there is a tendency toward increasing mechanization and consequently growing machinery demand. However, there is concern for some markets that are becoming saturated, and of course the great inhibition to most countries' attaining their mechanization goals is lack of hard currency.

On a broader scale, the overriding obstacles to agricultural mechanization are to be found in making the transition from traditional methods to the proper management of land, and irrigation systems that can afford efficient mechanization.

Agricultural production has actually been decreasing in developing countries such as Kenya, Tanzania and the Sudan. What is needed, they claim, is a cooperative type of approach - as in Venezuela - in which cooperatives for financing, irrigation

Company Number 3

projects and agricultural production lead to an upgrading of the agricultural system to the level where mechanization on a relatively efficient basis can be instituted.

Before efficient growth in agricultural mechanization in the developing countries can be realized, the following must be done:

1) Nomadic farmers should be induced to settle.

2) They must be taught not to destroy the land by overgrazing or otherwise robbing the soil of its nutrients.

3) Water management must be instituted.

4) Agricultural techniques must be taught to farmers so that they can produce marketable crops.

5) Maintenance and agricultural production management must be instilled through government or cooperative programs.

Q 3/3a There is a general consolidation and rationalization taking place in the agricultural machinery industry. The number of factories is declining (smaller regional, specialized manufacturers are decreasing) as well as the number of manufacturers. Productivity on an industrywide basis is increasing and the number of products in each category on the whole is decreasing. Because of the large number of specialized comfort and other features, tractor types are increasing. The number of combines produced remains relatively static, and the number of implement models is decreasing.

Company Number 3

Q 4/4a Subcontracting has become somewhat more important because of increased technological complexities, although most companies' policy is to do as much within the firm as is economically feasible, and to develop new product designs employing the maximum interchangeability of components and production line utilization. Subcontracting is especially prevalent in electronics and cab components.

Q 5 The trends discussed in Q 3 favor rationalization of existing product types, although the number of models is increasing.

International Diversification Trends

Q 6 Demand in the developing markets is growing more rapidly than in the developed markets. A rough estimate is that it is growing at about five percentage points per annum faster. It would be growing much faster if there were not hard-currency problems and political and economic instabilities.

Q 7 Adaptive changes are required for the developing countries. Older, less sophisticated tractors with some minor adaptations usually suffice.

Corporate Product Diversification

Q 8/8a The company has a full line of agricultural machinery and therefore is always diversifying within the sector. This is mainly in the area of new model types within the framework of

Company Number 3

the established products, as well as toward component standardization for easier adaptability to related nonagricultural products.

Q 8b Diversification outside agricultural machinery has recently taken place in the construction (earthmoving) and forestry areas. In addition, a line of consumer products has been developed including small lawn and garden tractors, lawn mowers, rotary tillers and snow removal equipment.

Q 9 The farm tractor is most easily adapted to earthmoving and industrial applications.

Q 10 Although the company has decided to try to develop interchangeability in components and to rationalize product types, diversification into the construction field has tended to develop a separate production line operation - as is the case with consumer products. It has, of course, aided in the broadening of its range of products and the development of new markets. The company is committed to developing in the areas where it is now strong. There is no defined effort at present to diversify outside these areas.

Corporate Policy and Strategies for Developing-Country Markets

Q 11 In general, the development from export to developing countries of completely built units to the production of machinery in those countries is generally forced either by the local government or by competition.

Company Number 3

Q 12 In very rare cases, production on a limited local content basis is justified. The optimum level of operation is to export completely built units to developing countries.

Q 13 The company is unable to give a fixed estimate on this.

Q 14 Criteria for approving production in developing countries include the following elements:

1) 220 working days without strikes;

2) availability of local, reliable supplies of raw materials that meet established specifications;

3) reliable transportation facilities; and

4) availability of an educated labor force that can undergo professional training and in turn train and manage a skilled labor force.

Q 15 Because of extremely high tooling costs, a successful factory must be able to quickly amortize investment through maximum utilization. A tractor plant producing fewer than 12,000 units annually is probably not economically feasible in an open, free market.

Q 16 The company does not believe that exports from developing-country plants are desirable. It takes years to develop product quality, performance and reliability.

Q 17 Local manufacturing is usually forced upon companies by developing-country governments. If they could choose, they would produce completely in their North American and European plants.

Company Number 3

Q 18 Local content requirements vary widely from one country to another, but they are usually unrealistic considering the countries' state of industrialization.

Q 19/20 Consists of the same criteria for establishing a plant, as outlined in Q 14.

Q 21 Unable to give minimums.

Q 22 The company is generally expanding through installation of factories in the developed countries. It produces locally where required to meet local demands.

Q 23/24/25 A full after-sales service and parts organization is considered a priority item in successfully meeting developing-country market demands and requirements.

Q 26 No products are now manufactured specifically for the developing-country markets. Only slight adaptations are offered. The company does not intend to produce them in the future, since it does not believe they are necessary.

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 With the exception of possibly overly sophisticated driver comforts, tractors produced for the developing countries do not contain many shortcomings. Because of the hard, dry soil conditions of many African and Middle Eastern countries, a minimum of 50-60 hp is required. In addition, power for soil

Company Number 3

preparation and tillage implements requires at least 40 hp, with another 10 hp for drawing - i.e., at least 50 hp is required in these conditions. On larger, more organized agricultural projects, such as can be found in the Sudan and in South Africa, the same mechanical requirements as for the developed countries prevail, in addition to the lower-powered, less sophisticated tractors.

