

The Development of Agricultural Mechanization in Jordan

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Abstract

The agricultural sector in Jordan plays an important role in the development of the country. Machinery is one of the major production inputs in agriculture. This study discusses the development and use of agricultural mechanization, the types and numbers of different farm machines used in the country, farm machinery manufacturing, and the major constraints to agricultural mechanization in Jordan. The mechanization of agricultural activities is limited to tillage and other operations. The results of the study showed that agricultural mechanization is increasing in Jordan, whether it is through ownership or through services.

There was an increase in the number of tractors, sprayers, seed drills and other machines and equipment. The study showed that local manufacturing of farm machinery is limited to the assembly of imported components and mold implements. The lack of research and extension services in farm machinery, the presence of a wide range of types of farm machines, low yield and the high cost of farm machines are major constraints to the adoption of more agricultural mechanization in Jordan.

Keywords: Farm machinery, tractors, combines, seed drills and sprayers.

1. Introduction

Jordan is located in the Middle East (east of the Mediterranean Sea) between latitudes 29° 32' N to 32° 42' N and longitudes 35° 00' E to 38° 15' E. The total area of Jordan is 88,777 km² of which 88,237 km² land constituting 99.4% of the total area of the Kingdom and 539.5 km² surface water (0.6%) of the total area, with a total population of 5,480,000 people and a growth rate of 2.8 (D.O.S 2003). The usage of land on a percentage basis is as follows: 4% arable land, 1% permanent crops, 9% permanent pastures, 1% forests and woodland and the rest (85%) are arid desert with annual rainfall rate less than 200 mm (Khdair 2002). The total planted area in the year 2003 was about 0.34 million hectares (ha) distributed as follows: 44,301 ha, or about 13% of the planted land is planted with vegetables; 124,145 ha (37%) field crops; 27,140 ha (8%) fruit trees; 6,697 ha (2%) citrus; 14,235 ha (4%) grapes; and 123,018 ha (36%) olives. The irrigated area was 45,583 hectares making about 13% of the total planted area, was mainly for irrigating fruit trees and olives (M.O.A, 2003).

The agricultural sector in Jordan plays an important role in the development of the country. Due to its scarce resources, Jordan gives more attention to the development of agriculture in its economic, social, and environmental aspects, and it deals with the agricultural sector on this multifaceted structure. This structure does not only consider economic returns, but the social and environmental benefits important for national security, environmental safety and public health. The agricultural sector contributes to the creation of job opportunities. The number of employed agricultural labor increased from 41,000 in 1991 to about 68,000 in 1996 (31 percent Jordanians) and to about 114,000 in 2000 (55 percent Jordanians) (M.O.A, 2003).

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In Jordan, the nature of the socio-economic development, led to rapid development of other sectors of the economy, especially services and industry, and has resulted in a continued decline in the contribution of agriculture to the gross domestic product (GDP). The contribution of agriculture to the GDP, at current prices, has declined steadily from 14.4 percent in 1971, to 8.3 percent in 1975, to 7.1 percent in 1980, to 6 percent in 1995 and finally to 3.8 percent in 2000 (M.O.A, 2003).

The objectives of this study are to discuss the development and use of agricultural mechanization in Jordan, the types and numbers of different farm machines used in the country, farm machinery manufacturing, and the major constraints to agricultural mechanization in Jordan.

Agricultural Mechanization in Jordan

Machinery is one of the major production inputs in agriculture. Agricultural mechanization is increasing in Jordan, whether it is through ownership or through services. Organizations providing custom services have played an important role in recent years. Agricultural mechanization in Jordan occurred on a purely private base without public interference. The mechanization of agricultural activities is limited mainly to tillage and partly other operations (Snobar and Arabiat, 1984).

Land operation was, and still is, the most important field of agricultural mechanization. The first tractors were imported to Jordan in the 1930s; the very first could have been an International Harvester with about 20 h.p. bought in 1933. Prior to 1948, tractors had steel wheels or tracks. They were operated with kerosene and pulled 4-moldboard plows and 15-disk-harrows (Lanzendorfer 1985).

Further introduction of the tractor was rather slow. According to the records of the Department of Agriculture there were nine tractors in Jordan in 1939 and about 74 tractors in 1948. According to the data on tractor assets from the Agricultural Censuses 1965 and 1975, the biggest advance in Jordan's tractorization must have been from the mid 1950s to the end of the 1960s. Moreover, in 1971/72 a sample of 112 farmers in the three pilot areas of the 'Dryland Farming Project Jordan/Karak' revealed that tractor use had become very common, when 84 percent of the farmers plowed their land with their own or hired tractors (Lanzendorfer, 1985).

