UNIVERSITI PUTRA MALAYSIA

HIRING DECISION OF AGRICULTURAL MECHANIZATION SERVICES BY RICE FARMERS IN THE ALNAJAF PROVINCE OF IRAQ

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By

ZUHAL RDHAIWI KADHIM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

March 2018

DEDICATION

To My Work Place;

Faculty of Agriculture, University of Baghdad

More Science & More Progress

To My scientific platform mates;

My Husband, my Son & my Sisters

Zuhal R. Kadhim

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

HIRING DECISION OF AGRICULTURAL MECHANIZATION SERVICES BY RICE FARMERS IN THE ALNAJAF PROVINCE OF IRAQ

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March 2018

Chairman : Associate Professor Norsida Man, PhD
Faculty : Agriculture

The use of machinery in different agricultural production processes has led to the occurrence of latent changes in agriculture like quantity increase and quality of farm products, decrease of farm production costs and increase of cultivated areas, and the degree of technological progress of any country usually depends on the extent of mechanization that is used in this country. However, investments in ownership of agricultural machinery services and access to them, especially for small-scale farmers, may not be the minimum cost option in comparison with hiring these required services through oral or written agricultural contracts. The major principle to select the optimal decision for obtaining agricultural machinery services, at small-scale farmers level, includes the analysis of the transaction costs when machinery services are hired and estimating both the fixed and variable costs of owning these services.

The main aim of this research is to analyze the hiring decision of agricultural mechanization services by rice farmers in Alnajaf Province. And specifically, the objectives are: 1) to clarify respondents' socio-economic characteristics in relation to the hiring decision of agricultural machinery services; 2) to determine the core attributes of transaction costs which may affect or encourage respondents' decisions to hire agricultural mechanization services; 3) to estimate the relationship between the affecting variables and respondents' decisions to hire agricultural mechanization services; and 4) to test whether the hiring decision of agricultural machinery services is better for study sample in comparison with the other potential alternatives.

The theoretical framework based on two economic approaches of analysis of hiring decision odds: 1) developed on the basis of transaction cost economics model, adapted and interpreted in the thesis to deal with the context of the study; and 2) included the financial approach of engineering costs analysis of agricultural machineries services. The data were collected by simple random sampling method using a standardized questionnaire with open-ended and close-ended questions. Copies of the questionnaire were distributed to 391 respondents from among the rice farmers in Alnajaf Province. The study was carried out over a period of three months from April 2016 until end June 2016. Descriptive statistics, Likert scale, a qualitative response regression models and engineering costs analysis of agricultural machineries were used to analyze the respondents' behaviors and decisions towards a hiring decision.

The dependent variable in this study was derived from the question pertaining to ownership (own, hire, or other) of the agricultural machinery services used on the farm, while the independent variables include the key attributes of transaction costs theory and selected socio-economic characteristics of respondents. Results indicated that most of the respondents in the study region agree that monitoring and negotiation costs are important elements in hiring decision make process, as well as some transaction cost attributes such as a machine specificity, behavior uncertainty, frequency and measurability of the machinery services concerned are important in determining the hiring decision. The results also showed significant differences in hiring decision in relation to some socio-economic characteristics such as respondents' age, farm area, the desire to use agricultural mechanization and education level. In addition, results of financial analysis of components of costs of hired agricultural machinery (tractors, farm sprayers and combine harvesters) pointed out that the investments on all new and used agricultural machinery in the study area are unprofitable based on pointers of breakeven point, net present value and benefit cost ratio.

The study illustrates the benefits of transaction cost economics to better understand how and why respondents prefer to hire machinery services purchase their own equipment. In light of these results, the study determines that it is necessary and profitable for small scale farmers in Alnajaf Province to continue hiring various agricultural machinery services rather than purchase them. The study recommends that the policy of the Iraqi government should be more encouraging to markets of agricultural machinery services so as to minimize the transaction costs of trading the agricultural machinery services between tenant farmers and other contracting parties. As such, programmes of agricultural extension and farm support would be helpful in the development of small scale farmers. Iraqi government also should take responsibilities for distributing the machinery and providing credit amenities on supported rates to those farmers who are want to buy the machinery individually.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KEPUTUSAN MENYEWA SERVIS MEKANISASI PERTANIAN OLEH PETANI PADI DI WILAYAH ALNAJAF IRAQ

Oleh

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Penggunaan jentera dalam proses pengeluaran pertanian yang berbeza menyebabkan perubahan dalaman untuk pertanian seperti peningkatan kuantiti dan kualiti produk ladang, penurunan kos pengeluaran ladang dan peningkatan kawasan tanaman, dan tahap kemajuan teknologi mana-mana negara biasanya bergantung kepada saiz mekanisasi yang digunakan di negara tersebut. Walau bagaimanapun, pelaburan dalam pemilikan perkhidmatan jentera pertanian dan akses kepadanya, terutamanya untuk petani kecil, mungkin bukan pilihan kos minimum berbanding dengan menyewa perkhidmatan yang diperlukan ini melalui kontrak pertanian lisan atau bertulis. Prinsip utama untuk memilih keputusan yang optimum untuk mendapatkan perkhidmatan mesin pertanian, pada peringkat petani skala kecil, juga melibatkan analisis kos transaksi apabila perkhidmatan mesin disewa dan menganggarkan kos pemilikan tetap dan yang berubah bagi perkhidmatan begini.

Tujuan utama penyelidikan ini adalah untuk menganalisis keputusan pengambilan perkhidmatan mekanisasi pertanian petani beras di Wilayah Alnajaf. Dan khususnya, objektifnya adalah: 1) untuk memperjelaskan ciri-ciri sosioekonomi responden berhubung dengan keputusan pengambilan perkhidmatan jentera pertanian; 2) untuk menentukan sifat utama kos urus niaga yang boleh mempengaruhi atau menggalakkan keputusan responden untuk menyewa perkhidmatan mekanisasi pertanian; 3) untuk menganggarkan hubungan antara pembolehubah yang mempengaruhi dan keputusan responden untuk menyewa perkhidmatan mekanisasi pertanian; dan 4) untuk menguji sama ada keputusan pengambilan perkhidmatan jentera pertanian lebih baik untuk sampel kajian dibandingkan dengan alternatif lain yang berpotensi.

Rangka teori berdasarkan dua pendekatan ekonomi untuk menganalisis kebarangkalian keputusan: 1) dibangunkan berdasarkan model kos ekonomi transaksi, disesuaikan dan ditafsirkan dalam tesis untuk menangani konteks kajian; dan 2) termasuk pendekatan kewangan untuk menganalisis kos kejuruteraan perkhidmatan jentera pertanian. Data ini dikumpulkan melalui kaedah persampelan rawak mudah dari menggunakan soal selidik piawai dengan soalan terbuka dan tertutup. Borang soal selidik diedarkan kepada 391 responder yang terdiri dari pada petani padi di Wilayah Alnajaf, dan dijalankan selama tempoh tiga bulan dari April 2016 hingga akhir bulan Jun 2016. Statistik deskriptif, skala Likert, model regresi bertindak balas kualitatif dan analisis kos kejuruteraan jentera pertanian telah digunakan untuk menganalisis tingkah laku responden dan keputusan yang membawa kepada keputusan menyewa.

Pemboleh ubah bersandar dalam kajian ini diperolehi daripada persoalan tentang kes pemilikan (dimiliki, sewaaan, atau lain-lain) perkhidmatan jentera pertanian yang digunakan di ladang, sementara pemboleh ubah bebas termasuk sifat utama teori kos transaksi dan ciri sosial-ekonomi responden terpilih.

Keputusan menunjukkan bahawa kebanyakan responden di kawasan kajian bersetuju bahawa kos pemantauan dan perundingan adalah elemen penting dalam proses membuat keputusan, serta beberapa sifat kos urus niaga seperti pengkhususan mesin, ketidakpastian tingkah laku, kekerapan dan cara mengukur perkhidmatan jentera yang berkaitan adalah penting dalam menentukan keputusan menyewa. Keputusan juga menunjukkan perbezaan yang signifikan bila keputusan yang diambil dikaitkan dengan beberapa ciri sosio-ekonomi seperti umur responden, kawasan ladang, keinginan untuk menggunakan mekanisasi pertanian dan tahap pendidikan.