Q 28 Nothing is or will be drastic in agriculture. Predictions about dramatic chemical innovations are not realistic. Among the problems to be considered if chemical applications became technologically possible replacements for machinery are the environmental and ecological questions.

Biological or hybrid innovations may be designed to obviate the use of chemical weed control by developing more resistant types. They will also continue to be developed to yield easier and more efficiently harvestable stands.

Q 29/29a No major new mechanical system is foreseen based on these possible innovations. Multiple tillage operations resulting in minimum tillage procedures will continue to be developed in North America and Europe, resulting in less power consumption, better stand and startup, but these will require only modifications in the present mechanical system.

Better, more complete straw utilization will probably be employed, in which methods for converting it into chemicals, fibers, feeds or heating sources will be developed. Again, only modifications to the present mechanical system will be required.

Company Number 3

Q 30 Modifications and adaptations will continue to be developed gradually in the future.

Q 31 No major consequences will be realized for the developing countries because of these changes. The question is a much more basic one of the development of agricultural infrastructure, level of farmer sophistication and training, land clearing and proper irrigation methods rather than technological innovations.

Q 32 The concept of the small, standard tractor model for developing countries is considered too simplistic and not feasible. The cost for the industry to manufacture this would be too high and therefore not economical. There is an attempt now in the industry to take the present tractor base element (in the 50-70 hp range) and eliminate unnecessary high-technology items and driver conveniences. Items to be eliminated would be air conditioning, electrical monitoring devices for implements, variable speed controls and power clutching. However, most require a minimum of automatic depth control with hydraulic sophistication.

New engines for the developing countries are not feasible because diesel is mandatory and other systems are not economical. Maintenance training and some modifications in fuel filtering systems can rectify present problems.

Harvesters could theoretically be redesigned especially for developing-country needs, which would be more efficient. But the volume of these requirements does not justify the development at present or in the foreseeable future. One major problem is the question of replacement of labor.

Company Number 3

Q 33 Pooling of components in developing countries is not considered feasible given current political conditions and economies of scale.

Company Number 4

General Description

This company is a European-based and -owned company that is relatively diversified, producing motors, agricultural and construction machinery, and turnkey plant systems. It is also active in an entire range of manufacturing operations, including electrical and machine tool production.

Agricultural tractors are produced in the home country as well as in one wholly owned plant in Latin America. In addition, they have licensing agreements in North Africa, Asia and Eastern Europe.

Total corporate turnover in 1978 was $4.4 billion, of which agricultural and construction tractors represented $1 billion.

General Comments About the Interview

Although the company professed an unwillingness to divulge confidential company information, the director of planning did give the company position on the "general opinion" subjects.

Subjects were generally treated from a global point of view, with reference to the differences in the developed markets and the developing ones.

Company Number 4

Global Market and Production Trends

Q 1 The total market for tractors during the last 10 years has been decreasing in the USA and Europe and increasing in South America, Asia and Africa.

Since sales are cyclical it is difficult to generalize, although there was a boom in the early 70s that has now leveled off.

Q 1a The company's forecast is that the total market for tractors will grow slightly in the future due to increases in mechanization in the developing markets.

Q 2 Production of tractors over 100 hp will increase in Europe and North America, as will production in the 60-99 hp range for developing-country markets. The demand for lower-horsepower units has been decreasing in all markets.

Q 3a Company officials foresee an increase in the number of factories producing agricultural equipment and tractors.

Q 3b There are not many new manufacturers; the increase in plants will come from established manufacturers who are extending their production capacity or providing technology in joint-venture or licensing arrangements.

Q 3c The techniques for higher productivity are improving although demand at present does not allow higher per-plant output.

Company Number 4

Q 3d There is no trend toward an increase in the number of products. New products tend to replace older models. Four-wheel-drive tractor models are increasing in number. In addition, new models with changes in the hydraulics, transmission and electronics systems are constantly replacing older versions.

Q 4 There is still a considerable amount of subcontracting for components that are technologically new or highly specialized. The company subcontracts plastic parts and electrical systems manufacture, as these are outside its present line of activities.

Q 5 The present trends in the industry favor both the creation of a new range of products/models and a rationalization of existing product types. These products, however, will be modifications or adaptations of the present models and not new systems.

International Diversification Trends

Q 6 Demand in the developing countries is growing more rapidly than in the developed-country markets. It is not known at what rate. The developed markets are stagnating in unit sales but are enjoying a slight increase in value of sales because of higher unit prices. Tractor models most demanded in the developing markets are 60-80 hp in the dry-land farming areas of Africa and the Middle East, and 40-60 hp in the Far East.

Company Number 4

Q 7/7a,b New product types are required, but only adaptive changes are necessary. There have been attempts to build a small, very unsophisticated tractor for developing countries, but these have usually been unsatisfactory because the developing countries really want the sophisticated, advanced models. At present the German GTZ, an institution that helps developing countries, is working on a simplified tractor model.

Q 7c Implements demand the most radical changes for developing-country needs because conditions vary so much from one area to another.

Q 7d Whether the modifications are economically feasible depends on the costs-vs-turnover potential.

