Proceedings of the International Conference for Agricultural Machinery & Process Engineering
October 19-22, 1993, Seoul, Korea

AGRICULTURAL MACHINERY MANUFACTURE IN GHANA

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ABSTRACT

Domestic production of agricultural machinery has come to be seen as appropriate entry route in the capital goods industry for most African countries, including Ghana, which has purely and strongly agricultural-based economies with a weak industrial infrastructure. Recent studies in Ghana do indicate that in addition to possessing technological capability in the manufacture of handtools, there is evidence of increased production of machinery for the primary food processing sector. Local manufacture of tractors and associated implements is embryonic, with an average domestic procurement ratio of only 2%. This paper looks at the domestic production of agricultural machinery in Ghana and analyses the available technologies and economic indicators in the local agricultural machinery industry. Areas for future development are identified.

Key words: Agricultural Machinery, Local Manufacture, Manufacturing value-added, Apparent Consumption, Domestic Procurement Ratio.

INTRODUCTION

The building of a strong, vigorous and self-sufficient indigenous agricultural machinery industry in Ghana has come to be regarded as an essential component not only in the modernization of traditional agriculture, but also in the national industrialization process. The agricultural machinery industry is a good interface between industry and agriculture. In a developing country such as Ghana which has a purely and strongly agricultural-based economy with a weak industrial infrastructure, domestic manufacture of agricultural machinery provides a firm base for agricultural mechanization and offers a suitable entry point for industrial growth.

Demands for Agriculture and Industry

Ghana has passed through the initial stage of importing large tractors and mechanical equipment for agriculture. As a result, three distinct types of agricultural mechanization technology exist in the country. First is the farmer with the hoe and cutlass practicing a system of shifting cultivation. Then the farmer using bullock-drawn equipment who is able to farm a greater amount of land because of his additional power. The third is the user of a 4-wheeled agricultural tractors and associated machinery and implement to grow such crops as rice maize and cotton in large fields under a monoculture system. The bulk of agricultural production is however still by the hoe and cutlass farmer.

Since the 1960's , different Ghanaian Governments have initiated policies aimed at encouraging agricultural mechanization. These mechanization policies have unfortunately tended to be based on the importation of needed machines and implements. The reliance on imported equipment has created serious constraints in the national agricultural mechanization efforts, as Government have not been able to provide the foreign capital required to purchase the machinery and implements in the right quantities required by the farming community.

In the process, it has been realized that generally agricultural mechanization programmes based on imported tractors and farm machinery have tended to be uneconomical and has not made any appreciable impact in enhancing agricultural production.

Alongside the requirements of agriculture, Ghana's industrial development policies have aimed at improving the industrial output, and increasing the sector's contribution to the overall national output. The industrial sector has been expected to transform the country's predominantly agricultural and rural economy into a modern and integrated industrial economy.

Given the Ghanaian situation, and against a backdrop of an import-substitution industrial development policy, a compromise strategy aimed at meeting the needs of both agriculture and industry appear to lie in the local production of agricultural machinery and rural equipment, including food processing machinery.

Structure and Performance of the Sector

Studies in recent times by Peck (1986) (2), Twum et al (1990) (4), and Twum and Dzisi (1992) (5), do indicate that a proportion of the capital goods produced in the country comes under the agricultural machinery industry (ISIC 3811 and ISIC 3822 in the International Standard Industrial Classification for all Economic Activities). The industry exists in different levels of production units, including a few modern factories which mass-produce handtools.

Handtools (ISIC 3811) are produced at several levels of technology as the technologies used in the manufacture of these handtools are relatively simple. Production is scattered and widespread, and is carried out by village blacksmiths, urban artisans, and in small-scale shops. Two modern industrial complexes produce high quality handtools at an annual production of about 3.5 million units. Animal-drawn and tractor-drawn tillage implements, (ISIC 3822) such as disc plough, harrows, ridgers and cultivators are manufactured in medium scale factories, but these firms have to import the discs, mouldboards and bearings from outside Ghana. There is no local production of equipment for sowing, fertilizer distribution and crop spraying machine. Apart from the handtools, no firm produces crop harvesting machinery.