During the 1970s, and especially after 1973, there was only a slight increase in the total tractor population. Purchases were mainly made to replace unserviceable machines. The increase that did occur was to a large extent, due to area extension and intensification of agricultural practices in the JordanValley. The articulated tractor was introduced to Jordan during the 1970s when 14 articulated tractors were bought between 1973 and 1979. Whereas the market for conventional tractors has become saturated, sales of articulated tractors indicated a cautious trend towards the need for more specialized machinery. Not only were old items substituted, but total assets were also increased. At the end of 1973, there were 3,260 tractors in the country. Of these, 1,905 tractors were used in agriculture. **Table 1** gives the numbers for tractors and other equipment and the number of tractors sold annually during the period of 1968 to 1973 in Jordan (Aresvik, 1976). In his study about the mechanization of agriculture in Jordan, Lanzendorfer estimated the assets of farm tractors and combine harvesters in the country in the year 1985 as follows:

Tractors

a. Based on Dealers Sales Statistics:

Allowing for an average life span of 12 years for a tractor in Jordan and leaving imports other than those of dealers out of consideration, the minimum sales for all dealers from 1967 to 1978 were 2055 tractors (from 1978 to 1985 there had been no significant change).

a. Based on Vehicles Registration Statistics:

In 1977, 2782 tractors were registered. In addition, 20% of non-registered tractors must be allowed. This means that there was a maximum population of 3500 tractors (from 1977 to 1985). The overall tractor population ranges between 2000 and 3500 tractors. If the registration figure of 2782 tractors is considered to be rather accurate, about 2900 seems realistic for the total number of tractors in Jordan in 1979 (Lanzendorfer, 1985).

Combines

The next major step in the mechanization of field operations was the introduction of the combine. It closely followed the increase in Jordan's tractor population. Until 1960, a total of 15 combines had been sold, but until the beginning of the 1970s, combine assets rose considerably (inventory 1973: 144). Afterwards, there was a sharp drop, because combine owners abstained from replacing unserviceable combines and because there were heavy sales of old ones (up to 1968 models) to Syria (Lanzendorfer, 1985).

Comparison between the two Agricultural Machinery Inventories of 1973 and 1978, and between the two Agricultural Censuses of 1965 and 1975, showed a decreasing number of combines. The Agricultural Census 1975 lists 36 combines owned by agricultural holders. The 1978 inventory counts 77 self-propelled combines and 43 pulled combines.

During the 1980s there were no accurate statistics about the number and types of farm tractors and other farm equipment in Jordan. The Directorate of Farm Machinery in the Ministry of Agriculture conducted a survey in 1992. The results of this survey indicated that the number of tractors increased from 2900 in 1979 to 3442 in 1992. In the same survey the tractors in Jordan were found in 34 types of which 51.6% were Massey Ferguson, 17% Volvo, 7.7% Ford, 4.2% Kubota, 2.1% John Deere and 17.4% others (Shadid, 1993).

In general, tractors and other implements in Jordan are imported by dealers. During the period of 1988 to 1991 about (1134) tractors, (18) combines and (5416) other implements were imported (Shadid, 1993). In the year 1997 the Ministry of Agriculture conducted another survey, the result of which showed that there was an increase in the numbers and types of farm machines used in the country. For example, the number of tractors increased by about 1000 from the year 1992 to 1997, it was 3442 in 1992 and 4445 in 1997. While there was no change in the number of combine harvesters (69) in 1992 and (63) in 1997, there was a clear increase in the number of boom sprayers and seed drills from (83) and (69) in 1992 to (328) and (92) in 1997, respectively. The numbers and types of different farm machines available in Jordan for the years 1992 to 1997 are given in **Table 2**. The statistics of the Ministry of Agriculture and the Department of Statistics showed that there was a major increase in almost all farm machines used in the country from the year 1998 to 2010. There was an increase in the number of tractors, sprayers, seed drills and other machines and equipment as shown in **Table 3 and Table 4**.

Farm Machinery Manufacturing

Most farm machineries in Jordan are imported. Local manufacturing is limited to the assembly of imported components and mold implements. Some specialized small workshops and blacksmiths manufacture some farm implements in Jordan. They can manufacture moldboard plows; chisel plows, cultivators, harrows, field sprayers, threshers, trailers and water tanks. According to Khdaif (2002), these machines and implements are produced mainly by three different enterprises: small scale, medium scale, and artisan shops.

a- Small-scale enterprises can repair all kinds of implements by using new technology for cutting, shaping and finishing. Their main products are assembling cultivators, moldboard plows, disc plows, P.T.O driven threshers, trailers, water tanks, and potato diggers.

b- The medium-scale enterprises produce traditional equipment like 7-9 tine cultivators, 500-L mounted type boom sprayers and 2-3 furrows moldboard plows (Hamam, 1996). Recently, these enterprises started manufacturing seed drills, potato planters, potato diggers, chisel plows and post hole diggers. They have supplied 40-50% of the country's need of the above tools.

c- Artisan workshops repair farm machineries and build traditional machines like 1.5-3 ton trailers and water tanks. These workshops do other basic work like welding, metal hardening, grinding, cutting and drilling. The distribution of farm implements manufactured by these enterprises is shown in **Table 5**.