Corporate Product Diversification

Q 8/8a The company is diversifying production very slightly within the agricultural machinery sector. It has an extensive line of agricultural equipment and is diversifying into new types of harvesters and implements.

Q 8b Although the company is diversified now in the manufacture of engines, agricultural equipment and turnkey plant systems, it is not at the moment pursuing a definite policy of diversification outside its present channels; in fact, it recently divested part of its construction equipment line.

Company Number 4

Q 9 The diesel engine is the base of the company's past diversification, which includes construction equipment, trucks, tractors and harvesters.

Q 10 They have diversified, but no significant results have been realized.

Corporate Policy and Strategies for Developing-Country Markets

Q 11 The optimum development steps in developing countries depend entirely on the situation. The company's experience in North Africa and Latin America leads it to the conclusion that there are very few circumstances in the developing countries that justify more than the export of completely built units to these markets.

Q 12 The company's level of activity is guided by government regulations, restrictions and demands.

Q 13 There are many countries anxious to have local production now; the company's corporate policy is to try to be as flexible as possible.

Q 14 The feasibility of producing locally depends on local conditions including such things as availability of components, market demand and skilled labor.

Q 15 Minimums depend entirely on local conditions, whether the market is closed to competition, etc. The company finds it impossible to give fixed amounts.

Company Number 4

Q 16 Exports are desirable but should not be counted on in determining production feasibility. Sometimes, however, exports are demanded by developing countries for hard-currency reasons. This is especially true for East European countries.

Q 17 Decisions to invest are based on a combination of government requirements and the company's own feasibility studies and initiative.

Q 18 Local content demands are sometimes totally unrealistic. Turkey, for example, made very difficult demands.

Q 19/20 Major obstacles to local production are:

1) financing
2) manpower
3) lack of materials and components
4) lack of sufficiently high market demand

Q 21 Positive steps to improve the environment depend on the local conditions under consideration.

Q 22 In order to meet developing-country demand, the company would expand its production facilities in its already existing plants at home as a first priority, and then produce in developing countries if necessary.

Q 23 Most important marketing strategies include: having good personal knowledge and understanding of the people who decide on purchases; developing a good brand image; and refining production line efficiency in those countries where they are already producing.

Company Number 4

Q 24 The low level of agricultural and mechanized knowhow is the major obstacle.

Q 25 Government training programs would help immensely.

Q 26 No products are specifically produced for developing-country markets, although some tractors are slightly modified for local conditions. The company does not plan to produce special developing-country products in the future.

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 The shortcomings in agricultural machines required in developing countries have little to do with their technological level or model type. It is more a question of the level of owner/user education and agricultural knowhow. The ability and willingness to maintain properly service-intensive machinery are the real shortcomings, not the machine design. Some tractors, however, are a bit too luxury- and comfort-oriented for developing countries.

Q 28 No major technological changes that would revolutionize agricultural production are foreseen. Innovations will be minor ones based on existing methods. Chemical and hybridization changes may be included.

Q 29/29a There will be minor adaptations or modifications of existing product types, but no major new mechanical systems will be developed.

Company Number 4

Q 30 Modifications and adaptations will continue in the future as they have in the past.

Q 31 The minor changes will not dramatically affect the conditions or the transfer of technology to developing countries because the question is far greater than technology - it is the institution of a modern agricultural system and mentality.

Q 32 There has been talk in the industry about designing a simplified tractor in the 25-30-35 hp range that corresponds to developing country needs for simplicity and economy. The company does not feel that this is economically feasible, nor would it be successful since buyer motivation in developing countries entails a form of pride - they want to have the same things as the developed countries. Furthermore, standardization is not feasible because of the wide variety of requirements in the developing countries.

It is not economically feasible to build specific model types for such small requirements. It is a question of economy of scale.

Q 33 Theoretically the pooling of alternative sources for the production of agricultural machinery in developing countries is possible, although it is not probable for a very long time. Sophisticated equipment such as electrical components, hydraulics and motors will never be manufactured economically in most developing countries.

Company Number 5

General Description

The company is a US-owned corporation manufacturing trucks, agricultural equipment (including harvesters, tractors and implements), construction and industrial equipment, and turbo machinery - as well as gasoline and diesel engines.

The company produces agricultural tractors and equipment in the US, Mexico, Australasia and Europe, and has joint-venture operations in the Near and Far East. Total plant capacity for tractors exceeds 120,000 units annually. Total corporate turnover in 1978 was $6.6 billion, of which agricultural equipment represented $2.5 billion.

General Comments About the Interview

The director of international marketing and the research manager were very cooperative and open in discussing market and technological trends.

Because of time constraints, the company did not answer the statistical section. It will send this later, after completing those sections that they are willing to answer. This will be forwarded after receipt.

Company Number 5

Global Market and Production Trends

Q 1 The growth potential in the developing countries is very high, but at present it is definitely not being realized because of political and financial problems.

The market in the developed countries is stagnating or slightly declining. Sales were up in the early- to mid-1970s but have been down since 1977. Unit sales are down, with horsepower capacity up and value down slightly.