Di samping itu, keputusan analisis kewangan bagi komponen kos jentera pertanian yang dipajak (traktor, penyembur ladang dan penuai gabungan) menegaskan bahawa pelaburan ke atas semua jentera pertanian baru dan yang digunakan di kawasan kajian adalah tidak menguntungkan berdasarkan petunjuk takat sama rata, nilai semasa bersih dan nisbah kos faedah.

Kajian menunjukkan bahawa kos transaksi ekonomi berguna untuk lebih memahami bagaimana dan mengapa petani memilih untuk menyewa perkhidmatan jentera mekanikal daripada membeli peralatan mereka sendiri. Berdasarkan hasil ini, kajian mendapati bahawa adalah perlu dan menguntungkan bagi petani skala kecil di Wilayah Alnajaf untuk mengambil keputusan untuk menyewa dan tidak melabur jumlah modal untuk membeli pelbagai perkhidmatan jentera mekanikal pertanian. Kajian menyarankan supaya polisi kerajaan Iraq lebih menggalakkan pasaran perkhidmatan jentera pertanian untuk meminimumkan kos transaksi perdagangan perkhidmatan jentera pertanian di antara petani penyewa dan pihak berkontrak yang lain. Maka, program pengembangan pertanian dan sokongan ladang boleh membantu pembangunan petani skala kecil. Kerajaan Iraq juga harus mengambil tanggungjawab untuk mengedarkan jentera dan menyediakan kemudahan kredit pada kadar yang disokong kepada petani yang ingin membeli jentera tersebut secara individu.

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GNP	Gross National Product
TCT	Transaction Costs Theory
TCE	Transaction Cost Economics
TCs	Transaction Costs
TAs	Transaction Attributes
NIE	New Institutional Economics
Outsourcing	Outside –Resource –Using
In sourcing	Inside –Resource –Using
AS	Asset Specificity Attribute
AU	Uncertainty Attribute
AF	Frequency Attribute
AC	Complexity Attribute
AM	Measurability Attribute
AGE	Farmers' Age
EDUL	Education Level
DUT	The Desire to use Agricultural Mechanization
EXP	Experience Years
LINCOM	Low Level of Income
MINCOM	Middle Level of Income
HINCOM	High Level of Income
SAREA	Small Size of Area
MAREA	Middle Size of Area
LAREA	Large Size of Area

CBA	Cost Benefit Analysis
TFC	Total Fixed Costs
TVC	Total Variable Costs
BEP	Break-Even Point
S.M	Safety Margin of Areas
DF	Discount Factor
NPV	Net Present Value
B.C.R (B/C)	Benefit Cost Ratio

CHAPTER 1

INTRODUCTION

This chapter provides the background to the study of the agricultural sector and agricultural mechanization services in Iraq, as well as hiring decision of agricultural machinery services. The chapter also identifies and discusses the problem statement and presents insights into the transaction costs, as well as the questions, objectives, scope, significance and organization of chapters of the study.

1.1 General Background

Agriculture in Iraq is one of the main sectors of the national economy, primarily because of its leading role as a major contributor to the GNP of Iraq. It also employs a significant segment of whole labour force of the Iraqi economy at about 28%. Agriculture is also a source of income for a large segment of Iraqi society; with many people involved in agriculture living in the countryside and making up more than 35% of the Iraqi population (Ministry of Planning and Development Cooperation-Iraq, 2015).

Agriculture sector in Iraq has a distinguished importance in aspect of food security and providing the different nutrition goods of Iraqi population. The total area of Iraq is about 39547800 hectares. The total arable area for farming in the country is about 12,904,045 hectares. Total cultivated area under different crops in the country is about 3,506,028 hectares of which cereal crops (Wheat, Parley and Rice) area is about 3,365,787 hectares (Sirhan, 2011).

Following the events of 2003, the agricultural sector in Iraq has suffered from low government funding due to security conditions in the country, and this jaw negatively affected even the basic activities of the agricultural sector. The sector faced several other drawbacks, including the Iraqi economy heavy reliance on the oil sector as a unique source of wealth. However, many have failed to realize that agriculture is still an essential source of living for a large segment of the Iraqi population, many of whom are rural residents (IIER, 2010).

Most Iraqi rural residents work in agriculture and many of them are ranchers, workers in agro-based businesses, agricultural service providers, brokers of agricultural products, and a small percentage of them are government employees. Among small-scale farmers, or those with less than three (3) hectares of land, one of the principal causes of poverty is the shortage of farm power especially mechanized power. Such a situation faced by smallholder farmers has led to a significant decline in farm production (Alsamaray, 1971).

1.2 Agricultural Mechanization Services

The development of any country is measured by the degree of mechanization. Subsequently, agricultural operation improvements, namely, the production of a particular crop, depends on the level of agricultural mechanization used for production (UNIDO, 2008).

Farm mechanization is a wide term, and it involves the use of small or big machineries, that may be moveable or fixed. Mechanization is often perceived as an activity run by power, such as those used for plowing jobs, harvesting and whipping processes. In addition, farm mechanization comprises power tonics for irrigation, lorries for hauling the crops of farm, handling machines, dairy machines for balm splitting, butter making, cotton ginning, rice hulling and even different electrical home machines (i.e., citing G. D. Aggarwal's words). The benefits of mechanization in agriculture can be summarized from the works of Wander (2001), Asoegwu (2007) and Albedry (2012):

1) The possibility of bringing a fresh product shape, that could not have been produced through the customary methods,
2) Decreased unit production cost of work,
3) Expansion of cultivated areas,
4) Increased efficiency and decreased farm loss,
5) Improved quality of farm products,
6) Increased unit production (i.e., higher land–income ratio),
7) Efficient use of areas for fodder production,
8) Efficient use of other yield-improving inputs,
9) Rapid completion of agricultural operations to save time and effort, and
10) Notable change in the social structure in rural regions

The agricultural mechanization in Iraq has notably improved since the 1960s, and this can mainly account for the rise in agricultural production and productivity nationwide. The succeeding sections describe progresses made for the agricultural mechanization services in Iraq and their role in agricultural operations.

1.2.1 Progress of Agricultural Mechanization Services

Technological progress is one of the main indicators of commercial, community and cultural development. For many states, technological progress is an important indicator of economic progress at the forefront of agricultural development. In the agricultural sector, technological progress takes numerous forms and it can even be personalized depending on the level of work skill (i.e., combining the technical and economic requirements of using tractors, combine harvesters and other agricultural equipment). In the past, Iraq depended on imported machinery from different sources and the local production of tractors for use in agricultural mechanization services. The Iraqi government has imported agricultural machinery (tractors and harvesters) mostly

from Arab countries like Algeria and Egypt due to their increased production. Agricultural machines are then distributed from a warehouse network to cereal crop (wheat, barley and rice) farmers, who used to sell their crops at low prices. This approach highlights the economic importance of acquiring agricultural machinery to achieve crop cultivation and national food security on a large scale (Alagedy, 2006).

However, the machines were not imported solely on the basis of scientific fundamentals and studies; rather, they were introduced to be used in field experiments but thus sector has slowly grown to technologically dominate agricultural activities. In addition, the Iraqi government has not been successful with investments in agricultural mechanization and in supporting cereal crop farmers, particularly to increase their production and productivity levels. The past two decades were also characterized by several obstacles, which hindered the widespread use of agricultural mechanization services and the resulted in the failure to perform its role to increase the cultivated areas with cereal crops and to develop the production and productivity levels. In light of these conditions, the commercial benefits of imported machinery have been transferred to the national administrations and organizations whereby the exclusive sector was included in the distribution process. Existing statistics indicate that 33% of ranchers have purchased equipment and machinery from the national organizations and 67% from the local markets (Shukr, 2010). The increase in the number of working machines in Iraq (Refer to Table 1.1) has largely contributed to agricultural improvements in land preparation and harvesting production. With increased efficiency, primitive methods of agriculture have been replaced by modern agricultural methods. The required agricultural development plans and technical know-how for agricultural production machinery have been implemented in tandem with raising the cultural, educational and professional levels of the agricultural community (Minhal, 2005).

