

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences



Czech University of Life Sciences Prague

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AgriSciences**

**Analyses and proposal of education and training in
agricultural engineering in the post conflict
reconstruction era of Iraq**

MASTER'S THESIS

Prague 2019

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Declaration

I hereby declare that I have written this thesis entitled “Analyses and proposal of education and training in agricultural engineering in the post conflict reconstruction era of Iraq” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to citation rules of the FTA.

In Prague

.....

Acknowledgements

I am extremely grateful to my supervisor Doc. Ing. Vladimír Krepl CSc. for his expertise, for sharing his extensive knowledge and for guidance in this process. I would like to extend my sincere thanks to Mr. Elaaf R. Hadi, Ph.D., from the Embassy of the Republic of Iraq for his effort and help in collecting data in Iraq. Special thanks to Mrs. Ghada Hazim of Baghdad University for her contribution to the survey. I would like to express my gratitude to Mgr. Ing. Ghaeth Fandi, Ph.D., and Niga Rzgar for translating the questionnaires into Arabic and Kurdish, for their insightful comments and for sharing their experiences about their homeland. I would also like to thank Niga for arranging the meeting with Iraqi students and for the support in the survey's trial run. I also wish to thank my family and my girlfriend for supporting and encouraging me during the whole process. Thanks also to Anja Hofmann, for proofreading my thesis.

Abstract

Iraq has gone through many conflicts in past decades. History affected the country's development badly. The education system was one of the most-developed systems in the Middle East prior to the 1990s. Illiteracy rate at the present amounts to more than 20 % among the population aged 15-24. Recent events had also an impact on the age composition of the population. Half of the population is younger than 19 years and one third of the population is unemployed. Absence of proper workforce development resulted in a huge decrease of agriculture production across the country. At the present, the country is still in its recovery phase. Each development starts with education and people. This thesis aims to analyse and propose a new agricultural engineering education curriculum according to the inhabitants' needs. Two semi - structured questionnaires were created and send to Iraq to agricultural universities to collect data. One questionnaire was aimed at students to get data about their background, their attitude towards and perception of agriculture and environmental engineering. The second one was aimed at teachers and employees of the same universities, to get information about opportunities for graduates and the overall situation in the agricultural sector across the country. Where is the biggest lack of people? After processing the results, through literature review and relating to the 'Resilience and Recovery plans' for Iraq, syllabuses were produced. The assessment shows that despite the fact that Iraq has great potential for agriculture, because of land and enough labour force, the perception of students was heavily affected by the fact that Iraq is one of the biggest oil producers in the world. Willingness to work in agriculture was not rated very high and only 13 % of students have decided to work in agriculture after graduation. Another finding was that the country has an enormous deficiency in agriculture engineers and technicians. A further important discovery was the partakers' opinion that agriculture education must be revised because at this time, it is not well suited for the existing conditions. Despite the limited number of respondents, the results can be used as an overview of the current situation in agriculture and environmental engineering. The conclusion can be of service to Iraqi authorities for further development of the agricultural education sector.

Key words: Iraq, high education, agriculture, environment, engineering, analyses, proposal,

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List of abbreviations used in the thesis

DOL	Department of Labor
EPDC	Education Policy Data Centre
EU	European Union
FAO	Food and Agriculture Organisation
FAOSTAT	FAO Statistical database
GDP	gross domestic product
IFAD	International Fund For Agricultural Development
IFRC	International federation of Red Cross
IiG	Investments in group
IS	Islamic State
MoE	Ministry of Education
MoE	Ministry of Education
MoP	Ministry of Planning
MT	metric ton
NGO	Non-governmental organization
NIC	National Investment Commission
NUFFIC	The Dutch organisation for internationalisation in education
RFSAN	Regional Food Security Analysis Network
SDG	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
U.S.	United States
UN	United Nations

UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for international Development
USD	United States dollar
WB	World Bank
WFP	World Food Programme
e.g.	example gratia
et al.	et alii
etc.	et cetera
km	kilometre
mm	millimetre
nes	not elsewhere specified
sq	square

1. Introduction and Literature Review

Nowadays, agriculture plays an important role in our lives. Huge areas of lands are taken and cultivated into arable land. Yields are constantly growing together with the population on the planet. For a good and qualitative agricultural production, we do not need just good environmental conditions such as water availability and fertile soil but we also need machinery, equipment, seedlings, and lastly and very importantly, skilled and well educated people and a beneficial policy. A qualitative agricultural production depends on the people carrying out the work and the support these people receive. An education for workers made available to all is of fundamental importance. Untrained workers cannot operate or service machines; they need the knowledge of how to cultivate the land, specific to the local environment. The yield will suffer, if any of the links in the chain are missing or not in an adequate condition.

The total labour force in Iraq in 2012 was 8.2 million people and approximately just 18.72 % of them were involved in agriculture (WBa 2018). This number has significantly decreased from 29 % in 2006 (WBa 2018). Agriculture does not even play a significant role in the national economy share of the GDP; it only accounts for five percent (WBb 2018).

The development of agriculture in Iraq can play a big role in the future. (Al-Haboby A at al.2014) The present situation however, is affected by a multitude of factors. Iraq has suffered through many conflicts through the past decades. Those changes had a negative effect on the environment and work force development in the agriculture section (WFP 2017). Proper education of students in agricultural and environmental engineering as well as an educational policy are important for further improvements. Students are taught and prepared for their career in vocational schools, high schools and universities, but some of those facilities have suffered immense destruction through the country's turmoils. Electricity outages and the lack of proper equipment are problems these institutions have to deal with in the present (Al-Shaikhly S. & Cui J 2017).

It is necessary to mention that a huge part in Iraq's economy is represented by the oil industry but it does not offer too many opportunities for job-seeking people.

People have a bigger chance to find employment in the public sector, in smaller private companies or in agriculture.

1.1. Iraq

The Republic of Iraq is the official full name of the state of Iraq. The country is located in western Asia. Iraq shares borders with Turkey in the North and Iran in the East; Kuwait is located in the southeast, Saudi Arabia in the South, Jordan in the Southwest and Syria in the West. Approximately 38.27 million of people live in Iraq (WBa 2018). Baghdad is not only the capital but also Iraq's largest city with a population of 8.8 million.



Figure 1. Map of Iraq.

Source: Wikimedia 2018

The total surface of Iraq is 435,052 sq. km. (FAO 2016) but the total area of agricultural land is 95,000 sq. km. (FAO 2017). The GDP of the country is 192,060,810 USD (WBa 2017) and the share of agriculture in the GDP is only 4.8% (WBa 2017). Oil creates 55.4 % (WBa 2018), Iraq has the 12th biggest oil resources worldwide and in

2018 was the third largest exporter in the world (WBa 2018). Iraq's population is made up of 49.38 % women (WBa 2018) and 50.62 % men. 30.41 % of the country's population live in rural areas but with 65.59 % (FAO 2017) the majority of people live in urban areas. The unemployment rate hit its high in 2003, when it was 28.1 %. Since then it has been decreasing and the unemployment reached 14.8 % in 2017 according to the official reported data (WBe 2019). The official languages of Iraq are Arabic and Kurdish. The country is divided into 19 provinces. The last one was established recently, which is why there are no mentions about this province in some documents.

Table 1. Population composition in 2016

age	female	male	total
0-14	39.87 %	41.18 %	40.54 %
15-64	56.66 %	56.04 %	56.35 %
65 - above	1.26 %	1.1 %	3.46 %

Source: The World Bank a 2018, Iraq

Table I shows the composition of population in Iraq in 2016 according to the WB collection. We can see the composition according to age and according to the sex. The last column shows the total percentage. The majority of people is aged between 15 and 64 years. There are more than 40 % of people younger than 14 years and just 3.46 % of the population is older than 65 years. According to the composition of gender, there are no significant differences between females and males but there are a little more woman who are older than 15 years. It could be a consequence of recent history. More than 56 % of population is under 24 years. The average age of Iraqi population is 21. Half of Iraq's population is younger than 19 years and 34.6% of the population are unemployed (Tull K 2018). Almost 600,000 people live in camps and 8.7 million of people are in need (UNICEF Iraq 2018).

1.2. Education

Education is a very important factor in every country, which can affect many indicators of the country. Everyone has the right to be educated. Access to quality education is even one of the SDGs (UN 2017). Insufficient education is often a key factor in limiting manpower development. The quality of education is closely linked to the allocation of state budget allocation. Education is a systematic preparation for the future career which gives theoretical and practical knowledge to the people. It should provide all knowledge to all people without any discrimination regarding gender, age, race or religion. Local models of education and extensions are required to produce the kind of person that developing countries need, now and in the future (Chaudhary M. A. & Al-Ha F.M 1985).

In the 1980s, before the Gulf War, Iraq's education system was one of the most advanced in the region with near universal primary education (UNICEF 2017). Since that time, the country went through many conflicts and instability together with sanctions. This led to an increase of illiteracy. Despite of improving access to education and eliminating the gender specific approach in 2013, there were 1.2 million of children without basic education. They were not able to attend primary schools because of the lack of accessibility. (UNICEFa 2017).

A big change in education came in 2003. In the academic year of 2015/2016 9.2 million students were enrolled across all levels of education in Iraq (UNICEFa 2017).

The decay of education in Iraq is particularly tragic, since Iraq used to have one of the most developed education systems in the Middle East (Al-Shaikhly S. & Cui J 2017). With stabilizing the situation in the country and ensuring safety of young people, numbers on students are increasing. The expenditures of the country on education however, are not increasing. Iraq is spending only 5.7 % of governmental expenditures on education (UNICEFFb 2017). The Literacy rate among the population between ages 15-24 is slightly higher in males with 82.42 % than with 80.61% in females (WB, 2015). Almost one quarter of the population (24. 72 %) has no education at all (WB 2010). There are still more than 1000 schools built from mud (Khalil S 2018). Those

facilities do not fulfil the basic hygiene norms. There is a huge lack of libraries. More than 15000 schools need to be reformed, especially regarding hygiene facilities and basic equipment (Khalil S 2018).

Table 2. Years of schooling in Iraq

	female	male
2012	6.4	6.4
2017	7.0	6.7

Source: Tull K 2018

Table 2 shows small comparison between average duration of education between females and males. We can see a bigger improvement in duration of education of females than males. Overall, there is improvement for both genders.

Table 3. Enrolment numbers by level of education (in thousands)

	Pre-school	Primary	Secondary
2013/14	268.1	6,765.2	2,774
2015/16	245.6	6,211.5	2,729

Source: MoE 2016

In Table 3 we can see the total numbers of students enrolled in school according to the level of education. There are two noteworthy aspects. The total number of enrolled students has decreased over time. A plausible cause for this could be the emergence of the Islamic State in this period of time and the ensuing war against it. The possible negative effect on education can be seen in the dropping numbers in the table. The second interesting factor is that the highest number of students lies in primary school education. The reason for this is that primary education is compulsory in Iraq.