Global historical trends by product category over the past 10 years are seen as follows:

Total sector	5-10% increase
Tractors	5-10% increase
Harvesters	1-4% increase
Implements	1-4% increase

Q 1a Forecasts for the next 10 years include a 1-4% increase in unit sales for the total product category. The following is a breakdown by product category:

Tractors	1-4% increase
Harvesters	static
Implements	1-4% increase

Company Number 5

Q 2 The major increases in tractor types will be in the 60-100 hp ranges. Tractors smaller than 35 hp and from 35-59 hp will both decrease by 1-4%, while 60-99 hp models will increase by 5-10%; models over 100 hp will increase by 1-4%.

Self-propelled harvesters will become dominant as pulled models are phased out.

Little is known about implements except that they are tied to tractor sales.

Q 3 The company sees a decline in the number of factories and number of manufacturers producing, but an increase in productivity per factory. The number of products made is increasing slightly but not significantly.

Q 3a The increase in different tractor models is due to the developing countries' demand for higher-horsepower machines with modifications.

Q 4 There will be little change in the tendency to subcontract. Some cab construction and design is subcontracted, but the company's policy is to integrate as much as possible in its own manufacturing lines. However, transmissions, motors, hydraulic systems, gear boxes and axles are subcontracted.

Q 5 The company's policy has been to rationalize the range of existing products, concentrate on the more productive ones and develop a broad range of models within the firm.

Company Number 5

International Diversification Trends

Q 6 The developing-country markets for agricultural equipment are growing faster than those in the developed countries by an estimated 10-15 percentage points. Tractors in the 40-70 hp range are most in demand in developing countries, and sales are growing by 9-10 percentage points faster than in the developed-country markets. The same type of harvester is demanded and sold in developing-country markets. Demand is thought to be growing by 4-5 percentage points faster in developing countries.

Q 7/a/b/c/d New product types are generally required in developing countries, but these are only slight alterations of the existing products sold in the developed countries. In wet farming conditions, tractors are often required to have protective housings for brakes and clutches. Sometimes stripped-down versions of tractors and harvesters are requested, but usually the same comfort-oriented models sold in the developed markets are requested in the developing countries. To strip a tractor or make modifications does not greatly affect the selling price.

Corporate Product Diversification

Q 8 The company is diversifying to some extent within the agricultural machinery sector. It started as an agricultural machinery manufacturer and diversified early into trucks, construction equipment and turbine engines. There is no present deliberate effort to further diversify.

Company Number 5

Q 9 The tractor is the product most easily adapted to diversification outside the range of agricultural equipment.

Q 10 The company has been diversified for so long that it is not possible to gauge what effects this has had on production line techniques, its range of products or the development of new markets.

Corporate Policy and Strategies for Developing-Country Markets

Q 11 The classical development steps are still held to be the most desirable. However, it is an academic question since there are very few countries where local production or even assembly is justified.

Q 12 The export of completely built models to developing countries is thought to be the best way to supply these markets. Even shipping knocked-down units turns out to be more expensive both for the importer and the manufacturer because of the availability of efficient roll-on-roll-off systems.

Q 13 No developing countries at present really meet the company's criteria for local production.

Q 14 A minimum of 10,000 tractors is required before local production becomes feasible.

Q 15 Implements such as plows and harrows could be produced efficiently with a yearly demand of 200-300, although these figures depend heavily on particular costing conditions.

Company Number 5

Q 16 Exports are desirable but should not be counted on when considering the feasibility of local production.

Q 17 Decisions to establish production in developing countries are generally a result of government local content regulations or pressures.

Q 18 Minimum local requirements are generally not considered realistic.

Q 19 Insufficient market size and the lack of industrial infrastructure are considered the major obstacles to establishing local production.

Q 20 The obstacles would be ranked as follows:

1) lack of minimum levels of market demand
2) lack of trained, technically qualified personnel
3) lack of locally sourced materials
4) lack of a stable, productive labor force
5) lack of available financing.

Q 21 The feasibility of local production in developing countries depends almost entirely on the industrial infrastructure. Regional markets have not proved to be a realistic answer. But even if they were, some regions would never qualify because of their present low demand, e.g. Africa. The demand generated by the whole of black Africa just barely justifies local production. Cooperation among these countries is highly unlikely given the present political and economic conditions.

Company Number 5

Q 22 This company is meeting growing demand in the developing countries mainly by increasing production capacity in existing home-country factories.

Q 23 The most essential marketing strategy for developing countries is considered to be provision of good after-sales support to distributors and end-users. This will greatly improve the image of the product.

Q 24 Major marketing obstacles are:

1) the lack of proper distribution facilities
2) the lack of trained user or maintenance personnel

Q 25 Remedies to marketing obstacles are:

1) upgrading distributors and their distribution outlets in developing countries
2) training maintenance and transport personnel

Q 26 No products are specifically produced for developing-country markets, although some product modifications are offered. The company does not plan to produce such specialized products in the future since company officials do not believe they are required.

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 The shortcomings of agricultural machinery in developing countries is seen as merely a function of inadequate distribution facilities for proper after-sales servicing.

Company Number 5

The company does not see any significant areas of design deficiencies except perhaps for overly sophisticated operator comforts. A more simplified system might be more appropriate, but it remains a question of supply and demand and economy of scale.

Smaller-horsepower tractors with four-wheel drive are not thought to be efficient in most developing country applications, where dry-land conditions tend to prevail.