Table 1.1 : Number of Tractors and Harvesters in Iraq (2000 – 2015)

Years	No. of Tractors	No. of Harvesters	Cultivated Areas with Cereal Crops/Hectare	Usage Rates of Tractors*	Usage Rates of Harvesters*
2000	59,512	5,775	1,737,250.00	29.19	300.82
2001	59,512	5,902	1,966,000.00	33.04	333.11
2002	63,056	6,079	2,878,500.00	45.65	473.52
2003	63,541	6,155	2,872,500.00	45.21	466.69
2004	63,717	6,155	2,795,250.00	43.87	454.14
2005	64,427	6,205	2,967,250.00	46.06	478.20
2006	64,600	6,205	2,851,500.00	44.14	459.55
2007	56,172	3,646	2,969,500.00	52.86	814.45
2008	57,918	2,373	3,022,000.00	52.18	1,273.49
2009	57,918	2,373	2,162,250.00	37.33	911.19
2010	68,777	4,966	2,595,000.00	37.73	522.55
2011	70,316	8,650	4,050,000.00	57.60	468.21
2012	70,540	8,823	4,114,250.00	58.33	466.31
2013	69,770	7,113	4,297,500.00	61.60	604.18
2014	48,344	5,300	3,582,500.00	74.10	675.94
2015	50,018	5,270	3,650,000.00	72.97	692.60
Average	**61,759**	**5,667**	**3,031,953**	**49.5**	**587.2**

***** Usage rate (tractor or harvester) = Cultivated area with cereal crops (hectare) ÷ Number of tractors or harvesters. Source: Ministry of Agriculture-Iraq (2015)

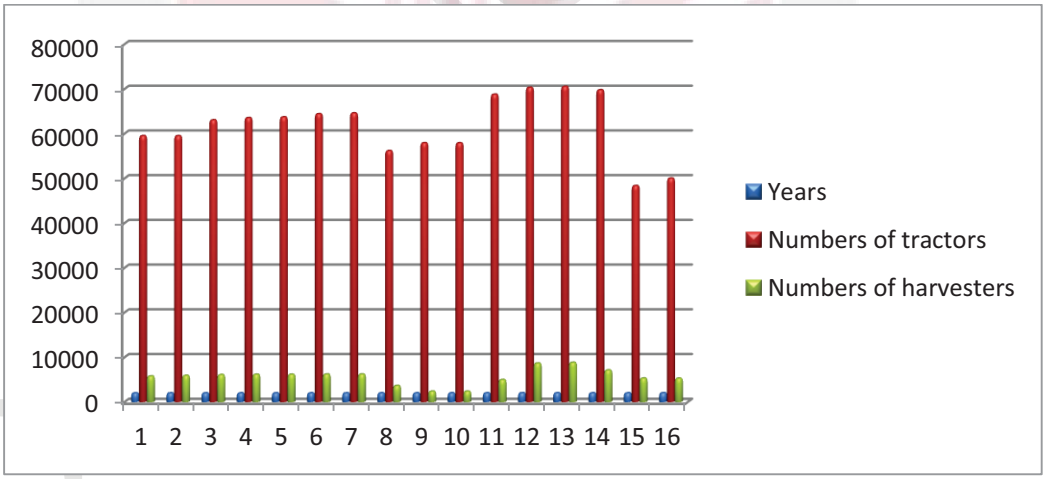

Figure 1.1 : Number of Working Tractors and Harvesters in Iraq (2000–2015)

Despite the numerical increase in tractors and combine harvesters, Iraq still suffered from a shortage of machinery services. Current statistics indicate that the machine requirements to plant 117,254 and 19,005 grains are 55,495 tractors and 13,338 combine harvesters, respectively (Albedry, 2012).

1.2.2 Agricultural Machinery Services at the Provincial Level (2015)

In Iraq, machinery services for the agricultural sector can be divided into five types: tractors, combine harvesters, services of new irrigation sprayers, pumps of irrigation water and other services.

1) Tractor Services

Tractor is the basic input used to determine the impact of tractors and allied machinery and equipment on agricultural machinery services. The number of tractors has rapidly increased at the provincial level. About 80% of operating tractors are concentrated in Nineveh, Kirkuk, Salahaddin, Diyala, Anbar, Baghdad and Babil (Table 1.2). As of 2015, the total number of agricultural tractors among 15 Iraqi provinces was 57,087. Of this number, 88% (50,018 tractors) were operational, whereas the remaining 12% (7,069 tractors) were not working. The largest number of tractors was in Salahaddin with 8,400 tractors (14.7%), whereas Basra ranked lowest with 145 tractors (0.25%). Table 1.2 and Figure 1.2 present the percentages of tractors for each province as of 2015, while Table 1.3 explains the number of agricultural tractors provided according to the provision source in the country.

Table 1.2 : Number of Tractors per Province (2015)

No.	Iraqi Province	Number of Tractors		Total Tractors	Percentage (%)
		Working	Non-Working		
1.	Nineveh	5,194	435	5,629	9.86
2.	Kirkuk	7,579	716	8,295	14.53
3.	Diyala	6,118	1,377	7,495	13.13
4.	Salahaddin	7,148	1,252	8,400	14.71
5.	Anbar	3,485	1,000	4,485	7.86
6.	Baghdad	5,119	545	5,664	9.92
7.	Wasit	2,968	200	3,168	5.55
8.	Babil	4,952	720	5,672	9.94
9.	Karbala	322	43	365	0.64
10.	Alnajaf	3,108	70	3,178	5.57
11.	Aldiwaniyah	2,073	164	2,237	3.92
12.	Almuthanna	264	59	323	0.57
13.	Dhi Qar	493	171	664	1.16
14.	Maysan	1,094	273	1,367	2.39
15.	Basra	101	44	145	0.25
Total		**50,018**	**7,069**	**57,087**	**100%**
(%)		**(88%)**	**(12%)**	**(100%)**	

(Source : Ministry of Agriculture-Iraq, 2015)

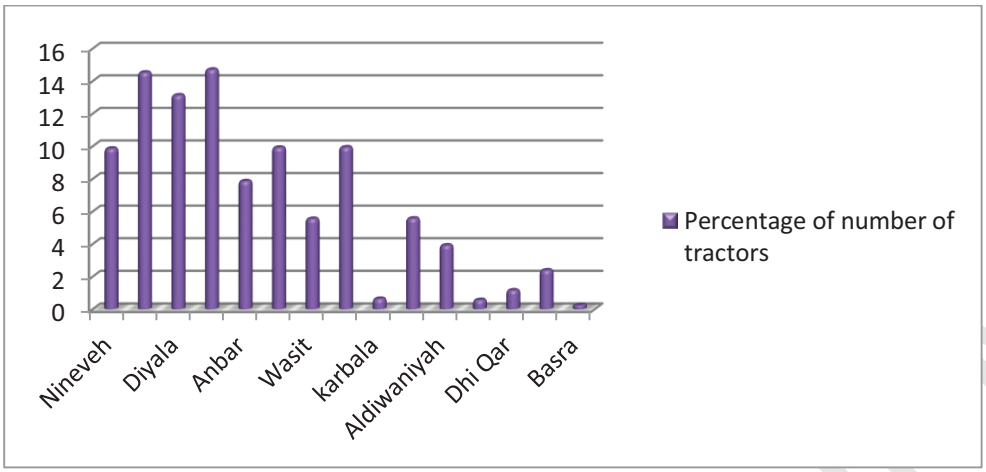

Figure 1.2 : Percentage of Tractors per Province (2015)

Table 1.3 : Distribution of Tractors Number according to Providing Sources

No.	Iraqi Province	Total Tractors	Number of Tractors Provided by Government	Number of Tractors Provided by Market
1.	Nineveh	5,629	955	4,674
2.	Kirkuk	8,295	1,663	6,632
3.	Diyala	7,495	2,026	5,469
4.	Salahaddin	8,400	887	7,513
5.	Anbar	4,485	198	4,287
6.	Baghdad	5,664	413	5,251
7.	Wasit	3,168	452	2,716
8.	Babil	5,672	425	5,247
9.	Karbala	365	89	276
10.	Alnajaf	3,178	331	2,847
11.	Aldiwaniyah	2,237	177	2,060
12.	Almuthanna	323	48	275
13.	Dhi Qar	664	60	604
14.	Maysan	1,367	56	1,311
15.	Basra	145	29	116
Total		**57,087**	**7,809**	**49,278**
(%)			**14%**	**86%**

(Source : Ministry of Planning and Development Cooperation –Iraq, 2016)

The total number of tractors provided by Iraqi government is 7809 with ratio 14%, while the total number of tractors provided by local markets is 49278 with ratio 86%.

2) Combine Harvester Services

The introduction of combine harvesters in Iraq was a technical revolution to rural people (Alagedy, 2006). Combine harvesters increase the operational efficiency of harvesting operations, as well as reduce economic losses, which are reflected positively in the increased economic returns for Iraqi farmers. The majority (84%) of the operating harvesters in Iraq were concentrated in Nineveh, Kirkuk, Salahaddin, Diyala, Wasit, Alnajaf and Aldiwaniyah (see Table 1.4).