The next table (Table 4) shows the disparity in enrolment among boys and girls by different levels of education, with more boys than girls attending school. There are

differences in each level. Aforementioned in the previous table (Table 3), the highest number of pupil attendance lies in primary school and there is also a possible decrease in student enrolment between school years 2013/14 and 2015/16.

Table 4. Enrolment numbers by level of education – by gender (in thousands)

		pre-school	primary	secondary
2013/14	boys	135.8	3,630.3	1,620.8
	girls	132.3	3,134.9	1,154.2
2015/16	boys	124.1	3,303.3	1,539.3
	girls	121.6	2,908.2	1,189.7

Source: MoE 2016

The dropout ratio is a negative phenomenon in the Iraqi education system. Table 5 shows the official reported percentage by MoE of how many students dropped out of school. The main reason for this is very often the prevailing economic situation. This number represents the number of pupils, who left school and they do not repeat the grade. Table 5 shows that the percentage of student dropouts has slightly increased through the years and concerns more girls than boys. The poorest children are affected by a dropout rate of 21% while the richest children are only affected by 2% (UNICEF 2015)

Table 5. Dropout rate in percentage

		primary	secondary
2013/14	boys	1.6	2.4
	girls	2	3.4
2015/16	boys	2	2.9
	girls	2.5	3.5

Source: MoE 2016

1.2.1. Children of Iraq

Even though primary education in Iraq is obligatory and public schools are free to all, a few thousand children do not attend school at all. The main reason for this is child labour. According to UNICEF, in 2016 more than half a million of children under the age of 15 were forced labourers or forced to do something else. Illiterate young children can be easily used in armed conflicts by different terroristic groups. The problem of child labour is related more to boys (7.3 %) than girls (5.4 %). (UNICEF 2014). Around 5.5 % of pupils attending primary schools are working as well (UNICEF 2014). The poverty line plays also an important role in child labour (DOL 2018). Children living in poverty do not have enough resources to go to school, when the school is located farer away. They also cannot afford to buy basic school equipment. Orphans have to secure their livelihoods themselves. Some of the children would prefer going to school over work but they are not able to. Others on the other hand, prefer earning money from an early age on (UNICEF Iraq 2017). There is a huge difference between poverty in rural and urban areas – affecting 34 % of children in rural areas and 17 % in urban areas (UNICEF Iraq 2017).

1.2.2. School educational system

Education in Iraq is overseen by the Ministry of Education. Education in the country is free at all levels. This applies only to public schools. There are also private schools but pupils have to pay a high admission fee. Primary education starts at age six and it is obligatory until age twelve. Duration of the primary education in Iraq is six years except in the region of Kurdistan, where the mandatory formation increased to nine years. Younger pupils can also attend voluntary preschool preparation at age four, lasting two years. After finishing the 6th and final grade (in Kurdistan 9th), pupils have to pass the national exam prepared by the Ministry of Education. They graduate with an Elementary Certificate. Unlike the system of education in the Czech Republic, the school week has six days. In 2017 the dropout rate in primary education concerned 11.4 % of girls and 5.4% of boys (UNICEF 2017)

For Entering secondary education the Elementary Certificate is required. Secondary education is divided into two phases (each lasting 3 years) and starts at age

twelve. After each phase, the MoE mandates a national examination of students. After successful graduation, the students receive the Intermediate Certificate. During their studies, pupils are prepared for tertiary education consisting of programmes specifically tailored to their focus. They can be continuously prepared for the next academic field or they can be prepared for entering the labour market. After finishing secondary education, students have to pass a test and receive the Preparatory Certificate. According to the percentage of score in the final test, the graduates are eligible to enrol in universities. Only the best ten percent have the possibility to opt for a path of higher education. Students have also the choice to enrol in vocational schools but not many students do so, due to the poor quality of education available there.

Universities in Iraq are providing higher education. Higher education is divided into two phases - undergraduate and postgraduate. Length of undergraduate programmes varies from 4-6 years. Students receive a bachelor's degree. The next step is a master's degree. The length of study is usually two years. After another three years of study, the student can achieve a doctoral degree.

Figure 2 shows the education schema in Iraq. Students of higher education have the possibility to get scholarships and study abroad. Top destinations are Jordan, the United Arab Emirates, Ukraine and Malaysia, India or the U.S. (Al-Shaikhly S. & Cui J 2017). A systematic overview of educational system is shown in figure 2. In 2013, 118,000 students were enrolled in universities (MoE 2016).

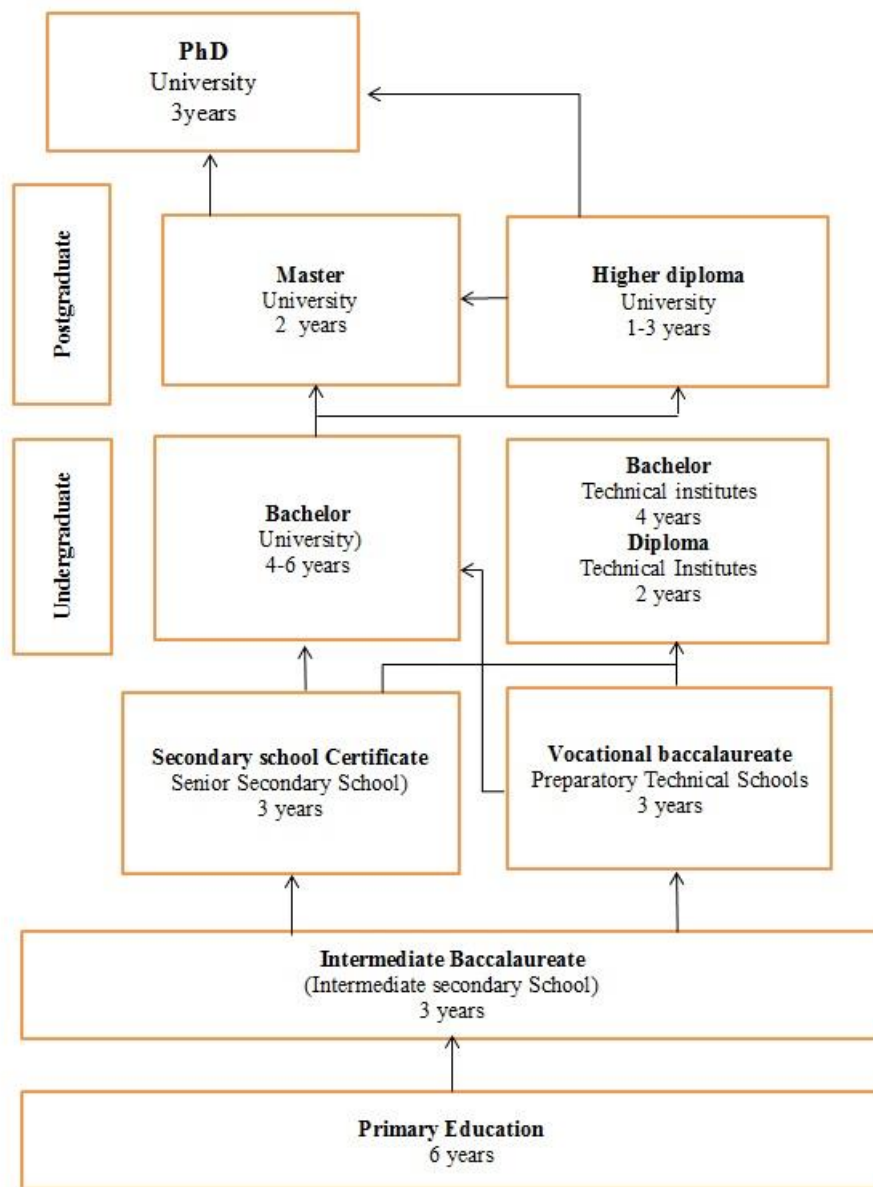


Figure 2. Iraqi school educational system

Source (NUFFIC 2017)

1.3. Agriculture

1.3.1. Geography

The surface of the country is very diverse. Big parts of Iraq on the West and Southwest consist of desert. Highlands are to the North. In the central part and southeast part are alluvial plains. The country's two most important rivers, Euphrat and Tigris, are in proximity to the plains. Mosul dam, the biggest dam in Iraq, is located on the river Tigris. The lowest point is 0 m, the highest point of the country measures 3,611 m. Average temperature during summer months lie above 40 °C but in winter it can drop below 0 °C.

Approximately 21.4 % of Iraq's surface can be used as agricultural land. Arable land is 11.5 % (WBa 2018). The most fertile areas are alluvial plains. Iraq's soil can be easily converted into arable land. Average annual rainfall differs according to the location. In the north-east part (Iraqi Kurdistan) the average is between 700-1000 mm. In the North in Mosul part is the average almost 400 mm. In the central part is the annual rainfall 150 mm. In north-west part in the Syrian Desert is annual rainfall just 120 mm (FAO Iraq 2016).

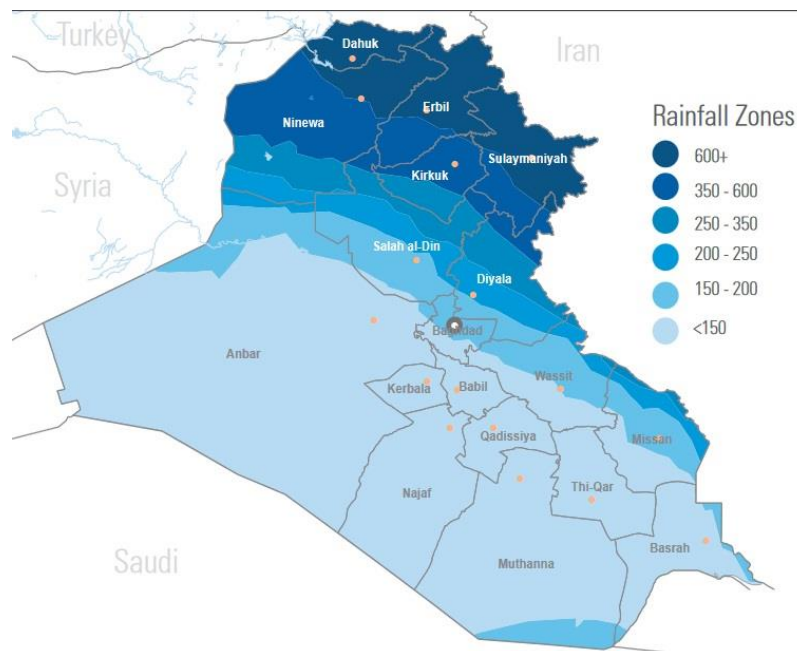


Figure 3. Annual rainfall in Iraq

Source. FAO Iraq 2016

1.3.2. Agriculture

Despite Iraq being an oil nation, agriculture plays an important role in the economy and people's lives. Together with population growth and other external factors, the demand for food is increasing. Agriculture production is not able to meet the demand. According to the WFP in 2015, 95,605 MT of food were distributed to the people (RFSAN 2016). More than 90 % of food must be imported (WegVoraus 2017). War conflicts play a significant role in economy and their impact can be devastating. With the emergence of the IS, agriculture production decreased by 40% in 2016.