The company has recently developed a rotary combine that it feels has considerable advantages in developing-country applications, where dry-land conditions prevail.

Implements are the least problematic. There is a trend toward minimum-tillage concepts, which have the advantage of conserving ground moisture.

Q 28 Technological innovations in agricultural production basically will be modifications of present systems and not new concepts that would drastically alter mechanical requirements. The company foresees that these developments will come first in the developed markets and be applied later in developing countries.

Q 29 Only minor modifications and product adaptations will be required.

Q 30 Some minor changes will take place gradually over the next 5-10 years, but major innovations will probably not be made before 20-30 years, if at all.

Company Number 5

Q 31 The impact of these modifications or alterations on developing countries is seen to be minor. Less sophisticated and less expensive forms of the present products might be desirable, although they are not economically feasible at the moment.

Q 32 The development of a standard mechanical tractor model is not considered to be economically feasible for the developing countries because of widely differing agricultural conditions.

Q 33 The supply of components from developing countries is seen to be extremely uncertain because of the lack of industrial infrastructure. So far these have been restricted to simpler products such as batteries, a few castings, and radiators.

The most important thing developing countries can do to further the trend toward more efficient mechanization is to concentrate on providing organizational structures and methods to improve effective land use rather than to worry about specialized mechanical models.

Company Number 6

General Description

This is a Japanese-owned manufacturer of agricultural equipment. The company makes tractors and combines mainly in Japan for export, although it also manufactures tractors in Brazil and assembles in the US, Taiwan, Indonesia, Malaysia and Iran. It has a total of 22 factories and produces about 120,000 tractors annually.

In addition to agricultural equipment, the company produces ductile iron pipe and related equipment for water supply and other utilities, castings and machinery, environmental control facilities and various building materials. It also constructs and sells housing.

In 1978, total corporate turnover was $2.3 billion of which $1.7 billion was from sales of agricultural equipment. Exports of agricultural equipment account for 14% of total agricultural equipment turnover.

General Comments About the Interview

Discussions were held with the planning director at the company's head office in Japan, and with the general director of its European subsidiary.

They were very frank and open concerning questions set out in the questionnaire. They considered the statistical information requested to be of a confidential nature and gave financial reports as a replacement.

Company Number 6

Global Market and Production Trends

Q 1 The company estimates that the total agricultural machinery market is growing at a rate of 5-10%.

Q 1a Its forecast is that the total product sector will grow at an average annual rate of 5-10%.

Q 2 Tractor models forecast to have the fastest rate of growth are in the below-35 horsepower to 59 horsepower range. The 60-99 hp category will grow only 1%. Production of harvesters and implements will grow at the same rate as the below-35 hp to 59 hp tractor category.

Q 3 Industrial production trends can be described in the following way:

1) The number of factories producing agricultural machinery is seen to be static.
2) The number of manufacturers in the industry is static to decreasing.
3) Productivity per factory is increasing.
4) The number of products in each category of tractors, combines and implements is increasing.

Q 3a The higher income of farmers and the shortage of agricultural labor account for the increase in agricultural mechanization.

Q 4/4a The tendency to subcontract in agricultural machinery production is considered to have been moderate. This is especially true of hydraulic systems and electrical assembly production.

Company Number 6

Q 5 The industrial trends described above tend to favor the creation of a new range of products/models especially for overseas markets, as well as the rationalization of existing product types for domestic markets.

International Diversification Trends

Q 6 The past growth of developing-country markets has been about 20 percentage points faster than developed-country markets for agricultural machinery. A rate of 10-13 percentage points faster is forecast for the next 10 years in developing countries.

In the US market, the company's products have been especially popular for nonagricultural applications such as gardening and mowing. In Southeast Asia, the company has expanded its market share by filling the gap between imported high-power tractors and the local demand for less power and less expensive models. The 10-35 hp range is most in demand.

Q 7/7a/b/c/d This company believes that new, adaptive changes are required to meet developing-country demands - which require more durable, less expensive and easier-to-maintain equipment. Tractors should be built more durably and harvesters should be supplied without complicated electronic components for monitoring. These adaptations are economically feasible.

Company Number 6

Corporate Product Diversification

Q 8/8a/8b The company has been diversifying its production of agricultural machinery by broadening its range of models and product types and by integrating the manufacture of components formerly subcontracted. It is also diversifying into nonagricultural areas such as construction machinery and marine engines.

Q 9 The construction machinery sector is the one most easily diversified into from agricultural machinery. An engine is the basic element that lends itself to different functions.

Q 10 Diversification has helped most to develop a broader range of products.

Corporate Policy and Strategies for Developing-Country Markets

Q 11 The company agrees that the classical development phases of operation, from exporting completely built units to local manufacture, are the most rational. It feels that the process of transition from the export of completely knocked-down units to local production has been shortened in recent years.

Q 12 The operating level of exporting either partly knocked-down (PKD) or completely knocked-down (CKD) units is considered optimum for most developing-country markets.

Q 13 Brazil, Taiwan, Indonesia, Thailand (where it will soon start production) and the Philippines (production foreseen in future) currently meet its corporate criteria for establishing local production.

Company Number 6

Q 14 The criteria for establishing local production consist of:

1) a request from the host government
2) the extent of competition

In general, the decision to produce locally comes from outside pressures, not from economic considerations.