Table 1.4 : Number of Harvesters per Province (2015)

No.	Iraqi Province	Number of Harvesters		Total Harvesters	Percentage (%)
		Working	Non-Working		
1.	Nineveh	1,691	101	1,792	31.63
2.	Kirkuk	563	49	612	10.80
3.	Diyala	433	29	462	8.15
4.	Salahaddin	587	86	673	11.88
5.	Anbar	155	18	173	3.05
6.	Baghdad	151	15	166	2.93
7.	Wasit	400	16	416	7.34
8.	Babil	215	-	215	3.79
9.	Karbala	4	2	6	0.11
10.	Alnajaf	450	20	470	8.30
11.	Aldiwaniyah	300	7	307	5.42
12.	Almuthanna	17	4	21	0.37
13.	Dhi Qar	84	12	96	1.69
14.	Maysan	212	32	244	4.31
15.	Basra	8	5	13	0.23
Total		**5,270**	**396**	**5,666**	**100%**
(%)		**(93%)**	**(7%)**	**(100%)**	

(Source : Ministry of Agriculture-Iraq, 2015)

As of 2015, the total number of harvesters in 15 Iraqi provinces was 5,666, but only 93% (5,270 harvesters) were operational, whereas the other 7% (396 harvesters) were non-operational. As shown in Table 1.4, as of 2015, Nineveh had the highest number of harvesters (1,792/32%), whereas Karbala ranked lowest with only six harvesters (0.11%).

Figure 1.3 presents the percentage of combine harvesters allocated to each of the 15 provinces in Iraq as of 2015.

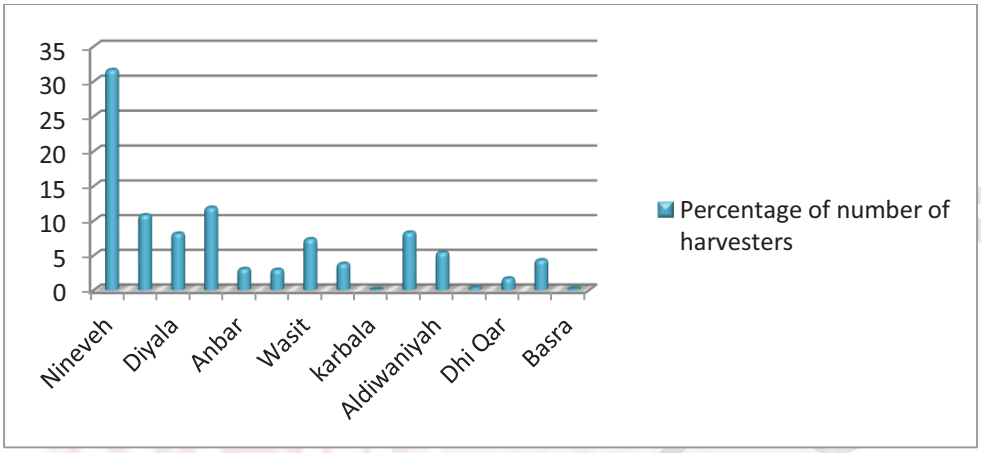

Figure 1.3 : Percentage of Harvesters per Province (2015)

Table 1.5 explains the number of agricultural harvesters provided according to the provision source in the country. The total number of harvesters provided by Iraqi government is 1,025 with ratio 18%, while the total number of harvesters provided by local markets is 4,641 with ratio 82%.

Table 1.5 : Distribution of Harvesters Number according to Providing Sources

No.	Iraqi Province	Total Harvesters	Number of Harvesters Provided by Government	Number of Harvesters Provided by Market
1.	Nineveh	1,792	358	1,434
2.	Kirkuk	612	156	456
3.	Diyala	462	118	344
4.	Salahaddin	673	115	558
5.	Anbar	173	14	159
6.	Baghdad	166	32	134
7.	Wasit	416	58	358
8.	Babil	215	52	163
9.	Karbala	6	2	4
10.	Alnajaf	470	34	436
11.	Aldiwaniyah	307	37	270
12.	Almuthanna	21	-	21
13.	Dhi Qar	96	12	84
14.	Maysan	244	31	213
15.	Basra	13	6	7
Total		**5,666**	**1,025**	**4,641**
(%)			**18%**	**82%**

(Source : Ministry of Planning and Development Cooperation –Iraq, 2016)

3) Modern Irrigation System Services

As for modern irrigation sprayers, 93% were concentrated in Nineveh, Kirkuk, Salahaddin and Anbar (Table 1.6). The total number of modern irrigation sprayers for the 15 Iraqi provinces was 7,916, of which 92% (7,206 systems) were operational, whereas 8% (620 systems) were non-operational. The largest number of irrigation sprayers was in Salahaddin with 3,520 systems (44.47%), whereas Dhi Qar ranked lowest with three systems (0.04%). Table 1.6 and Figure 1.4 present the percentages of modern irrigation systems in each Iraqi province as of 2015.

Table 1.6 : Number of Modern Irrigation Sprayers per Province (2015)

No.	Iraqi Province	Number of Irrigation Sprayers		Total Irrigation Sprayers	Percentage (%)
		Working	Non-Working		
1.	Nineveh	960.00	214.00	1,174.00	14.83
2.	Kirkuk	601.00	3.00	604.00	7.63
3.	Diyala	196.00	40.00	236.00	2.98
4.	Salahaddin	3,480.00	40.00	3,520.00	44.47
5.	Anbar	1,866.00	205.00	2,071.00	26.16
6.	Baghdad	19.00	33.00	52.00	0.66
7.	Wasit	19.00	38.00	57.00	0.72
8.	Babil	107.00	8.00	115.00	1.45
9.	Karbala	14.00	1.00	15.00	0.19
10.	Alnajaf	3.00	1.00	4.00	0.05
11.	Aldiwaniyah	5.00	2.00	7.00	0.09
12.	Almuthanna	20.00	3.00	23.00	0.29
13.	Dhi Qar	2.00	1.00	3.00	0.04
14.	Maysan	0.00	24.00	24.00	0.30
15.	Basra	4.00	7.00	11.00	0.14
Total		**7,296**	**620**	**7,916**	**100%**
(%)		**(92%)**	**(8%)**	**(100%)**	

(Source : Ministry of Agriculture-Iraq, 2015)

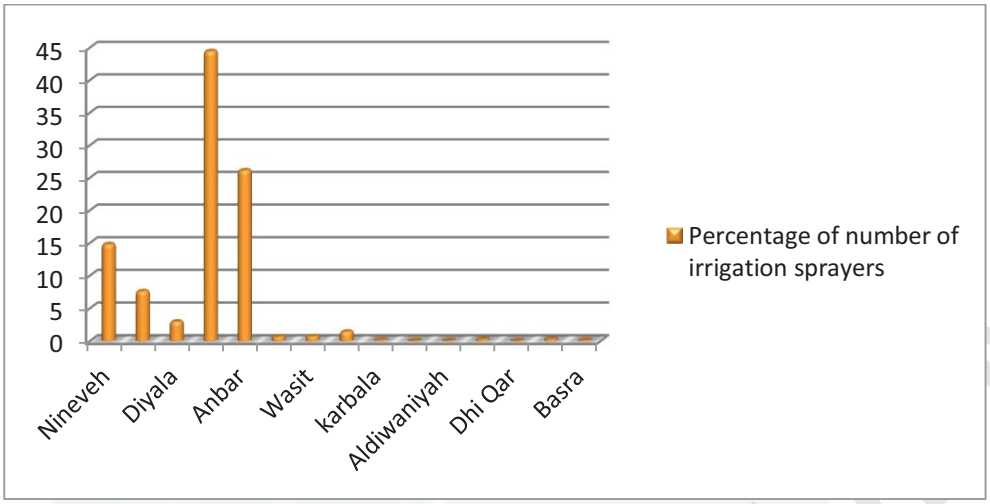

Figure 1.4 : Percentage of Modern Irrigation Sprayers per Province (2015)

Table 1.7 explains the number of agricultural irrigation sprayers provided according to the provision source in the country.