Almost 19 % of the economically active population is working in agriculture. The share of the agriculture sector on GDP was not so high in the past ten years as Figure 4 shows. Numbers remained almost all the time below 5 %. It took three years for the share to exceed 5 % slightly.



Figure 4. The share of agriculture in GDP in Iraq

Source. WBb 2018

The most important region for agricultural production is Kurdistan. It is often referred to as Iraq's breadbasket (IiG 2013). The first mention of agriculture production in Iraq dates back to 11,000 B.C. and comes from the oldest village Charmu or Jaro located in Kurdistan (USAIDb 2008). The northern part of Iraq has great potential for big diversity of agricultural crop production and livestock production. This region has good access to water resources due to five big rivers, groundwater and dozens of dams. (Schnepf, R 2004) Once fertile soil in the region was affected by years of conflicts and left fallow. Those areas have become non-productive.

Wheat and barley are two main crops, which' yield is accounts for almost half of Iraq's entire cereal production (FAO/WB 2012). Iraq is also the 6th biggest producer of date palm in the world with a production of 621.2 thousand tons in 2016. (FAO 2017). Other important types of crops are tomatoes, rice and cotton. Among the less produced crops, are sunflowers, watermelons, cucumbers and oranges (FAO Iraq 2016).

1.4. Brief recent history

Iraq has gone through many conflicts. Some of them were against other countries; some of them took place within the country. The educated population left and newborn inhabitants were only met with conflicts. The Gulf war or Invasion of Kuwait began in 1990. Until then, Iraq was the richest country in the Middle East. The war was followed by sanctions from the UN and many people left the country (Schnepf R 2003). After the terrorist attack in 2003, the invasion of Iraq was led by the US. A new government was established. In 2005, a new constitution was approved and a new government was elected. The change was accompanied by many conflicts inside the state and devolved into a civil war.

The total number of violence decreased most significantly in 2009. Due to the dissatisfaction of the people with their government and the huge corruption, together with unavailability of services and new jobs, it led to the Arab spring in 2011. It was gradually followed in the years 2014-2017 with the war against the IS (Britannica 2018). Since 2017, the country is trying to restore what has been lost, stolen or destroyed. Together with agricultural and environmental engineering. War destroyed

irrigation systems and water treatment plants across the country (FAO 2018). Storages and processing facilities were destroyed as well. The lack of resources and skilled people, diseases in livestock and crops have appeared (RFSAN 2016). The total cost of reconstruction of the educational sector has been estimated 4,561 billion USD. For the short term 912 million USD would be necessary to cover the basics (WBe 2018).

2. Aims of the thesis

The main objective of the study is to assert the current education curriculum in schools and academic bodies in the field of agriculture in Iraq. Specifically, the study seeks to answer the following objectives:

1. To determine socio-economic characteristics of students of agricultural and environmental engineering and their attitude, perception, ambitions and opportunities.
2. To get information about opportunities for graduates in the agricultural and environmental field.
3. Proposal of a new high education programme (syllabus) in agricultural and environmental engineering - related to the location.

3. Methods

3.1. Research design

The educational system in Iraq requires a beneficial policy environment. The insufficient educational system additionally suffered through thirty years of instability in the country. The development of agriculture in Iraq is at present unimaginable without sufficient education and training.

The main tool in the research was a questionnaires-based survey (Swinehart, K.A. 2013; Curbelo, A. 2006). It was used for first and second specific objectives. Primary data were collected with the help of questionnaires. Two questionnaires were designed. For each questionnaire there was a different target group. Both questionnaires were modified according to the comments of present and former Iraqi students in order to adapt them to present conditions in Iraq. In a trial run-through with students from both CULS and MENDEL University, questions on the questionnaire were adjusted or eliminated, if not comprehensive.

3.2. Data collection

The first questionnaire was aimed at students to meet specific objective 1. Target group were Iraqi students of higher education. The second questionnaire was aimed at teachers and other senior employees of universities, who are familiar with the current situation in the region and with questions of employment and agriculture. It aimed on specific objectives 2. Both questionnaires were translated into Arabic and Kurdish, the two official languages of Iraq. Both questionnaires were created as printed version as well as online version, for better and faster availability. The printed version was delivered to the Embassy of the Republic of Iraq in Prague and cooperation on data collection was agreed upon. The deputy head of mission was helpful with distributing the questionnaires among Iraqi universities. Online versions of the questionnaires were also spread with help of Iraqi students, former students and contact persons of my supervisor to partner universities. It took some time from initiating contact to receiving the first response.

The main research was done in Iraq in partner universities. The following universities were asked for cooperation: Baghdad University – College of Agriculture - Abu Ghraib, College of Agricultural Sciences – University of Sulaimani, Salahaddin University - Erbil -College of Agriculture. The Universities were selected due to their location and their importance in the country. Universities represent samples from central Iraq and north part Kurdistan. The data collection was held at the end of year 2018; however, the questionnaires are still published online. The obtained information was used for a proposal of syllabuses. With these unique collected data we can see how the Iraqi students perceive the agricultural and environmental educational field. Secondary data as a part of this study were obtained from scientific articles, mainly from Web of Science and organizations working in Iraq, namely FAO, UN, USAID, UNICEF. Governmental documentation was also used as relevant source of data.

The questionnaires mainly consist of closed-ended questions with some exceptions of questions requiring replies that are more detailed. The student questionnaire seeks answers about social data of respondents, how the student perceives his/her study of agriculture and environmental engineering and about the next step after graduation. The second questionnaire seeks answers about employment in the field of study, which sector has the biggest need of graduates and whether the state is willing to help.

3.3. Data analysis

Data obtained from online surveys were processed in MS Excel and basic descriptive statistic was done in SPSS. Data analysis showed frequencies and percentages. Crosstabs were also done, including correlation. Some results are laid out as diagrams. Results obtained from surveys were compared to the current situation in Iraq and to the ongoing development programme. The results were also used for objective 3.

The proposal is designed with the help of literature reviews and inspired results from this study. Inspiration was taken from the Czech and Iraqi documents (Krepl V 2003; Krepl V 2006; UNICEFFa 2017; UNESCO 2004). Requirements were obtained from country strategic plans and different development plans designed by many development

agencies (UNESCO 2011; UNICEF 2015; WFP 2018). A collection of Iraqi syllabuses gathered by the UN in 2010 was also used as inspiration.

4. Results

4.1. Students' data

4.1.1. Descriptive statistics

Sample description

The total amount of student respondents who participated in the survey is 83. Table 6 shows that a little more than half of the respondents in our survey are female (53 %). Males are represented by 47 %. The majority (75.9 %) of respondents were aged 20-24. The second biggest group (15.7 %) of respondents were students aged 25 – 29, who participated in our survey. Among the respondents were also students older than 29 years (7.2 %) and one student aged 15-19 years. The majority of students (80.7 %) are from urban areas, 16.9 % from the suburbs and only 2.4% are from rural areas.

Table 6. Sample description

Variables	Description	Frequency (N=83)	Percent (%)
gender	male	39	47
	female	44	53
age group	15-19	1	1.2
	20-24	63	75.9
	25-29	13	15.7
	over 29	6	7.2
place of living	urban	62	80.7
	rural	2	2.4
	suburb	14	16.9

Students' background

For a better understanding of the background of students who are studying this field, we asked if they have a family member, who is already working in agriculture and if the student had some previous practical experience. Table 7 shows our findings. More than two third (71.1%) of students had no previous practical experience in agriculture. Only 28.9 % were familiar with it before they enrolled to university. 28.9% of students had a family member who worked in agriculture, but the rest represented by 71.1 % do not have family members that work in agriculture. The results of table 7 show that having a family member working in agriculture does not mean the student will have practical experiences in the field and vice versa.

Table 7. Practical experience in agriculture and family members

		Previous practical experience in agriculture		Total
		<i>yes</i>	<i>no</i>	
Do you have a family member that works in agriculture?	<i>yes</i>	15.7 %	13.3 %	28.9 %
	<i>no</i>	13.3 %	57.8 %	71.1 %
Total		28.9 %	71.1 %	100 %

As mentioned, only 28.9 % of students have had a previous practical experience. Figure 5 shows where the students obtained their experiences. 10 % of students from our sample were from farming families. A small percentage of students (6 %) had experiences from part time jobs in agriculture and only 4 % of students obtained their experiences through previous schooling. This figure shows also that 10 % of students obtained their experiences in other non-specified ways.

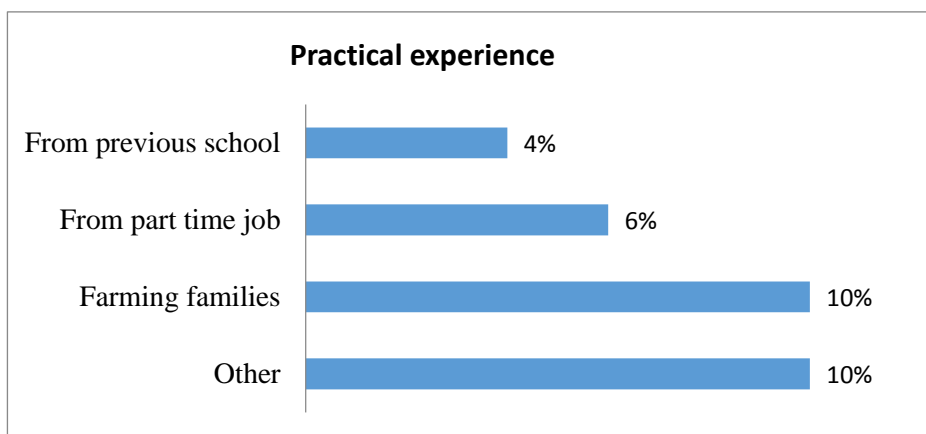


Figure 5 : Practical experience

In table 8, we can see which factors were playing a role in influencing the students to enrol. None of the students was influenced to do so by a fellow student in class. This means that no student enrolled to the faculty because of friends already attending. On the other hand, almost half of the students (47 %) were placed in the class because they did not have any other option. The second biggest group is represented by 33.7 %. They could choose this study field because of an obtained degree from high school. 80.7 % of students were not possible to choose another university to study. Only 10.8 % were interested in agricultural science and 3.6 % in agriculture scope. But some students (9.6 %) believed that agriculture education will benefit them in the future. According to the results we can also see that for 7.2 % of students their parents' opinions were a decisive factor in choosing their path. A small percentage of students (3.6 %) were affected by other non-specified factors.