Q 15 Minimum requirements for establishing local production would entail the production of at least 500 tractors and 1,000 engines monthly.

Q 16 Exports are considered of possible interest but should not be counted on in determining whether to establish local manufacture.

Q 17 Decisions to invest in developing countries are often a result of government pressures and, to a much lesser extent, a company's own economic analysis. Its production in Brazil, Taiwan, Indonesia and Thailand are examples of this.

Q 18 In general, the developing-country local content requirements are not considered realistic. For example, it will start local production of engines in Thailand soon. Local content requirements demand 20% in the first year, 40% in the second, 60% in the third and 80% in the fourth. These are considered unrealistic given the industrial conditions in this country.

Company Number 6

Q 19 The major obstacles to local production are:

1) unrealistic local content requirements unmatched by sufficient levels of industrialization
2) small market potential
3) low level of partner's technical and managerial skills

Q 20 Potential obstacles to local production are ranked as follows:

1) lack of locally sourced materials
2) lack of trained, technically qualified personnel
3) lack of minimum levels of market demand
4) lack of stable, productive labor force
5) lack of available financing

Q 21 The first positive steps in improving the environment for local manufacture in developing-country markets are:

1) to make locally sourced material more available by improving the steel and casting supply industries
2) to develop managerial and technical educational programs

Q 22 The company is meeting higher developing-country demand mainly by increasing home-country production facilities for manufacturing diesel engines and field tractors.

Q 23 The most essential marketing strategies for successfully competing in developing-country markets are:

1) to select the best local distribution partner
2) to provide adaptations to meet local market demand

Company Number 6

Q 24 The obstacles to successful marketing in developing countries are:

1) limited production capacities, low level of local technology and poor-quality materials, which make it very difficult to lower prices
2) financing for farmers, which is generally poor
3) limited availability of hard currency, making the importation of products and materials difficult
4) low educational level

Q 25 These obstacles could be overcome by:

1) adopting less complicated designs and mechanisms (reducing obstacle No.1)
2) government programs (reducing obstacles 2 and 3)
3) its own education and training programs (reducing obstacle 4)

Q 26 The company now produces special tractors in Thailand and Indonesia for its specific needs, and plans to produce tractors and diesel engines in the Philippines in the future.

Company Number 7

General Description

This company is a European-owned and -headquartered manufacturer of automobiles, construction and engineering equipment, steel, electronic components and railway equipment; it is active in many other business operations.

The company produces or assembles agricultural machinery in Western Europe, Romania, Turkey, Yugoslavia, Zaire, the US and Argentina. It produces a full range of implements, harvesters and combines in these facilities. Its total manufacture of agricultural tractors is approximately 90,000 per year, including licensing and assembly operations.

Total corporate turnover in 1977 was $1.6 billion, with agricultural equipment amounting to $750 million.

General Comments About the Interview

Interviews were conducted in corporate headquarters in Europe. The general manager of the agricultural machinery division and the marketing service manager were extremely cooperative in answering the questionnaire.

They have agreed to complete the statistical section to the best of their ability and will send it lat r. This will be forwarded when received.

Company Number 7

Global Market and Production Trends

Q 1 Trends in the total agricultural machinery market for the last 10 years must be differentiated between developed and developing markets. Increase in demand in developed markets was slow (replacement), whereas developing economies contributed overproportionately to the total growth rate. Growth has been cyclical.

Q 1a Growth over the next 10 years will follow past trends, with slightly higher growth rates for implements and harvesters. There may be an improvement in the tractor/implement ratio in developing countries.

It is difficult to forecast the agricultural machinery business cycle.

Q 2 This company predicts a decline in the under-35 hp tractor category, a stagnation in the 35-59 hp class, a 2% increase in the 60-99 hp class and the highest growth rate (3%) in the over-100 hp range.

The number of pulled harvesters is predicted to stagnate, whereas self-propelled harvesters are expected to increase in number by 1-4%.

Q 3 Industrial production trends were described as follows:

- the number of factories is likely to be static
- the number of manufacturers is likely to decrease
- productivity per factory will probably increase slightly
- the number of products per category may decrease due to standardization efforts

Company Number 7

Q 4 The tendency to subcontract has not been important at all, as most components are sourced within the company. Cabs, for example, can be manufactured within other divisions of this widely diversified firm.

Q 5 Current industrial production trends will favor a rationalization of existing product types.

Increasing energy costs in production processes may lead to a stagnation in the trend toward more sophistication (production of tractor platforms and cabs is very energy-intensive).

International Diversification Trends

Q 6 The developing-country markets are growing faster than those in developed countries, but fluctuations in effective demand can be extreme due to foreign exchange availability fluctuations.

Latin America favors the above-80 hp tractors (large-scale farming); Asia favors smaller hp classes (35-60; small-scale farming, rice); Africa favors medium-class tractors (60-80 hp), with a tendency to higher hp classes in large-scale, dry-land farming, i.e. the Sudan, Libya and other Middle East countries; only Asia will continue to favor pulled harvesters.

Q 7 Developing countries theoretically require less sophisticated products for reasons of durability, service and parts. These products are available or can be made suitable to meet these considerations either by modification and/or adaptation according to local soil and other farming conditions.

Company Number 7

In general, features such as hydraulic steering, 12 speeds, etc. are not necessary in most developing countries.