Table 1.7 : Distribution of Modern Irrigation Sprayers Number according to Providing Sources

No.	Iraqi Province	Total Irrigation Sprayers	Number of Irrigation Sprayers Provided by Government	Number of Irrigation Sprayers Provided by Market
1.	Nineveh	1,174.00	867.00	307.00
2.	Kirkuk	604.00	450.00	154.00
3.	Diyala	236.00	225.00	11.00
4.	Salahaddin	3,520.00	1,251.00	2,269.00
5.	Anbar	2,071.00	1,240.00	831.00
6.	Baghdad	52.00	46.00	6.00
7.	Wasit	57.00	57.00	0.00
8.	Babil	115.00	76.00	39.00
9.	Karbala	15.00	14.00	1.00
10.	Alnajaf	4.00	4.00	0.00
11.	Aldiwaniyah	7.00	6.00	1.00
12.	Almuthanna	23.00	23.00	0.00
13.	Dhi Qar	3.00	3.00	0.00
14.	Maysan	24.00	24.00	0.00
15.	Basra	11.00	6.00	5.00
Total		**7,916**	**4,292**	**3,624**
(%)			**54%**	**46%**

(Source : Ministry of Planning and Development Cooperation –Iraq, 2016)

The total number of irrigation sprayers provided by Iraqi government is 4,292 with ratio 54%, while the total number of irrigation sprayers provided by local markets is 3,624 with ratio 46%.

4) Irrigation Water Pumps Services

With respect to the irrigation water pumps services, more half of service (68%) was focused in Kirkuk, Salahaddin, Anbar, Babil, Alnajaf and Basra (Table 1.8). The total number of irrigation water pumps for the 15 Iraqi provinces was 179,788, of which 942% (168,681) were operational, whereas 6% (11,107) were non-operational. The largest number of irrigation water pumps was in Salahaddin with 34,145 pumps (19%), whereas Almuthanna lowest with 2,356 pumps (1.3%). Table 1.8 and Figure 1.5 present the percentages of irrigation water pumps in each Iraqi province as of 2015, while Table 1.9 explains the number of agricultural water pumps provided according to the provision source in the country.

Table 1.8 : Number of Irrigation Water Pumps per Province (2015)

No.	Iraqi Province	Number of Water Pumps		Total Water Pumps	Percentage (%)
		Working	Non-Working		
1.	Nineveh	8,842	864	9,706	5.4
2.	Kirkuk	11,265	1,580	12,845	7.1
3.	Diyala	7,635	348	7,983	4.4
4.	Salahaddin	33,298	847	34,145	19
5.	Anbar	13,981	905	14,886	8.3
6.	Baghdad	6,292	766	7,058	3.9
7.	Wasit	5,734	695	6,429	3.6
8.	Babil	22,558	1,385	23,943	13.3
9.	Karbala	3,041	31	3,072	1.7
10.	Alnajaf	21,242	965	22,207	12.4
11.	Aldiwaniyah	6,090	25	6,115	3.4
12.	Almuthanna	2,271	85	2,356	1.3
13.	Dhi Qar	7,513	941	8,454	4.7
14.	Maysan	6,490	131	6,621	3.7
15.	Basra	12,429	1,539	13,968	7.8
Total		**168,681**	**11,107**	**179,788**	**100%**
(%)		**(94%)**	**(6%)**	**(100%)**	

(Source : Ministry of Agriculture-Iraq, 2015)

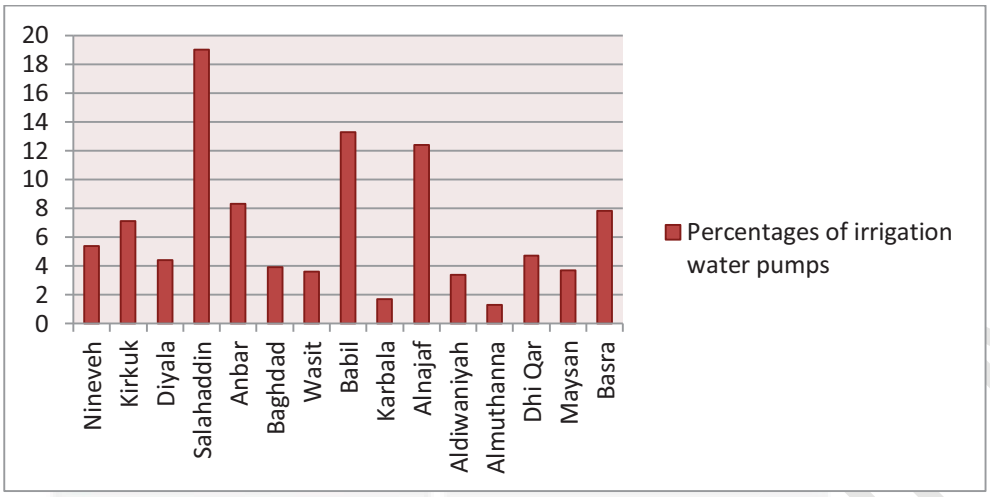

Figure 1.5 : Percentage of Irrigation Water Pumps per Province (2015)

Table 1.9 : Distribution of Irrigation Water Pumps Number according to Providing Sources

No.	Iraqi Province	Total Water Pumps	Number of Water Pumps Provided by Government	Number of Water Pumps Provided by Market
1.	Nineveh	9,706	2,755	6,951
2.	Kirkuk	12,845	2,873	9,972
3.	Diyala	7,983	993	6,990
4.	Salahaddin	34,145	211	33,934
5.	Anbar	14,886	1,743	13,143
6.	Baghdad	7,058	782	6,276
7.	Wasit	6,429	726	5,703
8.	Babil	23,943	3,146	20,797
9.	Karbala	3,072	72	3,000
10.	Alnajaf	22,207	-	22,207
11.	Aldiwaniyah	6,115	51	6,064
12.	Almuthanna	2,356	13	2,343
13.	Dhi Qar	8,454	895	7,559
14.	Maysan	6,621	666	5,955
15.	Basra	13,968	1,598	12,370
Total		**179,788**	**16,524**	**163,264**
(%)			**9%**	**91%**

(Source : Ministry of Planning and Development Cooperation –Iraq, 2016)

The total number of water pumps provided by Iraqi government is 16,524 with ratio 9%, while the total number of water pumps provided by local markets is 163,264 with ratio 91%.

5) Other Agricultural Machinery Services

In Iraq, agricultural machinery is not only limited to tractors, combine harvesters, water pumps and modern irrigation systems. Other equipment and machinery are used to prepare the land for agriculture such as ploughs, shredding machines, spades, trucks, shovels, settling machines (i.e., to loosen soil), drills for seed tillage and other equipment for seeding and planting. For crop servicing and vegetable production, the commonly used tools and equipment are air hoes, sapling machines for chemical and organic composts and mechanical farm sprayers for poisons and pest control. At present, available services are limited to national farming only, and not at the levels of provinces (Albedry, 2012).

1.2.3 Obstacles of Expanding of Agricultural Mechanization Services in Iraq

In spite of the available of arable areas for agriculture that are estimated by 12.905 million hectares and the fuels for operating of different agricultural mechanization services, the use of agricultural mechanization in Iraq is still low compared to other countries for more than one reasons (Keyniya, 1975, Kuba, 2013 & Ministry of Agriculture-Iraq, 2015):

1) Continuing on the methods of random and inherited cultivation which are not suitable for using mechanization to serve agricultural crops.
2) Most Iraqi farmers are largely ignorant and uneducated, and have not yet developed the sense of openness for the unchanged.
3) Lack of expertise in the maintenance and operation of machines used in the service of agricultural crops. In addition lack of skills for consistent spare parts and servicing of machines.
4) Lack of interest in the development of the machinery industry used in the service of agricultural crops.
5) Lack of ability to manage the machines used in the service of agricultural crops.
6) The irregular distribution of agricultural holdings, which led to the non-use of agricultural machineries economically whereby most holdings are very small, while machineries can be used on large farms efficiently and successfully.
7) Lack of optimal utilization of the mechanization power used in the service of agricultural crops.
8) Lack of scientific research and economic studies related to the agricultural mechanization in Iraq.

1.2.4 Rice Production and Mechanization in Alnajaf Province

Rice has been planted in Iraq since 400 BC. From Babylonia, its cultivation spread to Syria and Turkey (Gaid, 1988). Rice is one of the most important cereal crops in Iraq, ranking third after wheat and barley in terms of importance and first as a major summer crop in terms of the area and production. Thus, rice has a prominent place in agricultural production in Iraq (Tomas, 2010).