Constraints

The major constraints to the adoption of more agricultural mechanization technology were: (1) lack of relevant technology at the proper time, lack of farmer's awareness, small holdings, low yields and high cost of farm machines, especially harvesting technology (Salem and Snobar, 1995); (2) lack of enough specialized workshops for repairing and maintenance of farm machineries; (3) lack of research in farm machineries; (4) lack of extension services or training programs and (5) the presence of wide range of types of farm machines, most of which did not have spare parts in the imported companies.

Table 1: Tractors and other equipment available and tractors sold during 1968 to 1973 in Jordan.

Years	Tractors	1968	1969	1970	1971	1972	1973
Tractors at end of year		2507	2662	2758	2856	3060	3344
Tractors sold during year		179	155	96	98	204	284
Combines		11	15	3	22	24	N/A
Cultivators		190	232	466	94	241	90

Source: Kingdom of Jordan, Department of Statistics, Statistical Year Book, 1972 and 1973.

Table 2: Number of farm machines available in Jordan for the years 1992 to 1997.

Year	Machine	1992	1993	1994	1995	1996	1997
Tractors (Total)		3442	3404	3834	4089	4157	4445
Big tractor		3046	2986	3324	3436	3474	3663
Small & medium wheel tractor		394	413	506	650	680	779
Chain tractor		2	5	4	3	3	3
Boom sprayer		83	167	202	186	257	328
Combine harvesters		66	77	69	58	43	63
Big seed drills		65	71	75	61	56	65
Small seed drills		15	14	12	13	21	27
Seed drills (Total)		80	85	87	74	77	92
Harvesters pulled by a tractor		14	22	12	17	36	30
Mobile grain & hay thresher		502	500	559	564	539	620
Binder (Harvester)		44	47	29	31	15	72

Source: Jordan Ministry of Agriculture. Annual Report, 1997.

Table 3: Number of farm machines in Jordan for the years 1998 to 2004.

Year	Machine	1998	1999	2000	2001	2002	2003	2004
Tractors (Total)		5212	5114	5378	5579	5769	5744	5583
Big tractor		4347	4272	4488	4608	4767	4774	4475
Small & medium wheel tractor		862	837	877	958	989	956	1092
Chain tractor		3	5	13	13	13	14	16
Boom sprayer		362	331	367	380	378	405	417
Combine harvesters		54	72	78	80	77	78	61
Big seed drills		66	72	68	71	75	81	81
Small seed drills		32	28	35	35	28	32	30
Seed drills (Total)		98	100	103	106	103	113	111
Harvesters pulled by a tractor		37	39	39	39	50	57	58
Mobile grain & hay thresher		695	692	655	657	622	651	609
Binder (Harvester)		97	84	86	96	99	65	64

Source: Jordan Ministry of Agriculture. Annual Report 2005.

Table 4: Number of farm machines in Jordan for the years 2005 to 2010.

YearMachine	2005	2006	2007	2008	2009	2010
Tractors (Total)	5520	5483	5357	6844	5565	5674
Big tractor	4078	4053	3923	4898	3916	3848
Small & medium wheel tractor	969	946	892	1398	1008	1165
Chain tractor	17	17	21	19	16	22
Boom sprayer	456	467	521	529	625	639
Combine harvesters	74	80	76	78	82	71
Big seed drills	81	90	98	93	100	120
Small seed drills	42	47	49	35	32	80
Seed drills (Total)	123	137	147	128	132	200
Harvesters pulled by a tractor	66	60	74	69	63	61
Mobile grain & hay thresher	553	558	557	522	530	545
Binder (Harvester)	67	77	76	68	62	62

Source: Jordan Department of Statistics. Annual Report 2011.

Table 5: Distribution of farm implements manufactured annually by medium, small enterprises and artisan *Workshops.

Implement	Need/yr	Medium Scale Enterprise			Small Scale Enterprise		
		Full Capacity	Production	Sale	Full Capacity	Production	Sale
Thresher P.T.O. driven	50	None	None	None	20	20	20
Moldboard plow	120	90	80	75	50	35	35
Disc plow	60	85	60	45	65	45	35
Chisel plow	40	40	20	15	20	15	10
Rotary	30	20	15	1	10	8	8
Cultivator 7-9 tines	120	80	70	70	40	30	40
Disc harrow	10	10	8	8	5	5	3
Seed drill	10	10	5	3	None	None	None
Sprayer unit-trailed	120	120	115	100	20	20	20
Sprayer unit-mounted	130	130	125	130	None	None	None
Sprayer (manual)	100	None	None	None	100	90	80
Post hole digger	20	20	15	15	None	None	None
Rigger	50	50	30	30	30	20	20
Potato planter 1 row	10	10	8	5	None	None	None
Potato planter 2 row	10	10	8	5	5	3	2
Trailers 1.5-3 tons	200	80	70	65	70	65	55
Water tank 3m ³	200	150	180	120	50	45	40

*Manufacturing is limited to the assembly of trailers and water tanks.

Source: Khdaire, 2002.

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