Wheels, batteries and power take-offs are the items that most often need replacement.

There are no radical changes required and all modifications are economically feasible.

There is a profound discrepancy between what developing countries need and what they actually want. Low-specification machines (despite suitability and economics) can only be sold with difficulty, whereas Western-standard sophistication and specifications are in high demand. This is a crucial factor. A tractor is a very high-prestige item in most developing countries and is used extensively for other than agricultural purposes (i.e. family transport, etc.).

For example, this company left one tractor model (low specifications and most successful in Europe for many years) purposely in its product range because it thought it would ideally suit developing-country requirements. Experience has shown that this was a misconception and the model can hardly be sold.

Corporate Product Diversification

Q 8 This company is diversifying within the agricultural machinery sector and within all categories listed under Q 8a.

Company Number 7

Q 9 Tractors, crawlers and forklifts are most easily adapted to diversification within the agricultural machinery sector.

Q 10 This company's diversification has, for example, helped to open new markets.

Corporate Policy and Strategies for Developing-Country Markets

Q 11/12/13/14/15 In this company's view, only a few developing countries can economically justify local manufacture of tractors, because:

1) market size is too small, in which case only one manufacturer can be considered; this would exclude competition, which would finally be against the interest of the country concerned;
2) the production of more than 2-3 models would not be feasible and this could inhibit the importation of other hp tractors that might be needed;
3) the cost of tractors manufactured locally would be substantially higher than those imported; the local manufacturer would have to be protected by customs duties; in most cases the local farmer would have to pay a higher cost;
4) in most cases the basic industrial infrastructure on which to build a tractor manufacturing industry has not yet been established;
5) a feeder industry would not be feasible unless it produced for industries other than tractor manufacturing;

Company Number 7

6) logically, most countries should start with manufacturing implements and low-technology components, which could gradually be phased into locally assembled tractors (PKD/CKD);

7) investments are too high and production numbers too small to allow new production methods/technological changes to be adopted.

Currently, countries like Brazil, Turkey, Nigeria and India justify local manufacture.

Q 16 Because of low-volume markets, exports would be desirable, but local markets must, in most cases, justify the investment. Regional integration would considerably favor the feasibility of local production.

Q 17 The decision to invest is primarily based upon a company's own rationale, but it can be influenced by government pressure as well (i.e. Nigeria).

Q 18 Local content requirements differ from country to country. According to local industrial infrastructure, 20-40% is realistic.

Q 19/20 Potential obstacles in order of importance are:

1) market demand
2) lack of locally sourced material
3) lack of trained technical personnel
4) lack of stable, productive labor force
5) lack of financing

Q 21 The answer is to build up a feeder industry, training and education.

Company Number 7

Q 22 Current and expected (near-term) demand trends do not warrant increased capacity. The company is, however, ready to consider establishing production capacity in developing markets if and when local conditions justify such a decision.

Q 23 The priority is on: establishing and upgrading a network of distributors and agents; training, both technical and in agronomics; and identification of projects and financing possibilities.

Q 24 Obstacles are lack of trained personnel and financing.

Q 26 There are no products specially designed for developing countries, although "suitable" products are available (see Q 7). There are no plans to add specific products.

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 There are no major shortcomings in the existing range of agricultural machinery used in developing countries. The technology available would be suited for developing countries provided the same maintenance would be applied.

Less sophisticated machines would be easier to service and would more readily withstand "maltreatment" by unexperienced drivers and badly educated technical personnel.

Company Number 7

Q 28 No major innovations in agricultural production are foreseen. There might be new crops or cropping conditions that could require either modification or adaptation of existing machinery. A complete new mechanical system is, however, not foreseen.

Q 32 A standard mechanical system designed for developing countries could be feasible, but the real question is whether those countries would want it.

Q 33 In theory, a new model of this sort could well draw on a pool of supply sources in developing countries.

Company Number 8

General Description

This company is a North American-owned and -headquartered manufacturer of agricultural and construction equipment, diesel engines, electrical products, materials handling/outdoor power equipment, power generation and transmission and processing systems. Recently, its construction equipment line was partly divested and majority shares sold to a European manufacturer.

Agricultural equipment is produced exclusively in North America. A full range of tractors, implements and harvesters is manufactured. While the company does not manufacture in developing countries, it actively markets and distributes its products throughout the world.

Total corporate turnover in 1977 was $1.5 billion, with $545 million accounted for by agricultural equipment sales.

General Comments About the Interview

Discussions were held in North American and European headquarters. The director of international market development and the international marketing manager were both very helpful and cooperative in supplying information.

Statistical information asked for was considered too time-consuming and of a confidential nature. Financial reports were offered in its place.

Company Number 8

Global Market and Production Trends

Q 1 The total agricultural machinery market is estimated to be growing by 5-10% annually. Production of all categories is growing in this field, although the manufacture of harvesters is increasing slightly faster (closer to 10%).

Q 1a Growth for the next 10-year period is expected to be about 7%.

Q 2 Production of tractors in the 35-99 hp range will increase by 5-10%, while those below 35 hp and above 100 hp will increase by 1-5%.

The number of self-propelled harvesters will grow at about 5%, while pulled models will decline by about 1-4%.