At present, rice cultivation in Iraq is constrained because of water shortage, and hence, cultivation is only done in the six Provinces located in the middle Euphrates region, namely, Alnajaf, Almuthanna, Aldiwaniyah, Babel, Maysan and Dhi Qar (Refer to Table 1.10). According to the estimates of the Iraqi Ministry of Agriculture, comparison of 2015 production with production in previous years, the areas cultivated with rice have decreased to about 40% (32,618.6 hectares) from previous levels, mainly because of lack of water irrigation and the political–economic–security crisis that has gripped Iraq since 2003.

Table 1.10 : Rice Area, Production and Yield per Province (2015)

No.	Province	Area/Hectare		Amount of Production/Ton	Yield/kg/Hectare	
		Cultivated	Harvested		Cultivated	Harvested
1.	Alnajaf	15,804.5	15,669	55,024.998	3,481.6	3,511.7
2.	Aldiwaniyah	15,364.09	15,364.09	50,155.9123	3,264.5	3,264.5
3.	Almuthanna	656.71	647.785	1645.20	2,505.2	2,540
4.	Babel	593.47	593.47	2,400	4,044	4,044
5.	Dhi Qar	121.805	121.805	218.96	1,797.6	1,797.6
6.	Maysan	78.03	75.225	171.02	2,191.7	2,273.5
Total		**32,618.605**	**32,471.375**	**109,616.09**	-	-

(Source : Ministry of Agriculture-Iraq, 2015)

Figure 1.6 shows the areas where rice crops are cultivated and harvested, distributed over several Iraqi provinces, for the agricultural season in 2015. The largest area for cultivation is in Alnajaf, followed by Aldiwaniyah, Almuthanna, Babel, Dhi Qar and Maysan.

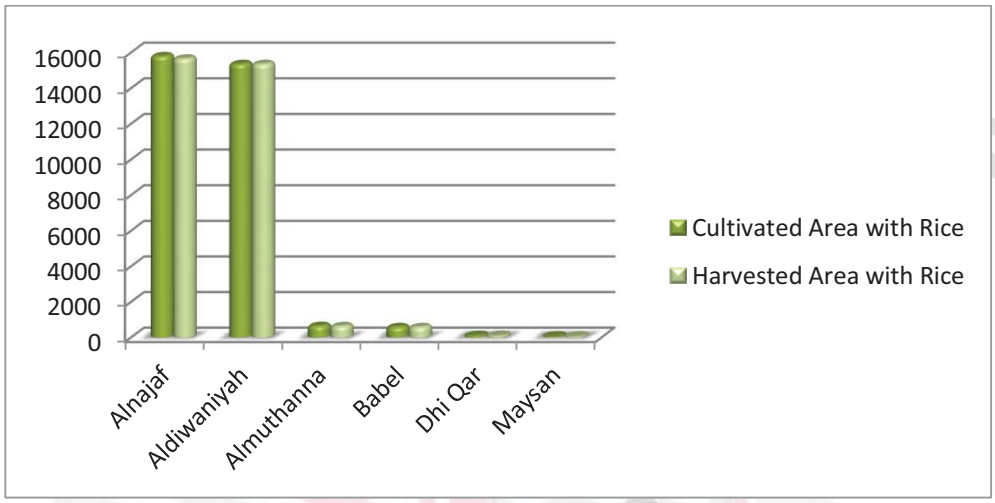

Figure 1.6 : Cultivated and Harvested Areas with Rice per Province (2015)

The production rates and yield per hectare of rice in Iraq are estimated by 90,000.438 tons and 2.7 tons, respectively (Tomas, 2010). This level of productivity is considering very low in comparison with progressed countries. The main reason of declined productivity of rice in Iraq belongs to use the old and customary methods in rice transplanting as manual farming instead of mechanical transplanting, where the use of agricultural mechanization service limited to machineries of soil preparation for planting and harvesting processes (Aladiley, 2013).

Although the important role of agricultural machinery services in reducing unit costs of rice production in Alnajaf province, the number of holding tractors and combine harvesters has been decreased up to 685 and 300 respectively in 2015 (Refer to Table 1.11) in comparison with past years (Department of Alnajaf Agriculture, 2015).

Table 1.11 : Number of Rice Farmers, Tractors Owners, Harvesters Owners, Modern Irrigation Systems Owners and Irrigation Water Pumps Owners in Alnajaf Province (2015)

Cultivated Area with Rice/Hectare	Number of Rice Farmers	Number of Tractors Owners	Number of Harvesters Owners	Number of Modern Irrigation Systems Owners	Number of Irrigation Water Pumps Owners
32,619	3,898	685	300	2	3,270

(Source : Department of Alnajaf agriculture, 2016)

Above table displays the total number of rice farmers, number of tractors owners, combine harvesters owners number, number of modern irrigation systems owners, and number of irrigation water pumps owners in Alnajaf province as of 2015 year. The statistics in Table 1.11 refer to the explaining shortage in number of possessed tractors and combine harvesters on the level of Alnajaf province during 2015 season.

Alnajaf province has a big number of small scale rice farms level with land holding of less than 3 hectares as well as a low level of economic living conditions related to farm income. Personal farm ownership and use of agricultural machinery on these small farms is not economically feasible. However, in order to get the benefits of agricultural mechanization, small scale rice farmers make a decision to use the agricultural mechanization services through the custom hiring of these services where the appropriate features to agriculture conditions (Aladiley, 2013).

Shifting of farming is the new term for sustainable agricultural development especially in rice field in Alnajaf province (because of water constraint). Shifting means escapist a large area under rice to other crops. Machinery needed for sowing, planting, crop protection and harvesting and salvage is greatly crop specific. Thus, shifting would require use of a massive type of additional machinery for these operations on limited area especially in the primary stages, making it uneconomic on ownership root. However, custom hiring through private providers helps to increase annual use of this machinery in that way making them inexpensive. Thus, custom hiring of specialized farm machinery for replacement crops can highly enable modification of farming on level of rice farms in Iraq (Kuba, 2013).

1.3 Hiring Decision of Agricultural Machinery Services as a Solution

Prior to the 1950s, hiring was widely used in the real estate sector. Throughout the middles of the 20th century, many have proposed the concept of rent as a step towards possessing various types of fixed assets. Hiring or leasehold is a contract wherein a renter (lessee) delivers payment on an agreed-upon deadline to a landlord (lessor) for an asset utilized by the renter or for the services provided by the landlord over a particular period (OIB, 2016).

The cereal crop farmers of Iraq have gained from the supportive policies over the past two decades. However, these policies in place are still inadequate to cover the deployment and distribution requirements of agricultural technologies, which can benefit several cereal crop farmers. Modern agricultural mechanization can help framers revive their agricultural lands and increase production. However, owing to the lack of modern mechanization, farmers shave had to resort to other options, such as those provided by the private sector like large farmers, to access agricultural technology (Kuba, 2013).

In the context of agricultural services, most small-scale farmers of cereal crops who cultivate less than three hectares of land could not use the agricultural machinery imported by the Iraqi government for many reasons (Uasen, 1991, Altahan, & Sedeq, 2011, Survey, 2015):

1) Financial Poverty and Ignorant Farmers: Generally, most Iraqi farmers are poor and, therefore, they could not buy expensive tractors and other machineries.
2) Small farm size: Machines are economical and effective when used on large farms. When used in small farm plots, the cost of operating these machines is relatively high. Iraq not is in a place to yield farm machinery on a large holdings level. Therefore, it was focused on such machineries to import them from foreign countries.
3) Lack of spare parts: Small-sized farms in Iraq often suffer from lack of machine spare parts, face problems with machines unsuitable for agricultural work conditions and power shortages. Most agricultural machines were imported from other countries at high cost, similar to the case of spare parts.
4) Limited knowledge of farmers and local service providers: Machines ultimately need to be repaired, which expectedly cannot be done by a small farmer. Operating and repairing imported agricultural machinery require specialize knowledge, which implies the farmers should be professionalized. Workshops stations for repair services and facility maintenance are approached to raise the knowledge of farmers.

The aforementioned limitations have led numerous cereal crop farmers, many of whom are rice farmers, to make a hiring decision and seek the private sector in the country to hire agricultural machinery services. Moreover, admission to suitable mechanization services was constrained by a particular agricultural condition faced by each province. Imported agricultural machinery by Iraqi government has no scope on small scale farms level due to the really small size of holdings which are less than 3 hectares, even though these small holdings are not found together but dispersed over the country Provinces. Small scale rice farmers decided to hire the agricultural machinery from private markets whereby the suitable characteristics to conditions of small farm.