The production of farm tractors (ISIC 3822) has come from a few Tractor Assembling Plants which have been engaged in assembling completely knockdown (CKD) tractors imported into the country. The annual output from these plants were about 100 units in the mid-1970's when production was at its peak. The local component of these assemblies have been near zero. Unfortunately all these tractor Assembling Plants have lately folded up because of lack of market as they became incapable of competing with completely imported models.

Two and four-wheeled 3- and 5-tonne tipping tractor trailers, (ISIC 3829), with steel or wooden bodies are locally produced to high exportable standards. Production of primary agricultural and food processing machines is an area which is dominant in the local industry in terms of manufacturing value-added (MVA). Indigenous technologies and capacities exist for the production of such processing equipment as cassava graters, gari processes, palm oil digesters and presses, cornmills, vegetable mills, flour kneaders, etc.

PRODUCTION DESIGN AND TECHNOLOGIES

Whilst there are a fairly large number of establishments in both the formal and informal sectors of the Ghanaian economy which are engaged in the manufacture of agricultural and rural equipment, only a few of these use modern production equipment, and do possess adequate technology and design capabilities. The bulk of manufactures have relatively low technology complexity. They fall into what UNIDO (1970 (6) classifies as categories A and B machines, and have component parts of between 1 - 50. The set-up of craftsmen and mass-production units co-exist because the current products are of generally low technological complexity, coupled with the rather small demand for these products are suited to artisan and small-scale manufacturing units with batch production techniques. Production technologies involve simple metal cutting and jointing operations, with relative emphasis on basic sheetmetal working, welding and some simple machining operations. Characteristic of these artisanal and small producer shops is the employment of a few universal machine tools (mainly metal shears, drills, centre lathes and welding plants) with cutting and welding constituting the dominant production process. The use of jigs and fixtures is limited and there is a general lack of quality control, except in the industrial complexes which produce high quality products from standard engineering drawings. Whilst there have been a fairly high level of indigenous designs, in the field of handtools and processing equipment, other products have been designed and developed based on copying and with modifications to imported foreign models.

THE INDUSTRY IN GHANAIAN ECONOMY

Table 1 - 6 provide official figures and statistics for the relatively medium and large firms in the formal sector which are registered as engaged in the agricultural machinery manufacturing industry. These employ 30 or more persons.

Generally the industry occupies only a small share of both the manufacturing industries.

TABLE 1: Employment in the Agricultural Machinery Industry as Percent of of Total Employment in all Manufacturing Industries as Capital Goods Industries (1977-1986)

YEAR	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A) All Manufacturing Industries (ISIC DIVISION 3)	88947	85249	79832	80269	77365	67661	58278	55783	61638	60588
B) All Capital Goods Industries (ISIC Group 38)	9781	8695	8577	7524	7293	6156	5043	4776	5888	5590
C) All Agricultural Machinery Industs. (ISIC 3811+3822)	950	854	763	863	886	1049	882	911	1203	1272
D) All Agric. Mach. as % of All Mfg. Inds. (c/a)%	1.1	1.0	1.0	1.1	1.3	1.5	1.5	1.6	2.0	2.1
E) All Agric. Mach. as % of All Capital Goods Inds. (c/b)%	9.7	9.8	8.9	11.8	14.4	17.0	17.5	19.1	20.4	22.8
F) Share of Tractor and Associated Implement Inds. in all Agric. Mach. Industries $\left[\frac{(ISIC3822)}{(ISIC3811+ISIC3822)}\right]$	14.5	8.2	8.9	11.1	8.8	19.2	6.9	6.9	4.2	4.9

SOURCE: Statistical Service, Accra: Industrial Statistics (1977-1986)

Note: i) Figures for Establishments engaging 30 or more persons
ii) ISIC3811 - Agricultural Hand Tools, including axes, matchets cutlasses, hoes, etc.
iii) ISIC3822 - Agricultural Tractors and Associated Implements, including ploughs, harrows, seed planters, fertilizer distributors, harvesting equipment, milking machines and farm tractors