Table 8. Enrolment factors

How did you enrol to the faculty?		
	Frequency	Percentage (%)
<i>friend in the class</i>	0	0
<i>interested in agriculture scope</i>	3	3.6
<i>interested in agricultural science</i>	9	10.8
<i>because of parents</i>	6	7.2
<i>I was placed in the class</i>	39	47
<i>agricultural education will benefit me</i>	8	9.6
<i>because of my degree in high school</i>	28	33.7
<i>other</i>	3	3.6

Even though seen in table 7, no students are enrolled because of a recommendation from a friend, 27.7 % of students have answered that they would recommend an agriculture education to their friends (see table 9). The rest 72.3 % would not recommend them to take up this study. In the agriculture scope, we can find many variables. Environmental engineering represents a big part in this process. For a successful production good access to an acceptable water source, fertile soil, and knowledge of using renewable resources are needed. According to the results 36.1 % of students were not interested in environmental engineering at all. The biggest interest (31.3 %) lies in renewable resources. Slightly less interest (25.3 %) was put in water management and the smallest interest (7.2 %) was in environmental soil science. Interestingly, 7.2% of students would recommend the study programme to a friend, although they personally are not interested in environmental engineering at all.

Table 9. Recommendation to the friends and interest in the engineering (Percentage)

		Would you recommend a friend to take agricultural education classes?		
		yes	no	Total
Are you interested in the environmental engineering?	<i>Water management</i>	9.6	15.7	25.3
	<i>Environmental soil science</i>	3.6	3.6	7.2
	<i>Renewable resources</i>	7.2	24.1	31.3
	<i>no</i>	7.2	28.9	36.1
Total		27.7	72.3	

For the adaption of proper experiences in agricultural and environmental engineering, it is necessary to have enough practical training, through which the knowledge can be transferred directly to the students. The students were asked, whether they have some practical training and if they have more than one placement during their studies. Figure 6 shows the results. The smallest amount of students (17 %) had only one practical training placement during their studies. 43 % of students had two or more training and 40 % of students of agriculture education had no practical training during their studies.

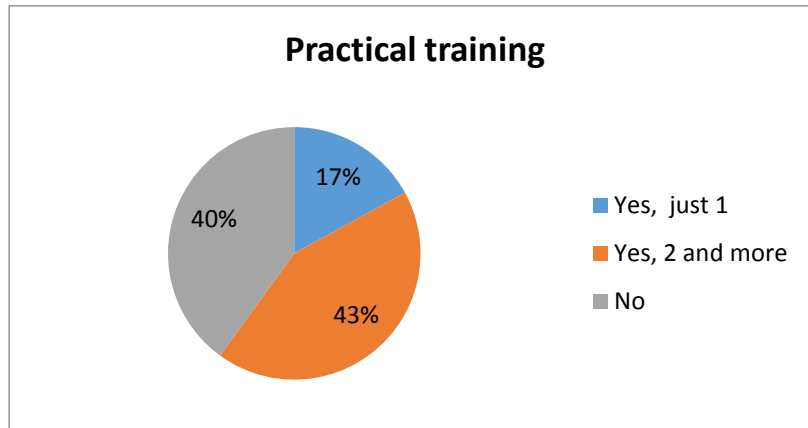


Figure 6 Number of practical trainings during study

School can motivate its students to better results in a few ways. One of them is providing a scholarship. Scholarship can be made available to the students with the best grades or for getting awards. Scholarships would also be a financial aid to students from low income families, who cannot afford to study otherwise. In every case it should motivate the students to do better. Figure 7 shows the scholarship situation in Iraq. The majority of students (96 %) answered that they cannot get a scholarship at their university. Only 3 % answered, that they could.

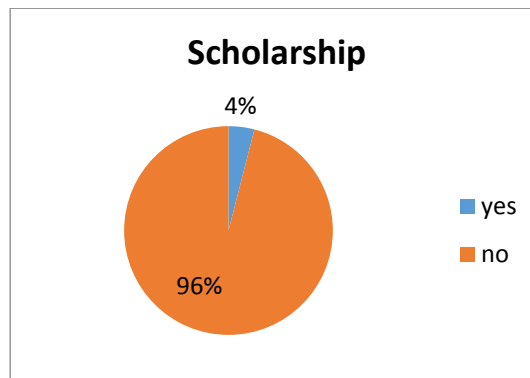


Figure 7. Can you get a scholarship at your university?

Good and experienced teachers are pillars of school education. They transfer their knowledge to the students. However, it is possible that some teachers do not have access to the newest approaches or researches. This is a reason, why it is beneficial to invite teachers from other countries to extend knowledge and teach students something new. According to Figure 8, foreign teachers taught a small percentage (18 %) of

students at university. There were 82 % of students who did not have a foreigner teacher at their university at all.

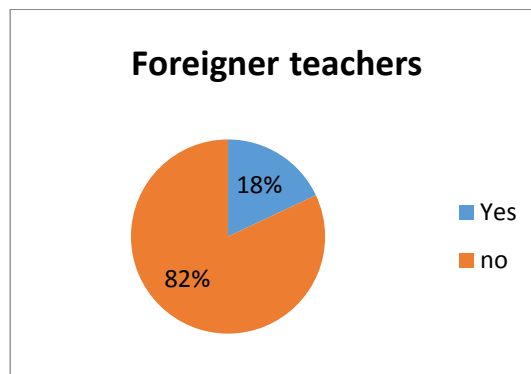


Figure 8. Do you have a foreign teacher?

For student it can be also beneficial to go and study abroad. There, students can improve social relations, improve foreign languages and obtain lots of information. Figure 9 and 10 show small comparison between how many students were studying abroad and how many students would go to study abroad if they would have an opportunity. Only 1 % of students were studying abroad but 78 % of students would jump at the chance to study abroad, if they had the opportunity.

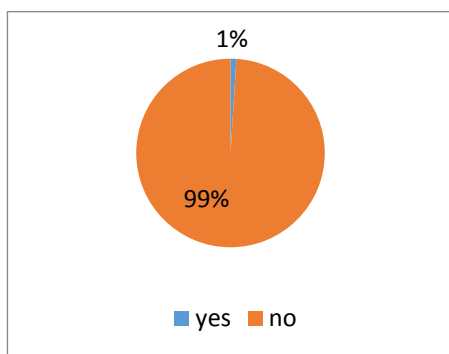


Figure 9. Have you been studying abroad?

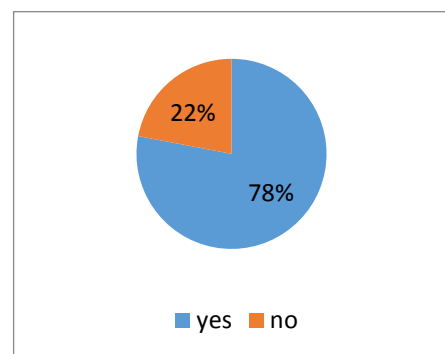


Figure 10. Would you go study abroad?

For further development of the agriculture sector, it is necessary to employ as many graduates as possible. Figure 11 shows what the students would like to do after graduation. The biggest percentage (21 %) of students chose to do business. 18% of students wanted to work as a teacher. 15 % would opt for further studies at another

university. Only 13 % of students would like to work in agriculture. 13 % of students chose a scientific career. 11 % of students would like to go abroad. Six percent would like to work as gainers and two percent would like to join the military after graduation. Finally, only one percent of students would like to work in a technological career.

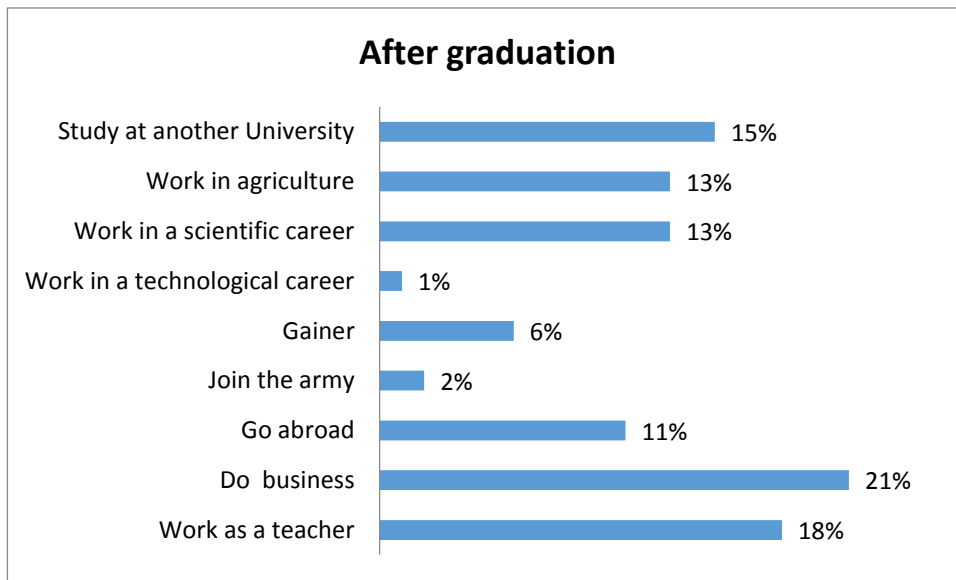


Figure 11. Post-graduation career

Post-graduation career can be affected, when students are still in school. For example, a school can host job fairs. In figure 12, 15 % of students stated that their school can help them finding employment. The majority of 85 % have to find employment opportunities by themselves without the help of their educational facility.

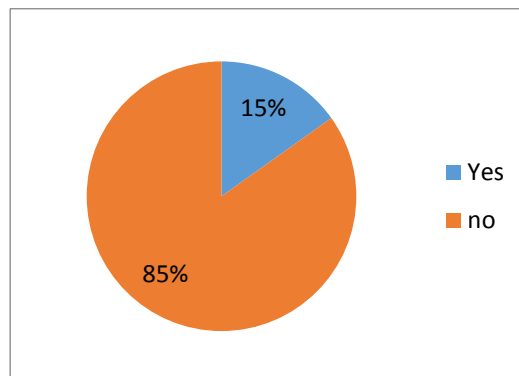


Figure 12. Help from school in finding a job

Perception of students

Following figures show the overall perception of students in agriculture and environmental engineering and their attitude of working in the scope. Figure 13 illustrates their willingness to work in agriculture. 20 % of students are highly motivated to work in agriculture. 19 % show still a high interest in working in this field. 22 % of students had no specific preferences concerning this matter. 15 % were reluctant of the idea and the majority of students (24 %) are completely averse to working in the agricultural field at all.