April 2003 marked the milestone date when the private sector began to exclusively service the farmers from southern and central Iraq on a neighbor-to-neighbor basis. However, several present-day issues have been noted, such as the informal hiring approach in the service sector, as well as the acquisition of low-quality machine spare parts. Hiring services that were mainly based on farmer-to-farmer contracts were seldom on a personal basis (FAO, 2012).

Hiring contracts maybe can lead to increases in using efficiency of agricultural machinery services by providing farmers with motivations to deliver services and to produce crops in ways that decrease processing costs and, finally, trade prices, where the use of hiring contracts suggestion some advantages to farmers (Macdonald & Korb, 2011). First, hiring contracts can assure farmers of passages for services in markets with few providers and, thus, assure a better income on investments in physical capital and time. Second, hiring contracts can also link prices more closely to service attributes and, thus, provide incomes to farmers who can hire those attributes.

Small-scale rice farmers (i.e., in the region studied by the present research) who opted to hire machinery services are still undecided on whether equipment ownership is a better option, as farmers who previously declined the services are now considering buying machines or hiring machinery services. As an alternative to owning agricultural machinery and equipment, a farmer can hire personnel services to perform specific farm tasks. Choices and comparisons between hiring personnel services and owning machines are key decisions taken by an administrator of a farm as it mostly affects farm profitability (Ronald, 2015). Some farmers think it is better to complete a specific service rapidly while decreasing costs (i.e., hire option) compared with spending large capital to purchase machinery (i.e., ownership option). In addition, hiring is one of the sources of medium- and long-term financing because it enables organizations (producers) to extract benefits from the asset without ownership (OIB, 2016).

1.4 Insights into the Transaction Costs

Market economy is defined by several economists as a system wherein production and price are limited by the result of the convergence of demand and supply of buyers and sellers. Hence, the market is where buyers and sellers meet (Hasona et al., 2012). From this definition, it may seem that the convergence of vendors and buyers is without cost or burden; however, the buyer pays, whereas the vendor is paid. Thus, buying and selling, or transactions are achieved without extra costs borne by the buyer or seller, or both. However, the transactions are not free, and their costs may increase or decrease depending on how farm owners deal with vendors.

Coase (1937) suggested that the alternative of the market implies additional costs, such as costs searching for and receiving information, costs of bargaining, and costs related to enforcement and policing. These costs can be removed or reduced through the organization of these services supervised by the agent.

Costs linked to search and information includes costs incurred to ascertain if the needed commodity is accessible in the marketplace, which commodity has the minimum cost, among other expenses. Costs of bargaining are the charges obligatory to arrive at a collective arrangement with the alternative party to the contract, design a suitable contract, among other costs. Controlling expenses are the charges of ensuring that the other side obeys the contract conditions, and undertakes the necessary action (oral or written) if this happens not to be the scenario (Coase, 1937).

Transaction costs can be classified in agreement with the stage of transaction into four types (Richter & Furubotn 1999): information costs -search and information gaining of about possible partners of transaction and their circumstances- , negotiation costs -strength and time spent of negotiations and contract design and reach an agreement- , control and monitoring costs -ensuring of decided dates submission, prices, quantity, quality and finally privacy- , and version costs -administration of changes in dates, prices, quantity and quality due to changing circumstances during the contract period

For some, transaction costs (TCs) ultimately increase, perhaps because a farmer tries to avoid purchasing appropriate machinery earlier, thereby decreasing economic activity in the farm. Meanwhile, more developed farms may have less transaction costs as a result of constant interaction with individual producers, which also implies increased volume of economic activity (Albblauy, 2003).

Access to information also has a cost, which implies that market efficiency is not only determined by economic science, albeit economy by itself should not be ignored. In schools, economic theory is often characterized as a perfect competition model. Several assumptions are considered, but the most important is the availability and completeness of information accessed by all parties. From the perspective of transaction cost, perfect competition implies contracting and conducting transactions without restrictions. Unfortunately, in real life, the hypotheses on available information and perfect transactions are not true (Ménard, 2012).

Increasing transaction costs deter farmers from recovering from past economic activities. Constantly increasing costs can lead to economic recession or depression, and vice versa. Imbalanced transaction costs usually take the form of imperfect information about a product, its characteristics, and its specifications, which require farmers to explore other sources of information (Hasona et al., 2012).

These costs may also take the form of administrative expenditures paid to brokers such as lawyers, wholesalers or accountants among others. Transaction costs are also reflected in the complicated procedures required to reach an agreement before the bargaining contract is signed. Approvals and licenses should be obtained, and other administrative procedures should be followed (Abdalkader & Esa, 2013).

Transaction costs are not only limited to the effort, time and finance given by farmers (buyers of service). They also include the confidence of farmers to look to the future with certainty. Farmers do not normally decide in light of present situations, but from what is expected in the future (Alshaer, 2008).

Understandings and uses of transaction costs in agribusiness fields suffer from the lack of empirical studies at level of farm and nonexistence of standard methods to evaluate transaction costs. Therefore, there is a need to do not just one more study reviewing what main elements related to transaction costs said in a theoretical way, but also need more empirical studies, where researchers in fact evaluate what is going on at the level of transaction, such studies will provide more appreciated information for public and private decision makers (Wander, 2013).

In agriculture, contracts of transactions are imposable arrangements between farmer and firms, or farmers and other ranchers that include limited conditions for the buying services such as hiring a custom machinist, buying a new machine, forward pricing a product or service and organizing for a future delivery (Dey, 2002).

Agricultural transactions contracts between farmers and providers can be classified in a number of methods. Contracts can be formal written manuscript, or informal oral arrangements. Contracts of transactions also can be separately negotiated between the farmer and provider, or one party, generally the farmer, may be offered a "take it or leave it" contract by the provider (Goodhue & Simon, 2016).

1.5 Problem Statement

In Alnajaf province, as in other provinces in Iraq, hiring decisions problem is faced by rice farmers when they seeking agricultural machinery services. Custom hiring issues in Iraq, in aspect of use of agricultural machinery services, have been documented since long time. On the other hand the studies related with such issues are still limited and they are technical more than economic studies. In addition, most these studies showed similar outcomes that custom hiring of agricultural machinery services comprises a significant proportion of farm decisions, and there is a group of internal and external factors can effect farmers' decisions to hire these services.

Alshamaa (2007) stated that currently about 30% of all new agricultural capital machineries financed over hiring arrangement, and the lack of existing of explained instructions for getting long-term agricultural assets services based on hiring contracts makes financial decisions unclear on the level of working farms in Iraq. Minhal (2005) stated that hiring of agricultural tractors in Iraq is increased since the seventieth and the number of hired tractors has been developed with annual growth rate 4% during 1995-2002 years. However, despite all that, the number of tractors used in Iraq is still few in comparison with developed countries and has not contributed in increasing the cultivated areas and the average production of unit farm.

Alsamaray (1971) described that investment volume of smallholding farmers is low; these farmers cannot buy expensive mechanized farm power. Therefore, they are making use of modern machinery like combine harvester and tractor machinery through custom hiring. This has helped them develop the suitability of action, rise acreage productivity and increase economic revenues. As a result the living average of rural population in Iraq has improved. Custom hiring prices rates of harvesting machinery exceed their rates of other machineries; the number of owned tractors by the farmers especially in the north region of Iraq is few big. These large numbers of tractors are mostly used for custom hiring operation relating to harvesting process (Alsamaray, 1971).

The investment in aspect of rice mechanization in Iraq (buy or hire) especially for rice transplanter can be influenced by four main factors: personal factors (such as education level, social position, family income, farm size and specialization in rice planting), economic factors (such as costs of machinery and its effect on rise production rates), environmental factors (such as natural conditions and biological factors), and factors related to institutional organizations (such as institutions, markets, targets of farmers and amount of sources) (Aladiley, 2013).

Mustafa (2002) reported that the social factors, inherited cultures and behavioral traditional of farmers, and the difficulties and problems of agricultural policies in Iraq needs farmer to be well-knowledgeable are more important factors to persuade the farmers in Iraq for hiring machineries of soil preparation and harvesting equipment services. In the south and center regions of Iraq hire services are usually provided by the private sector exclusively by farmers on neighbours to neighbours source, about 51% of farmers use their own machineries and 49% use individual contractors for land preparation and harvesting tasks (FAO, 2012).