EMPLOYMENT

In terms of employment, available official statistics for 1977-86 presented in Table 1 indicates that the agricultural machinery manufacturing industries employed only between 1-2% of all persons engaged in manufacturing industries. Witnin the Capital Goods Sector however, the agricultural machinery industries' share of employment increased significantly from 9.7% in 1977 to 22.8% in 1986. The share of tractor and associated equipment (ISIC3822) within the whole agricultural machinery manufacturing industries declined from 14.5% in 1977 to 4.9% in 1986, indicating that the increases recorded by the whole agricultural industry come from the hand tools sub-sector. The decline in the tractor industries may be attributed to trade liberalisation and general economic policies of the 1980's which appeared unfavourable to the local industries. Farmers prefer imported machinery to locally assembled models.

TABLE 2: Ratio of Manufacturing Value-Added (MVA) by Agricultural Machinery Manufacturing Industries to MVA of All Capital Goods Industries

	MVA IN ¢'000				% Share of MVA	
YEAR	All Capital Goods (ISIC38)	All Agric. Machinery (ISIC3811 +ISIC3822)	Agric. Hand Tools (ISIC3811)	Agric. Tractors & Implements (ISIC3822)	All Agric. Machinery In All Capital Goods (%)	Agric. Tractors & Implements in all Agric Machinery (%)
1977	78000	6180	5804	376	7.9	6.1
1978	103768	8494	8229	265	8.9	3.1
1979	127747	12447	11453	994	9.7	8.0
1980	121670	26701	24441	2260	21.9	8.5
1981	155193	40384	39575	809	26.0	2.0
1982	164493	42452	39005	3447	25.8	8.1
1983	211563	43375	40593	2782	20.5	6.4
1984	430872	121795	117211	4584	28.3	3.8
1985	954145	193239	191543	1696	20.3	0.9
1986	1697779	697069	693834	3235	41.1	0.5

SOURCE: Statistical Service, Accra: Industrial Statistics (Various years).

Manufacturing Value-Added (MVA)

Table 2 gives the manufacturing value-added (MVA) of the agricultural machinery as a share of total MVA of all capital goods manufactured. Whilst there is a persistent increase in the total share of all agricultural machinery and implements (ISIC 3811 + ISIC 3822). Again the proportion of tractor and associated implements is observed to have declined from around 6% - 8.5% in 1977 to a marginal 0.5% in 1986.

The generally low MVA for tractor and associated implements may be explained by the dominance of assembling the formal sector of these industries. In recent year the official figures suggest increased assembling of imported components, which generally provide less scope for domestic value-added. The general performance of these assembly plants have actually declined so that its share has reduced to about one-twentieth of its share in 1980.

Utilization of Local Materials

An aspect of importance in assessing the overall picture of the domestic local production of agricultural machinery is the rate of utilization of raw materials of local origin. This gives idea of the extent to which local industries are dependent on imported materials. The rates as shown in Table 3 for the period 1975-1986 do indicate a steady improvement in the utilization of local materials for the handtools, whilst producers of tractors and associated agricultural machinery who were using more local materials during the early 1980's when foreign currency was relatively more difficult to come by are now changing to depend more on imported materials. Sources of local supply of materials have been the recycling of scrap materials and the use of local hard wood for handles.

TABLE 3: Percent of materials of Local Origin in Total materials Consumed by Agricultural Machinery Manufacturing Industries, the Capital Goods Industries and all Manufacturing Industries