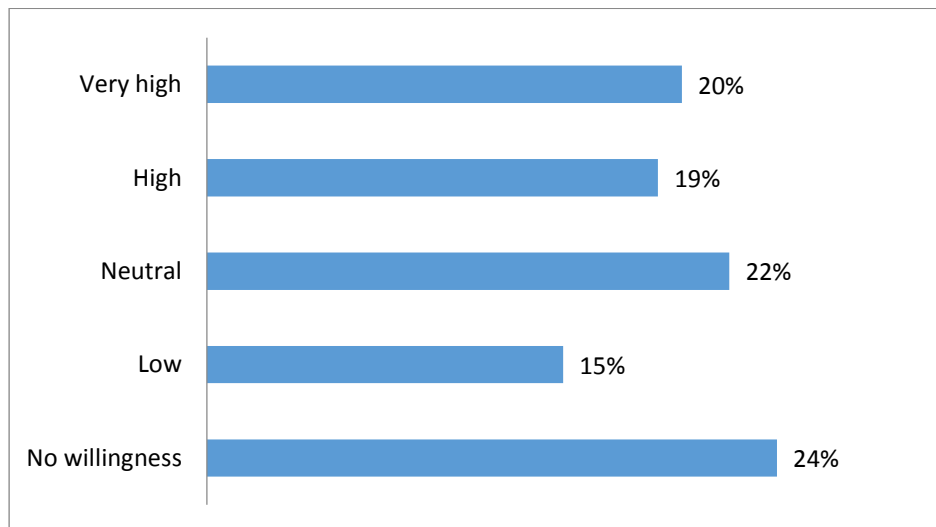


Figure 13. Willingness to work in agriculture

The next important part is to find out, how much the students learned during their studies. The biggest percentage of participation (41 %) claimed that they learned in the study programme "as much as usual". Almost one-third (32 %) have learned "less than usual" and seven percent of students learned almost nothing. 15% of students claimed to have learned "an exceptional amount" and five percent of students stated that they learned "more than usual".

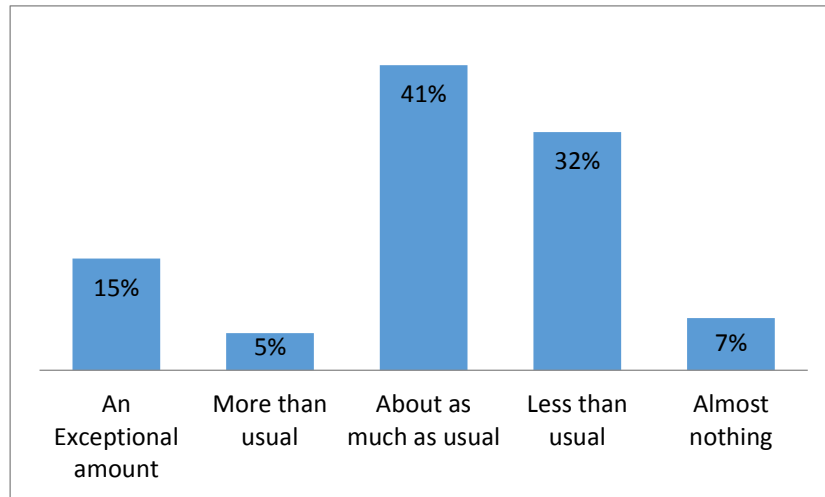


Figure 14. How much you learned in the study programme.

For a complete evaluation of the impact of agricultural education and relation of students to agriculture and environment, we need to look at the general knowledge of students in the field and their overall experience of working in the field. The following figure (Figure 15) is of help in creating a clear picture of the situation. The overall knowledge and overall experiences were in some answers almost similar. They relate to each other to some amount (see table 10). Just seven percent of students rated their overall knowledge as very good and even less students (5 %) claimed that their overall experience is very good. Quite a difference was shown in rating as good. 33 % of students answered that their overall knowledge was good while only 8 % of student rated their overall experience as good. There was no such difference in rating of satisfactory. The majority of students (41 %) were satisfied with the knowledge they received and one-third (34 %) claimed that their overall experience was satisfactory as well. 16% of students rated their overall knowledge as poorly, while 23% reported that their general experiences were lacking. Only one percent rated their overall knowledge inadequate and two percent of students claimed that they have not received any knowledge of agriculture and environment at all. Five percent of students claimed that their overall experience of working in agriculture and environment was insufficient and 25 % of students claimed that they do not have any experience at all.

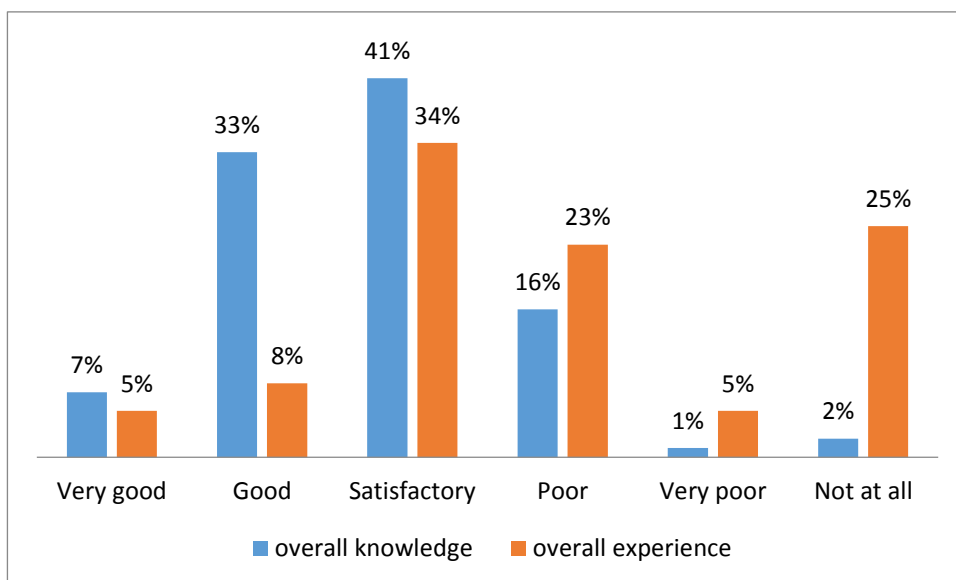


Figure 15. Overall knowledge and overall experience

Table 10. Correlation

		Willingness to work in agriculture	how much you learned	overall knowledge	overall experience
Willingness to work in agriculture	<i>Cor. Coeff.</i>	1	0.191	0.209	0.155
	<i>p</i>		0.084	0.058	0.299
how much you learned	<i>Cor. Coeff.</i>	0.191	1	.267	0.164
	<i>p</i>	0.084		0.015	0.140
overall knowledge	<i>Cor. Coeff.</i>	0.209	.267	1	.571
	<i>p</i>	0.058	0.015		0.000
overall experience	<i>Cor. Coeff.</i>	0.115	0.164	.571	1
	<i>p</i>	0.299	0.140	0.000	

There is a significant link between how much they learned and overall knowledge. The coefficient is 0.267 and significant at level 5%. The results show that if the amount they learn increases, the overall knowledge will increase as well. Another valid connection shows between experience in agriculture and overall knowledge. The coefficient is 0.571. This coefficient is significant at one percent level. This relation shows that if the experience in agriculture increases, overall knowledge increases too.

Willingness to work showed no important connection to the other factors. Based on the results, I can conclude, that agriculture education enhances overall knowledge, as well as previous experience with agriculture enhances overall knowledge.

4.2. Teachers' data

4.2.1. Descriptive statistics

To find employment opportunities for students after graduation, their overall situation has to be evaluated, not just based in the academic field but in wider perspective. Where do graduates mostly find employment? Where is the biggest need of graduates, in which field? Is the state willing to support them? Does the school educational system meet the demands of their needs in finding work after graduation? The next survey had participation of 73 people, mainly university teachers and some higher staff members of universities in Iraq.

Table 11 presents the areas, in which the graduates are employed the most and which sector they aim for. Only 16 % of graduates of agriculture universities are employed in agriculture. Ten percent are heading for employment in ministry and regional offices and another ten percent of graduates stayed in the academic field as teachers. Four percent of graduates are employed in extension and advisory and three percent are farming. Most of the graduates (57 %) are employed somewhere else or possibly unemployed.

Table 11. Employment of graduates

Where are your graduates most employed?	Frequency	Percentage
<i>Ministry and regional office</i>	7	10%
<i>Industry and agricultural services</i>	14	16%
<i>Extension and advisory</i>	7	4%
<i>Teaching</i>	10	10%
<i>Research and development</i>	0	
<i>Farming</i>	4	3%
<i>Other</i>	46	57%
Total	73	100%

The following figure (16) shows different sectors and percentage where the graduates are most needed. The biggest need of graduates (44 %) lies in management and planning. This could be due to the situation of post conflict reconstruction, in which Iraq is right now. The second biggest need of graduates is in agriculture mechanization along with soil and water engineering (both 16 %). Rural structures' need of graduates is 10% and just three percent of graduates are needed for storage and processing. Other sectors covered 10 % of graduates.