In a study done on the four cereal crops farms in Nineveh province, it was found that the average revenue per hectare and coefficient of financial support were higher in farms hired machinery services than in farms did not hire these services (Altahan, 2008). Alagedy (2006) explained that the custom hiring processes of services of agricultural harvesters and other harvesting equipment form the highest level than other machineries in Iraq due to the high investment value of these tackles.

Shukr (2010) explained that the absence and weakness of government's role in investment in agricultural machinery field in Iraq motivated farmers to make a hiring decision. In addition, the hard nature of structure of socio-demographic and economic factors and shortage of support policies of income in Iraqi rural enhanced the significance of this decision among Iraqi farmers (Shukr, 2010). Keyniya (1975) reported that the agricultural mechanization for cereal crops production has been the most impressive to use in Iraq and there is decreasing in agricultural mechanization services (tractors and harvesters) where the annual growth rate of tractors and harvesters services is negative during the study period. Northern provinces of the country are the highest mechanized region and there are two types for utilizing agricultural machinery: as an owner by 40% or through custom hiring service by 60%.

Alrubey and Alrekabey (2007) reported that the relevant costs (transaction and production) with special managerial decisions have participated influential in directing the managerial decision of in factories of agro-industry activities in Iraq. These costs can help the managers and decision makers in determination the costs that can be avoided and costs that could not be avoided when select a specific product or service, and then they can reach to efficient a managerial decision.

New concepts in institutional economics (NIE) also explained that the outsourcing decisions like hiring can be considered as a transaction especially when the goods/service transaction can be shifted through mechanically independent frontiers, and if the contract can be organized in such a way that the final total costs (i.e., transaction costs and production costs) can be minimized (Williamson, 1981 and Diho, 2014).

Williamson (1985) reported that transaction costs can affect the making and development of outsourcing contractual preparations in different economic activities, where limited rationality and opportunism play an important role; basically there are three main elements relating to which transactions – and the resulting transaction costs – differ have been described: asset specificity, uncertainty and frequency. These measurements help to explain which contractual preparations are most appropriate for a sure type of transactions.

For the purpose of proceeding with a hiring transaction, farmers must seek information and monitor the ongoing process to certify a confident deal (Wander et al., 2003). Refer to all efforts expended to enable machinery services in a farm, transaction costs include both fixed and variable costs. Fixed costs are those required to set up the farm, which serves as basis for succeeding alternative contract choices. In contrast, variable costs are the payments that occur with existent short- or long-term contract choices, including those for hiring machinery services (Wander et al., 2003).

A study prepared by Silva et al. (2010) for documenting the role and importance of search and information costs in agricultural, it was found that information costs to find the suitable service comprise 70% of the total transaction costs incurred by farmers in Dambulla area in Sri Lanka. Such information can help farmers not only in deciding where and at what price to sell their products, but also in decreasing the high search costs associated with localizing passages. Search and information costs in aspect of hire agricultural machinery services represent costs related to find machines to prepare the land and harvesting processes as well as find the meet abour (Silva et al., 2010).

Ivanaj and Franzil (2006) presented the determinants which can judge the decision to the logistic outsourcing activities based on the transaction cost economics perspective. The decision is caused by direct effect of three attributes of transaction: assets specificity, uncertainty and frequency, the decision also is caused by indirect effect of three relative factors: firm size, level of expertise and degree of organization of the logistic function (Ivanaj and Franzil, 2006).

Wander and Zeller (2002) stated that it is difficult to measure transaction costs, but they are vital cost components in the decision-making process related to agricultural machinery services. The resulting transaction costs when agricultural machinery are rented is based on seven attributes influenced transaction costs: assets specificity, uncertainty, frequency, complexity, measurability, level of investment and length of contractual relationship, while the predictable costs like depreciation costs, opportunity costs of capital and variable costs of agricultural machinery are important elements in the comparison among alternative contract selections (Wander & Zeller, 2002).

There is also evidence reported by Vernimmen et al. (2000) about the importance of transaction costs in outsourcing decision-making of some farm managerial tasks. Important differences in outsourcing in relation to farm's profile such as age, land size and organizational environment are found, also to transaction elements such as uncertainty, complexity and requirements of time to do the managerial task (Vernimmen et al., 2000). Gong, et al. (2006) stated that the fluctuations in direct and indirect marketing channel choices by beef cattle farmers in china thanks to the significant role of transaction costs and their basic attributes. The number of growers decide to use direct market channel (directing sell) can be expected to rise as it will reduce transaction costs. With more negotiating power and more knowledge in the farm management, more farmers may decide to sell their products directly.

The hiring decision of agricultural mechanization needs to analysis and determine the economic variables which lead to its make by rice farmers in Iraq. Hence, it is necessary for the study to be performed to detect the latent determinants that effect hiring decision from the respondents' viewpoint. The study also focuses on the calculating of some economic criteria relevant to investments options in aspect of agricultural mechanization services.

According to the new documents of agriculture departments in the country (2015), several small-scale rice farmers in Alnajaf province engaged in undertaken transactions to hire agricultural machines services, mainly for the use of tractors and soil preparation machineries, farm sprayers and combine harvesters for rice production. The case of Alnajaf is thus suitable in studying transaction costs economics and some economic criteria in relation to the choice of rice farmers on whether or not to hire machinery services.

1.6 Research Questions

The questions of this study are:

1) What are the socio-economic characteristics of rice farmers and how are these associated with the decision to hire agricultural machinery?
2) What are the transaction costs attributes influence rice farmers' decisions to hire agricultural machinery services?
3) What are the economic criteria associated with the hiring decision in comparison with the other alternatives?

1.7 Objectives of the Study

1.7.1 General Objective

The main purpose of this study is to analyze the hiring decision of agricultural mechanization services by rice farmers in Iraq.

1.7.2 Specific Objectives

More specifically, the objectives are:

1) To clarify respondents' socio-economic characteristics in relation to the hiring decision of agricultural machinery services;
2) To determine the core attributes of transaction costs which may affect or encourage respondents' decisions to hire agricultural mechanization services;
3) To estimate the relationship between the affecting variables (such as transaction's attributes and selected socio economic factors) and respondents' decisions to hire agricultural mechanization services;
4) To test whether the hiring decision of agricultural machinery services is better for study sample in comparison with the other potential alternatives.

1.8 Scope and Terms of the Study

In this study, two economic principles are of interest: the first one based on transaction cost economics approach by analyzing core transaction's attributes for hiring decisions, and the second principle based on financial approach by analyzing cost–benefit of engineering economic services by using per unit model of three economic criteria which are: break-even analysis (BEP), net present value (NPV), and benefit cost ratio (BCR). Previous studies have shown that these two points are the most important elements of the respondents' decision towards hiring of agricultural mechanization services. The study also focuses on specialized farms in rice production to determine if decisions are made based on the correct fundamentals.

1.9 Significance of the Study

The study is addresses the absence of applying transaction costs approach in the field of farm management in Iraq especially in respect of agricultural machinery management. Therefore, the scientific significance is derived from the analytical methods used in the study, which examines the role of transaction costs attributes in choosing the decision to hire agricultural mechanization services by rice farmers in Alnajaf province.

The results of this study can contribute to select the best economic decision in relation to the required machinery for rice production. Transaction cost analysis could also help respondents choose either to hire or own agricultural machinery on the one hand and to reduce costs in relation to the choice of machinery for farm production processes on the other hand.

Calculated economic criteria of agricultural mechanization services could also guide respondents to evaluate their decisions to hire agricultural machinery. Results may also provide clear guidelines for the Iraqi government when reformulating the political and economic decisions, particularly in relation to rice agriculture and production.

Finally, this study considers the first work for investigating rice respondents' opinions towards transaction costs in respect of agricultural machinery hire, so this study will pave the way for complementary studies and serve as a future reference for scientists and researchers who wish to address a study on the same field.

1.10 Thesis Organization

This research paper is organized into five chapters. The first chapter includes the background of the agricultural sector and machinery services in Iraq, statement of the problem, objectives, and importance of the study. Second chapter presents a review of past literatures of relevant works connected to the present study as well as related studies and empirical findings that are important to develop the theoretical framework and methodological concerns related to the decision to hire the agricultural mechanization. Chapter 3 explains the study methodology including data sources and the sampling technique, questionnaire design and data collection on mechanization, and the methods of data analysis. Chapter 4 focuses on data analysis and discussion of the empirical results of the current study. Chapter 5 presents the conclusions, limitations and recommendations of the study.

Finally, all references used in the study, appendices for each chapter, bio-data of student-researcher and list of the researcher's published journal articles are also provided.

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