Implements will follow tractor trends but toolbar ridgers will increase by 1-4%, disc harrows by 5-10%, disc plows by 1-4%, chisel plows by 1-4% and others (especially row crop tillage implements) by 5-10%.

Q 3 The number of factories producing agricultural machinery is considered to be increasing slightly. The number of manufacturers, productivity and the number of products in each category are also seen to be increasing.

Q 3a The increase in product categories is a result of small-company innovations. This is true for tractors and implements but not for harvesters, which require considerable capital investment.

Company Number 8

Q 4/4a This company feels that the tendency to subcontract part of the manufacturing process has been very important. This is especially true for motors, electrical assemblies, hydraulic systems and diesel injection systems. Almost all the electronic monitoring systems for harvesters are supplied by outside manufacturers.

Q 5 Industrial concentration tends to favor a rationalization of existing product types. No new range of products or models has resulted.

International Diversification Trends

Q 6 The developing-country markets for agricultural machinery are growing at a faster rate in units (5-9 percentage points) than the developed-country markets. Tractors of 65-85 hp are most in demand. Tractors with 180 hp are increasing rapidly in number for agricultural land development and clearance. Self-propelled harvester/combines are growing rapidly in number because of the increasing cost and nonavailability of labor, and the growing recognition that timely harvesting increases yields. There is a trend now to produce deep-tillage implements to be used with high-capacity land clearance tractors, in addition to normal implements that are used with the 65-85 hp tractors. Sales of all agricultural machinery in the developing countries are inhibited by a general lack of hard currency, low level of mechanical training and political instability.

Company Number 8

Q 7/7a/b/c/d The existing models are suitable for the developing-country markets. Simplified tractor concepts for developing countries are considered to be a waste of time since the present tractor has basic features that are adaptable to developing markets. If they were more simplified, they would lose their sales appeal as well as their efficacy. There is no substitute for a diesel engine and this has a complicated injection system. A four-speed transmission system is considered minimal. Brakes are generally considered essential since tractors are frequently used as transportation. A three-point hitch hydraulic system is the minimum for even the most simplistic agricultural functions. Ironically, when developing-country buyers are offered stripped-down versions, they usually order the more sophisticated models. If an existing tractor model were stripped of the cab, power shift and the three-point hitch, and were equipped with smaller tires, a saving of about 12% could be offered.

Corporate Product Diversification

Q 8/a/b The company is highly diversified already and is rationalizing product lines rather than diversifying into new areas either in or outside the field of agricultural machinery. It had a construction machinery section but this was partially divested.

Q 9 When considering diversification, the adaptation of the agricultural tractor to industrial and construction sectors was thought to be the most natural move.

Q 10 Few new production-line techniques or economies of scale were realized through earlier diversification. These have become separate operations. But product range has broadened and new markets have been developed.

Company Number 8

Corporate Policy and Strategies for Developing-Country Markets

Q 11/12/13/14/15 The company considers the best approach in most developing-country markets to be the export of completely built units from its factories in North America. It approaches each developing-country market independently and tries to develop its marketing base there. Local manufacturing is usually demanded by local governments that are unconcerned with profitability considerations. Criteria for establishing local production include:

1) sufficient market demand
2) exportability
3) backup industry for components
4) availability of trained personnel

Q 16 Exports are considered desirable but feasibility should not depend on them.

Q 17 The decision to invest in most developing countries comes mainly from government requirements or pressures.

Q 18 Local content requirements can vary from 0-90% within 5-6 years. Some are reasonable and others totally unrealistic.

Q 19 The lack of a backup industry that produces components is the major obstacle to local production.

Company Number 8

Q 20 Obstacles are ranked as follows:

1) lack of minimum levels of market demand
2) lack of locally sourced materials
3) lack of trained, technically qualified personnel
4) lack of available financing
5) lack of a stable, productive labor force

Q 21 The initiation of effective government programs to develop mechanization including training, finance, irrigation, etc. is considered to be the most important first step toward improving the possibility of local production - in addition to the promotion of industrial development of backup industries such as foundries and a metalworking industry.

Q 22 The company meets foreign demand by increasing domestic capacity.

Q 23/25 The company considers that the same obstacles to local manufacture are applicable to marketing and distribution.

Q 26 No products are produced exclusively for developing-country markets, nor are any planned for the future.

Technological Trends and Potential Innovations in Agricultural Mechanization

Q 27 The company does not believe that there are major shortcomings in the agricultural machinery now offered to the developing countries. The shortcomings can basically be remedied by having the developing-country users utilize what is available properly.

Company Number 8

The concept of a small basic tractor model to be used especially in the developing country is not practical. The basic tractor in use in the developed countries is the minimum required for agricultural production in the developing countries. In addition, developing-country users usually demand the most sophisticated products available because of pride.

Q 28 No major technological innovations are foreseen in agricultural production. Conservation tillage, improvements in seed placement uniformity and increasing yields will continually require modifications in products - especially harvesters and planters. No revolutions are ever experienced in agriculture or mechanization - only evolutions. Chemical developments will continue to require machine application.

Q 29 These evolutionary changes will require only modifications in the existing range of products.

Q 30 Changes will occur slowly over a long period of time.

Q 31 No foreseeable consequences will occur from these changes concerning the transfer of production to developing countries.

Q 32/33 The development of a standard mechanical model is not considered feasible.

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