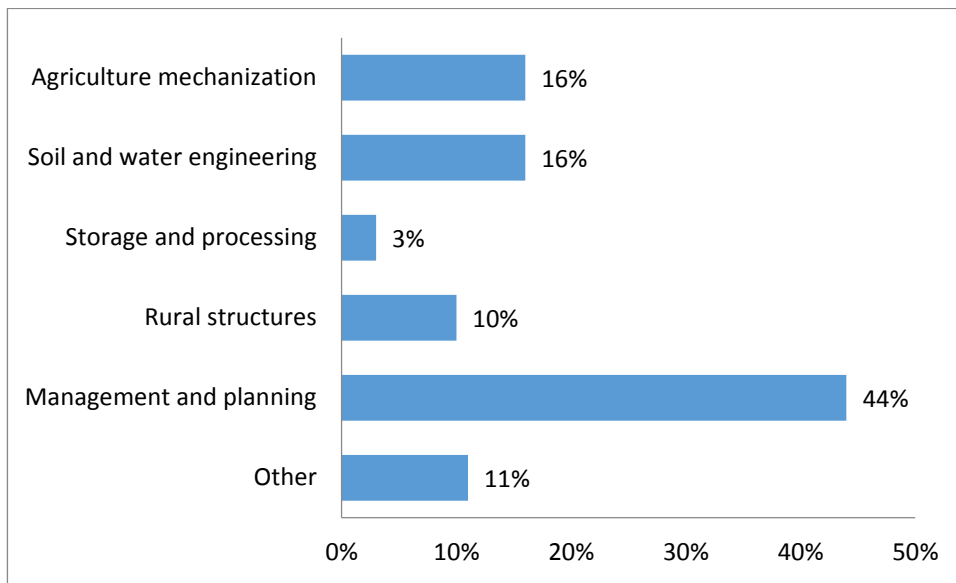


Figure 16. In which sector are graduates most needed

Each sector needs its specialists. Specialists can be graduates of high schools with certificates or the graduates of universities with diplomas. Each specialist is trained in his career. Figure 17 illustrates different sectors and compares where the biggest lack of engineers with diploma and technicians with certificate is. It is clearly visible that the biggest lack of engineers (38 %) and technicians (37 %) can be found in the agricultural mechanization. The situation in soil and water engineering is slightly better. The lack of engineers amounts to 16 % while lack of technicians is 12 %. The position in storage and processing is quite opposite. The lack of engineers accounts for less (10%) than the lack of technicians (16 %). The deficiency of graduates was the smallest for rural structures, with six percent of engineers and seven percent technicians needed. Management and planning are accountable for the second largest deficiency in engineers (18%) and technicians (11%). For other sectors, there was a bigger need in technicians (17 %) than engineers (12 %)

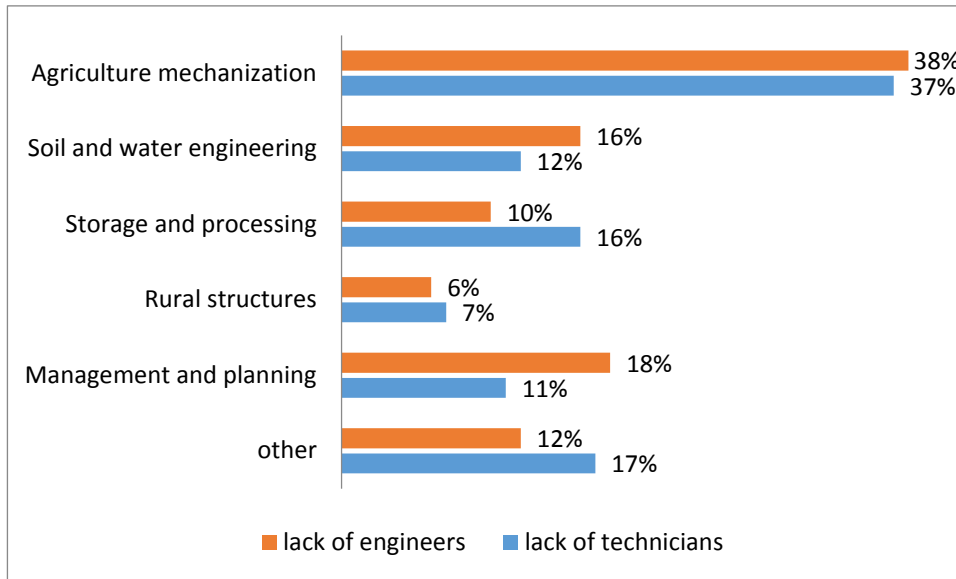


Figure 17. Lack of graduates in different sectors

To ensure that students will work in the field, an assessment of their relationship to their studies, to the scope, is helpful. Figure 18 shows an overview of the students' relationship to agriculture science. Six percent of students are very interested in this field of study. 21 % see their studies in this field in positive light and merely one percent had no association. 12% negatively associate with agriculture science. According to the many teachers and employees of universities in Iraq, 60 % of students of agricultural sciences studied only because of the degree they obtain.

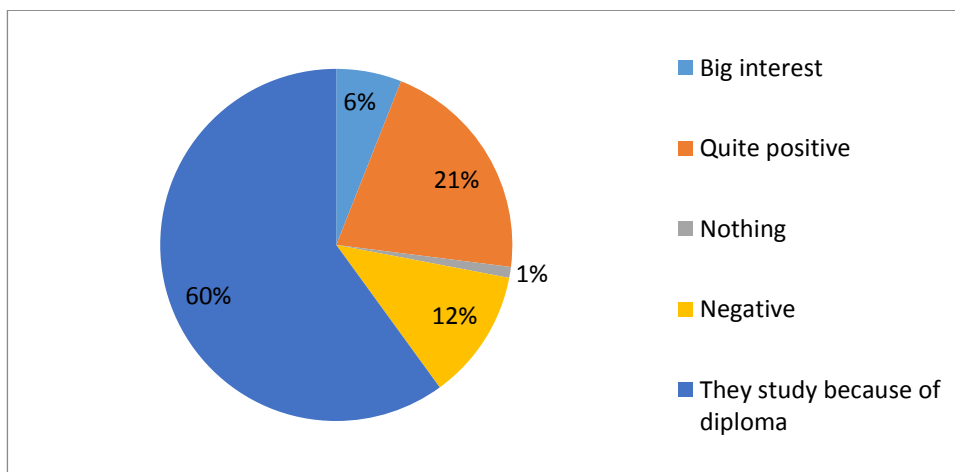


Figure 18. Student relationship to agriculture science

Another important aspect for students to think about, concerning their post-graduate career path, is how they see the state and what concerns they have about the schools and the agricultural sector. Will the state support them or do Iraq's interests lie somewhere else. The information gathered in table 12 reveal that only one percent of respondents think that the state invests into education and into other sectors. Just three percent say that the state supports students. According to 10 % of respondents, the state invests into development of the agricultural sector and the majority of respondents (85 %) claim that Iraq's interest lies in petroleum. This table also shows the opinion of resources for the modernization of the agricultural sector. Only 13 % of respondents think the state has enough resources for modernization. According to 20 % of respondents, the state has not enough resources for modernization. 67 % of respondents declare that the agriculture sector is not the focal point of interest for modernization. This table also shows that 62 % of respondents, who answered that the agriculture sector is not the focal point, also claim Iraq being mainly focused on petroleum.

Table 12. State and agricultural sector

		Are there enough resources to modernize the agricultural sector?			Total
		yes	no	Agriculture sector is not the point of interest	
Is the state Willing to make changes?	<i>State Invest into schools</i>	0%	0%	1%	1%
	<i>State Support of students</i>	3%	0%	0%	3%
	<i>Investments in the development of the agriculture sector</i>	6%	1%	3%	10%
	<i>No, petroleum is the point of interest</i>	4%	19%	62%	85%
	<i>Other</i>	0%	0%	1%	1%
Total		13%	20%	67%	

Some regions and provinces have established official requirements for agricultural graduates to employ in agriculture. It can be due the location, climate or water reserves. Figure 19 illustrates the general situation in Iraq. Almost all respondents (89 %) claim that their region has not established any official requirements for agriculture graduates. Only 11 % state the opposite; there are official requirements for graduates in their region.

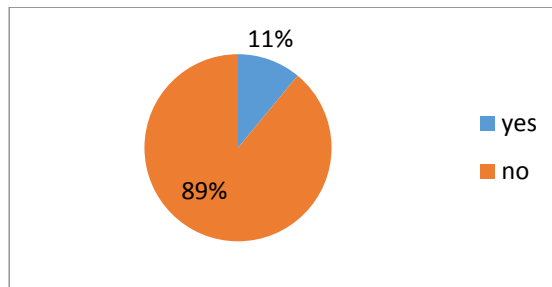


Figure 19. Requirements for graduates to be employed

A good development of the agriculture sector can be influenced by the system of education. The educational system should prepare the graduates at an appropriate level for serving the community and be beneficial. Figure 20 shows the opinion of respondents, whether the present system of education in agriculture engineering in their region is well suited for the prevailing conditions to serve the farming community. 21 % of respondents answered yes, they believe it is sufficient. Slightly less (19 %) replied no, that the system of education is not well suited. More than half of the respondents, exactly 60 %, have answered, that the present educational system of agriculture engineering is not entirely suited for condition and cannot cater functionally to the farming communities.

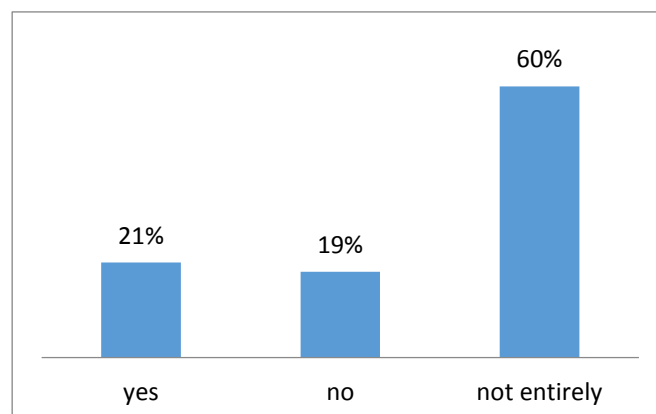


Figure 20. Is the system of education well suited to serve at an appropriate level

4.3. Proposal of syllabuses

4.3.1. Agriculture

The graduate of agriculture specialisation should be familiar with the basic agricultural terminology, the graduate should be able to recognize and ensure good conditions for livestock production and crop cultivation. They must understand the basics of ecology and the relationship between agriculture and natural resources and issues of sustainable farming practices, with respect to their ecological impact.

The graduate must have a good knowledge of crop and livestock production so that s/he can set up a good crop rotation, feed rations, establish appropriate farming deadlines and adapt those skills according to current needs in Iraqi practice, in order to make this farming model environmentally friendly and sustainable. Emphasis should be placed on the student's autonomy and communicativeness during his / her studies, work with computers and communication in English is essential, including understanding technical texts. They should be able to use and operate different mechanization means for work in agricultural operations and know the basic rules of their maintenance, adjustment and minor repairs as well as the management of larger motor vehicles and agricultural machinery.

The graduate must be able to assess the economic impacts of his / her activity, s/he must be familiar with the basics of accounting, financial and tax issues, s/he must pay attention to the economic use of raw materials and be able to ensure the effective functioning of his / her operation economically.

During their studies, students will learn to respect the principles of safety and hygiene at work on farms and how to pass them on to their future colleagues. Graduates will find employment as agricultural technicians and specialists in larger farms, in the manufacturing industry and its economic sectors, in quality control of agricultural products, but also as privately managed farmers, or in the state sector, in vicinity of the Ministry of Agriculture.