YEAR	PERCENT OF MATERIALS CONSUMED (%)				
	ALL MANFG. INDS.	CAPITAL GOODS INDS. (ISIC MAJOR DIV.3)	ALL AGRIC. MACHINERY INDS. (ISIC 3811 + ISIC 3822)	AGRIC HANDTOOLS (ISIC 3811)	TRACTOR AND ASSOCIATED AGRIC. MACHINERY AND EQUIP. (ISIC 3822)
1975	28.5	9.1	4.7	2.7	6.6
1976	26.9	10.5	26.0	13.3	38.7
1977	28.2	21.2	8.3	14.3	2.3
1978	31.5	20.0	13.9	22.6	5.2
1979	31.7	18.9	19.7	35.7	3.7
1980	26.9	10.5	16.2	8.4	24.1
1981	24.9	8.89	18.2	7.8	28.5
1982	24.9	23.6	31.1	27.6	42.5
1983	32.4	13.0	30.9	21.0	40.8
1984	23.2	24.3	48.7	62.4	34.9
1985	25.1	22.1	45.9	62.3	29.4
1986	28.4	16.9	35.0	53.8	16.1

SOURCE: Statistical Service, Accra, Industrial Statistics (Various years)

Export:

There is no clear indication that Ghanaian agricultural machinery products participate in competitive export market as official information does not indicate any such export. However, it is known that some local companies in the sector periodically export in limited quantities to neighbouring West African countries and some unofficial and unquantifiable exports occasionally take place.

Imports:

Table 4 gives imports of agricultural machinery for the 1979-88 period. The table indicates that the percentage share of agricultural machinery in total imports has been about 1.4% except in the 1983-85 period when this share sharply declined to a bare 0.2% The percentage share of agricultural machinery in the total capital goods has fluctuated between 5.1% -0.6% in the 1980's, but appears to be picking up again at 3% comparable figure for 1979 was 10%

TABLE 4: Imports of Agricultural Tractors and machinery as Share of total imports and Capital Goods imports 1979-1988 (Million Cedis current prices)

YEAR	TOTAL IMPORTS (¢'000,000) (1)	CAPITAL GOODS IMPORTS SITC (69+7) (¢,000,000) (2)	AGRIC MACH. IMPORTS (SITC 695.1+712) (¢'000,000) (3)	SHARE OF AGRIC TRACTORS & MACH.IMPORT IN TOTAL IMPORTS (%) (3/1)	SHARE OF AGRIC MACH. IMPORTS IN CAPITAL GOODS IMPORTS (%) (3/2)
1979	2346.0	518.0	51.6	2.20	10.0
1980	3103.6	999.7	41.0	1.3	4.1
1981	3484.3	1018.3	51.4	1.5	5.0
1982	2781.6	877.4	49.9	1.4	4.55
1983	11021.8	3855.4	146.5	0.2	0.62
1984	21663.0	8305.1	321.4	0.2	0.51
1985	39527.0	9881.8	546.9	0.18	7.25
1986*	69881.0	30883	900.4	1.76	2.92
1987*	143319.0	52916	1875.0	1.41	3.54
1988*	185605.0	79576.2	1930.3	1.18	2.43

SOURCE: (1) Statistical Service Department, Accra: External Trade Statistics (Various years). (2) United Nationa, New York: International Trade Statistics year's book, various years.

NOTE: a) Imports and Exports are grouped according to standard International Trade Classification (SITC) Revision 1
*b) Figures for 1986-1988 are provisional

TABLE 5: Apparent consumption and domestic procurement ratio for agricultural machinery, 1979-1987

YEAR	DOMESTIC PRODUCTION (a)	IMPORTS (b)	EXPORTS (c)	APPARENT CONSUMPTION (a+b)-c	DOMESTIC PROCUREMENT RATIO $\frac{(a)}{(a+b)-c} \times 100\%$
1979	12.45	52.96	-	64.40	19.3
1980	26.70	41.0	-	67.70	39.4
1981	40.38	51.4	-	91.78	44.0
1982	42.45	49.88	-	92.33	46.0
1983	43.38	146.49	-	189.87	22.8
1984	121.80	321.40	-	443.20	27.5
1985	193.24	546.86	-	740.10	26.1
1986	697.07	900.37	-	1597.44	43.6
1987	709.80*	1874.84	-	2584.64	27.5

SOURCE: Computed from data extracted from Statistical Service, Accra. Industrial Statistics and External Trade Statistics (various years.
*NOTE: Figures for 1987 are provisional.