Table 13. Agriculture proposal

Grade	1		2		3		overall
Total weekly periods	34		34		34		102
Obligatory subjects	Hours	Lessons/ week	hours	Lessons/ week	hours	Lessons/ week	
Basic subjects	32		32		32		
Native language	3		3		3		9
English language	3		3		3		9
Introduction into agriculture	2		1		1		4
Mathematics	3		3		3		9
Introduction to environmental science	2		2		2		6
Introduction to biology and ecology	2		1			1	4
Agriculture Mechanization Plant + Animal husbandry			2		1		3
Plant production Date Palm Tree Plantations	2	1	2	1	1	1	5
Animal husbandry	2		2		1		5
Written and electronic communications	2	2	2	2	2	2	6
IT	2	2	2	2	2	2	6
Accounting	2	1	2	1	2	1	6
Basics of agricultural technology			2		2		6
Practice, Excursion	2	2	2	2	2	2	
Optional subjects							
Workshop Practice	1	1	1	1	1	1	3
Blacksmith Practicum	1	1	1	1	1	1	3
Agricultural Machinery	2	2	2	2	2	2	6

4.3.2. Entrepreneurship and Agriculture services

A graduate of the programme 'Entrepreneurship and Agriculture services' should have the skills needed for self-realization, s/he should have an overview of Iraqi's regions and their types of agriculture, s/he should be able to speak a foreign language and be able to communicate in common social and professional situations.

Furthermore, the graduate should understand the chemical and biological nature of plant and animal processes and should have knowledge of plant and animal husbandry under sustainable conditions of organic farming. S/he should be able to assess the condition of plants or animals and the suitability of the environment for their use by conventional methods breeding and implement these conditions in accordance with ethical management and well-fare.

The graduate must have a good theoretical background in the field of marketing and economics to be able to navigate the market economy and be able to use its knowledge in the purchase of raw materials, materials and technologies and vice versa, when selling products and semi-finished products. S/he should also be well-versed in accounting, fundamentals of fiscal, credit and financial management and be able to handle business correspondence, including in a foreign language and via computer.

The field of study will provide the student basic knowledge of agricultural machinery, machine parts and their use in agriculture, so that the graduate has an overview of agricultural mechanization and handle the principles of its activities.

However, the graduate must also be able to assess agricultural production in terms of its potential negative impact on the environment and its ecosystems so that s/he can eliminate adverse effects and protect the environment as a whole. Of course, they must have the necessary knowledge in the field of occupational hygiene, occupational health and safety.

The graduate of the study programme 'Entrepreneurship and Agriculture services' will find an employment in a wide range of sectors, whether they are primary production plants, independent agricultural activities in the private sector, in agriculture services, in breeding, seed and breeding organizations or in agricultural production companies. S/he will also find employment in the departments of the state agricultural

self-government and its organs, in the food industry, in rural regeneration services and in the landscape maintenance.

Table 14. Entrepreneurship and Agriculture services proposal

Grade	1		2		3		overall
Total weekly periods	34		34		34		102
Obligatory subjects	Hours	Lessons/ week	hours	Lessons/ week	hours	Lessons/ week	
Basic subjects							
Native language	1		1		1		3
English language	4		4		4		12
Geography and agriculture	2						2
Mathematics	3		3		3		9
Physics	2						2
IT	2	2	2	2	2	2	6
Introduction to environmental science	1		1		1		3
Introduction to biology and ecology	1		1		1		3
Economics and Business	3		3		3		9
Chemistry	1	1	1	1	1	1	3
Introduction to engineering	2	1					2
Introduction to agriculture mechanization	1		1				2
Statistics	1				1		1
Accounting	1		1				2
Optional subjects							
Finance and credits					1	1	1

4.3.3. Technician of an agriculture machinery

The graduate of this programme should master the repair of machinery, equipment and their functional components. S/he should be able to inspect the functionality after repair, be accustomed to basic manual and machine operations during assembly and disassembly and the preparation of simple electrical work directly related to the repair of the relevant equipment. The graduate should master different types of welding, oxygen cutting, driving larger motor vehicles, be able to operate more complex diagnostic equipment and use the results of their inspections to increase the operational reliability of agricultural equipment.

Furthermore, the graduate should have an overview of the basic relationships of his / her profession to the environment and the principles of its protection and should be capable to perform his / her work so that it does not affect the environment, but contributes to its improvement.

The graduate must know the principles of safety and hygiene at work and be able to operate fire-fighting equipment and know the fire protection regulations.

The study programme prepares graduates for the performance of the workers' profession as a technician of an agriculture machinery. After completing their studies, they can take up employment on farms and in other larger entities in the agrarian sector.

Table 15. Technician of an agriculture machinery proposal

Grade	1		2		3		overall
Total weekly periods	34		34		34		102
Obligatory subjects	Hours	Lessons/ week	hours	Lessons/ week	hours	Lessons/ week	
Basic subjects							
Native language	1		1		1		3
English language	2		2		2		6
Mathematics	3	1	3		3		9
Physics	2		1				3
Introduction to biology	1		1				2
Introduction to Automation	1		1				2
Vocational subjects							
Economy and organization					2		2
Technical drawing	2		2		2		6
Engineering technology	1.5						1.5
Engineering	2		2				4
Technology	1						1
Introduction to agricultural production	2		2		2		6
Agricultural machinery and equipment			3		3		6
Electro-technology			2.5		2.5		5
Practical Training		15		17.5		17.5	50

4.3.4. Water Management

The graduate of 'Water Management' should be familiar with the issues of management and planning of water resources management. The field provides information not only about the historical development of water management, the water cycle from its collection, treatment of drinking water, its transport, cleaning, and processing to wastewater treatment plants, chemical and biological, sewerage and irrigation systems. The programme will also prepare graduates in maintenance of potable water reservoirs, river basin maintenance technologies, amelioration and flood control measures, agricultural irrigation technology, and recycling of drinking water.

Special emphasis should be placed in understanding the ecological context between water management and water management in the landscape and in the rational and sustainable management of water resources so that they are well maintained and maintained for future generations. The graduate has to master the basic hydro biological minimum and should be familiar with the problems of aquatic ecosystems.

After graduation, the student can find employment for example in the state administration and in positions associated with the Ministry of Water Management. There are also job opportunities in the private sector, in places where the issue of water resources affects agricultural practice, for example drinking and service water supply and wastewater treatment.

Table 16. Water Management Proposal

Grade	1		2		3		overall
Total weekly periods	34		34		34		102
Obligatory subjects	Hours	Lessons/ week	hours	Lessons/ week	hours	Lessons/ week	
Basic subjects							
Native language	1		1		1		3
English language	2		2		2		6
Mathematics	2		2	1	2	1	6
Physics	3						3
Chemistry	3	1	2	1			5
IT	2		2		2		6
Vocational subjects							
Water resources	2		1		1		4
water management and planning	1		1		1		3
Water management systems	1		1		1		3
Water quality of water sources	2		1		1		4
Protection of surface and underground water resources	2	1	2	1	1	1	5
Wastewater treatment plants	1	1	1	1			2
Vegetation root treatment plants	2						2
Water Treatment Technology	2	1	2	1	1	1	5
Collection and treatment of drinking water	2	1	2	1	2	1	6

4.3.5. Blacksmith and Toolmaker

The graduate of the 'blacksmith and toolmaker' study field will master the technical terminology typical to the field and be able to use practical knowledge, rules and concepts in solving practical tasks. Graduates will be capable to read and understand drawings, diagrams, and other technical documentation and will be able to sketch simple parts and semi-finished products.

They will know the basic types of materials and semi-finished products used in engineering, including their labelling and properties important for their processing. They must be able to select and use auxiliary materials such as lubrication, cooling and tool maintenance, etc. The graduate will be familiar with the issues of basic types of machining, forming, casting, melting and welding, including refurbishment of the components.

For forging and machining of mouldings of lesser technological complexity, the graduate will be able to choose independently the operating procedure of the desired operation, including the choice of tools, jigs, gauges, preparation of workplaces and work aids such as furnaces and equipment for semi-finished products. For their further forcing or machining they will be able to prepare the necessary plating bath.

Graduates will also gain practical knowledge of welding and flame and arc welding, oxygen cutting and they will be apt to drive larger motor vehicles.

The adoption of the basics of fire protection regulations is necessary, including the knowledge and ability to use fire extinguishers. Furthermore, the control of the principles of protection against the effects of electric current and the ability to provide first aid in its intervention are vital.

The graduates should be able to make independent decisions, be aware of the responsibility for the results of their work, be able to maintain technological and work discipline, and cooperate with other workers.

The graduates in this field of study will find employment mainly in the production, maintenance and repair centres of agricultural machinery, tools and their components, or in related professions such as welder, locksmith, toolmaker, operating technician and the like. After completion of the relevant practice, they can start their own business in the field.

Table 17. Blacksmith and Toolmaker proposal

Grade	1		2		3		overall
Total weekly periods	34		34		34		102
Obligatory subjects	Hours	Lessons/ week	hours	Lessons/ week	hours	Lessons/ week	
Basic subjects							
Native language	1		1		1		3
English language	2		2		2		6
Mathematics	2		1		1		4
Physics	1		1		1		3
IT	1		1				3
Economy	1		1				2
Technical documentation	1		1				2
Vocational subjects							
Engineering technology	1	1	1	1			2
Engineering	1		1				2
Technology	2	1	2	1	2	1	6
Agricultural production and mechanization	1	1	1	1			2
Farriery	1		1				
Practical training							40-50

4.3.6. Recommendations

Students should have the freedom to choose a field that suits them and is in the interest of the society in which they live in; for example, the desired professions are blacksmith, plumber, as well as positions in technical fields in agriculture, entrepreneurship in the agrarian sector and others.

The proposal of new high education programmes in Iraq should be covered with a quality material background - the optimum type and status of school buildings with basic equipment such as study rooms, laboratories, exercise rooms with practical instruments, school canteens and sanitary facilities with acceptable hygiene conditions so that students can focus on learning, whether theoretical or practical.

In the educational approach, emphasis should be placed on teachers to promote a teacher-pupil dialogue. The practice of the Iraqi education system so far has suppressed such behaviour, but if we put more emphasis on discussion between the pupil and the teachers, we would raise a generation of students more capable of independent and innovative thinking.

Curricula for the main disciplines and sectors of the new educational programmes should be designed taking into account the demand in the current Iraqi labour market. This is one of the aspects that are deficient in the overall Iraqi education system.

The education system must be directly linked to all production sectors in which students may get access to practice by being accepted as trainees during their learning period. When they finish their education, they will find it easier to apply for employment in their sector, also thanks to the contacts and skills they have obtained as trainees.