Apparent consumption and Domestic procurement ratio

In order to understand the overall performance of the local production industries, and the extent to which local industries are able to meet local demands, one has to analyse the Domestic Procurement Ratio, i.e. agricultural machinery imports in relation to Apparent Consumption.

Given that Ghana does not export agricultural machinery, Table 5 gives figures for the whole aggregate of agricultural machinery in Ghana's External Trade, whilst Table 6 gives corresponding figures for the different categories of these machinery within the sub-sector.

Figures from Table 5 show that the ratio of local production to apparent consumption has generally been constant at about 26% for most of the period, except in 1981-1982 and in 1986 when local industries supplied around 45% of national requirement.

TABLE 6: Apparent Consumption and Domestic Procurement Ratio for Main Categories of Agricultural Machinery in Ghana 1979-1986

YEAR	DOMESTIC PRODUCTION (¢'000.00)		IMPORTS (¢'000.00)		EXPORTS (¢'000.00)		APPARENT CONSUMPT. (¢'000.00)		DOMESTIC PROCUREMENT RATIO (%)	
	HAND TOOLS (ISIC 3811) (a)	OTHER AGRIC. MACHINES (ISIC 3822) (b)	HAND TOOLS (ISIC 3811, SITC 695) (c)	OTHER AGRIC. MACHINES (d)	HAND TOOLS (e)	OTHER AGRIC MACH. (f)	HAND TOOLS (ISIC 3811) {(a+c)-e} (g)	OTHER AGRIC MACHINES (ISIC 3822) (b+d)-f (h)	HAND TOOLS (ISIC 3811) a×100% / (a+c)-e (i)	OTHER AGRIC MACHS. b×100% / (b+d)-f (j)
1979	11.45	0.99	0.48	51.48	-	-	11.93	52.47	96.0	1.9
1980	24.44	2.26	2.78	62.32	-	-	27.22	64.58	89.8	3.5
1981	39.58	0.81	5.36	79.30	-	-	44.94	80.11	88.1	1.0
1982	39.01	3.45	3.34	46.54	-	-	42.35	49.99	92.1	6.9
1983	40.59	2.78	16.68	129.81	-	-	57.27	132.59	70.9	2.1
1984	117.21	4.58	48.17	273.23	-	-	165.38	277.81	70.9	1.6
1985	191.54	1.70	69.20	477.66	-	-	260.74	479.36	73.5	0.4
1986	693.83	3.24	55.36	55.36	-	-	749.19	848.25	92.6	0.4

SOURCE: Completed from data extracted from Statistical Service, Accra. Industrial Statistics and External Trade Statistics (Various Years)

NOTE: a) Hand Tools cover ISIC 3811 and SITC (695100+695120+695190) aggregate
b) Other Agric. Machines cover all other agricultural machinery except handtools, and include animal-drawn and tractor-drawn equipment and tractors.

Table 6 shows that the high local supplied shown in Table 5 is made up mainly by handtools. The local manufacturing industries for the period 1979-86 provided between 71-96% of Ghana's handtools requirements. On the other hand only about 2% of Ghana's consumption of tractors and associated implements and machinery came from local production sources. Current domestic supplies is highly marginal at only 0.4% of consumption. These figures confirm a high degree of self sufficiency in the field of agricultural handtools, but absolute reliance on imports for the supply of the tractors and associated implements and machinery needed for the country's agricultural mechanization.

CONCLUSION

Whilst there is evidence of substantial provision of agricultural machinery and implements manufactured in Ghana, current local capabilities are limited to the manufacture of handtools in which the country is near self-sufficiency. Production of tractors and related implements are embryonic and the country relies heavily on imports for the supply of these equipment.

Tractors and related implements are highly proprietary. Designs incorporate large research and development investments, and product and manufacturing complexity is generally high. Nonetheless in view of the strategic nature of these machines in sustained agricultural and economic growth, there is need for a national policy decision to allocate more resources for the local manufacture of tractor drawn implements and simple equipment related to agriculture. Existing technological capacities should be strengthened either through joint-ventures or licence agreement with foreign partners for the necessary technology transfer for both the product and the manufacturing know-how.

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