5. Discussion

The Republic of Iraq is a country of many contrasts. Despite the fact, that the population is composed of more males than females, and the literacy rate is higher in males (WBa 2018), with 53 %, more female students than male students of Iraqi agricultural universities participated in our survey. According to the results of the questionnaires, only 13 % of students want to work in agriculture after graduation. Agriculture in Iraq has more than 10,000 years of history, but nowadays it is struggling and facing many problems. Iraq has encountered many challenges through the decades, including war and sanctions. All this heavily affected agriculture and education across the country. School buildings have been damaged, looted, infrastructure was interrupted. Food production decreased due to the destruction of water systems, irrigation facilities and many crop diseases spread (FAO 2018). Presently, with a more stabilised situation, there are many projects running for developing all of society's make-up, including education and the agricultural sector (IFAD 2017)

Education is an investment in human capital that pays off in terms of higher productivity (Bertelsmann Stiftung 2018). Even though the primary education is compulsory and is free at all levels at public school, there is a huge dropout rate of students and only a small percentage of students reach university education. This is caused by economic factors, such as persistent existence of child labour along the displacement of people due to the conflicts (EDPC 2018).

At the present, several organizations are active in developing the country; namely 'Framework for Reconstruction and Development', 'Iraq vision 2030', the 'National Development Plan' and the 'Recovery and Resilience Programme' (Abass S 2019; FAO 2018). Priorities of those programmes lie mainly in restoring Iraq's infrastructure as well as the education - and agricultural sector. There are evidently more items on the country's agenda that need prioritization, but every step is depended on labour force. People should be trained, skilled and understand that their help and effort is important and not overlooked. All of this can be taught in schools. University students can act as catalyst of their country's development. Results of the questionnaires showed that 75.9 % of students are aged 20-24. It could be consequent to the age composition in Iraq, with 56 % of the population being younger than 24 years (WBa

2018). The results also showed that almost 81 % of students are from urban areas, correlating with the almost 66 % of Iraq's total population residing in urban areas. According to the WB 19 % of the population is working in agriculture. It is not surprising that 28.9 % of students have a family member, who works in agriculture. The same amount of students have gathered practical experience in agriculture, but only ten percent have a farming background. In reality, the number could be higher, because 19 % of the population is employed in the agricultural sector, they have salaries. People, who are producing crops and animals for their livelihood, meaning they are living on their own produce, are not part of these 19%. This prompts the question, why the students study agriculture, despite the majority of them having no practical experience and the population working in agriculture is decreasing. Merely ten percent of students think an education in the field of agriculture will bring benefits to them and approximately 14 % of the students are truly interested. The rest of students study agriculture because of their parents (7 %) or because of the degree, they obtain from high schools, when they have no other options for studying at a university than an agricultural university. The survey was done during the term, when students could / could not choose university according to the scores of the final tests in secondary education. During writing this chapter, I received information from an Iraqi site that from the beginning of 2019 forwards, there will be a change in the school educational system and students are no longer dependent on their results of the final tests. Now they may choose freely the university they want to attend. Time will tell how this will change the enrolment factors and situation among the students in the future. For this thesis however, the previous model of the system has been observed. Since the change in the educational system occurred only in the beginning of 2019, the work on the thesis and the questionnaires' results are predating this newly developed circumstance. It was not foreseeable during the work on the thesis and the students, who took part in the survey, were not given such a perspective. The new information therefore is not to be considered in this thesis. Maybe the new situation will change students' sentiments towards an agricultural education, for only 27.7 % of students would recommend such an educational path to a friend, according to the survey.

For the restoration of agriculture and water systems across the country, it is substantial to educate people in environmental engineering. After the emergence of IS, the agriculture production decreased by 40 % (RFSAN 2016) and many water systems

were destroyed. (FAO 2018; IFRC 2019). 25.3 % of students are interested in water management. More than one third (36.1 %) are not interested in environment at all; this comprises water, soil and renewable resources. Their perception could change through the 'Recovery and resilience programme' in Iraq in cooperation with FAO, which is targets agriculture and water systems in 2018-2022. Positive experiences for students lie in practical training. 43 % of students have had two and more work placements, which can be very useful in many recovery programmes (UN Iraq 2018). On the other hand, 40 % of students do not have any training at all, but if they would, it might change their mind and perception of agriculture. A good motivation in students can lead to possible scholarships. A scholarship could be a reward for academically success, for research and for students in economic need. Only four percent of students answered that they have the possibility to apply for a scholarship for their schools. According to the document Iraq - Education in transition (UNESCO 2004), the isolation of provision of scholarships is one of the weaknesses of the school educational system at the time. In 15 years, this situation has improved only slightly.

With the access to quality education, inviting competent teachers from foreign countries can bring new knowledge and skills to schools. 18 % of students have foreign teachers in their schools currently. A big part in quality education takes the opportunity to study abroad. Even though it is possible for an Iraqi student to study abroad and 22% of students would gladly take the opportunity, only one percent of partaker in the survey went abroad. Top destinations for students are Ukraine, Malaysia, India or the U.S. (Al-Shaikhly S. & Cui J 2017).

As mentioned earlier, good access to quality education is not all. Willingness to work in the field of study after graduation is important as well. There has to be a will to participate in the country's development. Merely 13 % of students want actually to work in agriculture after graduation. The biggest percentage (21 %) wants to do business and slightly less (18 %) want to become teachers. Job fairs and career centres in schools would be helpful in finding their career paths. Only a low number of students have found employment through the help from their schools (15 %). Decent career centres could be links to the labour market (UNICEFa 2017, UNESCO 2004)

The students' perception of agriculture is not very good. There are 20 % of students, whose willingness of working in agriculture is very high and overall

willingness of 39 % is positive, but 24 % of students are not willing to work in agriculture at all. 39% perceive a career in agriculture negatively. The survey's results show that overall willingness of working in agriculture has no statistical relationship to the amount of how much students learned during studies together with overall knowledge of agriculture and not even with overall practical experiences obtained during working in agriculture and environment. The biggest percentage of students rates their overall knowledge (41 %) of agriculture and overall experience (34 %) as satisfactory. 25 % of students have no practical experience at all. One of the possible reasons of a not so positive attitude towards agriculture could be the fact that Iraq is an oil country and one of the biggest oil exporters in the world (WBb 2018). Other possible causes will be described further. This opinion was supported from Iraqi students studying in the Czech Republic, who were helping me with trial runs of the survey and the translation of the questionnaires. Another confirmative fact is that a mere 14 % of students of agricultural universities are really employed in agricultural sector. With unemployment of 34.6% (some sources say even 50 %), the agriculture sector in Iraq represents a huge potential for graduates. (WBd 2017). According to the official reported data by the government, the unemployment is about 14.8 %. Together with the fact that the country had been struggling for many years, millions of people were displaced and many infrastructures were destroyed, gathered from data, estimated by the organizations (FAO, UNICEF; WFP) which are operating in the country.

The results of the survey display that the biggest need of graduates lies within the management and planning sector followed by the agricultural sector in second place. The agriculture sector covers mechanization, soil and water engineering, storage and processing. Agriculture is not only about rummaging around in soil. To fulfil 'Vision 2030', which covers many SDGs for improving environmental conditions and life condition for humans, it is necessary to increase the workforce and fill the labour market. (UNDP 2018) All those create opportunities for graduates of agricultural schools, not only universities, but even different high schools, vocational schools and training centres. It is not a thing of impossibility, with 6.2 million of students at primary schools, 2.7 million of students at secondary schools (MoE 2016) and more than 250 thousand of university students (Abbas A 2017). The biggest lack of agricultural engineers and agriculture technicians across Iraq is in mechanization. Engineers are also highly needed for soil and water systems. While the second biggest lack of technicians

is found in the storage and processing sector. One of the organizations responsible for job opportunities in agriculture and supporting them is USAID. Since 2007, it has created more than 14.7 thousands of jobs in agricultural sector (USAID 2019). As mentioned before, students' attitude towards agriculture is not very positive. According to the second questionnaire, 60 % of students have elected agricultural studies for the sole purpose of receiving a diploma at graduation. Only one quarter of students has a positive attitude towards or is interested in agriculture. Despite the fact that there are many organizations operating in Iraq, which target it is to increase awareness and access to agriculture along with access to good quality education, and the state is involved in each development projects. The question is why the students perceive a perspective path in agriculture negatively. Maybe the participation is not enough. People must have leading examples. They must see involvement and effort to change something. The majority of respondents of the teaching staff questionnaire from Iraqi universities are convinced that the state is solely interested in petroleum. Only ten percent think the government invests adequately in the development of agriculture. Merely one percent believe Iraq invests sufficiently in the school system. Looking at another example, almost 70 % of respondents say that the resources are not used for development of agriculture, because the agricultural sector is not the government's point of interest. Only 13 % are convinced that the state spends enough resources on the development of agriculture. There is a possible huge rift between the perception of state and students regarding the overall situation of the agricultural sector. Although it holds the most opportunity for employment in any work field in the country, more than 90 % of food has to be imported (Abi-Ghanem R at al 2013; Wegvoraus 2017). Taking into consideration the diverse geography of Iraq and the through past conflicts to different degrees destroyed areas and provinces, it is not a surprise that some regions have established official requirements for graduates which to fit the needs of locality. On the other hand, 60 % of respondents are convinced that the present educational system of agriculture is not well adapted to the prevailing conditions and it does not serve the farming community well.

Upgrading or reforming the educational system is one of the components of the country's 'Recovery and resilience programme' prepared by the UN (FAO 2018) and the 'National development plan' prepared by the Iraqi government. (MoP 2018). This includes higher investments into education, preparation or modification of the

curriculum, according to modern standards and needs. The new systems should decrease the illiteracy rate as well as the dropout rate. The education should be made more available to the poorest and the enrolment of students in schools should increase. Financial support should also be made available to students of low-income households and poor family backgrounds. The chance of an education should not be diminished or entirely prevented through poverty. It is each human's given right to be educated, no matter the social status. When the nearest source for education is kilometres away, the state needs to make it possible for the student to be able to attend school. Everybody should receive the same chance at education, no matter the social status, background or gender.(WBc 2018; WFP 2015) The government should place incentives for good exam results, motivation and student morale. Connections between engineering and labour market, e.g. in agriculture, should be established.

A possible proposal of new high educational curricula/syllabuses is presented in chapter 4.3. Those syllabuses were prepared after interviews with former Iraqi students and Iraqi people living in the Czech Republic, who are familiar with the situation in their country and know the best what is needed the most. The survey's findings are also reflected in the planning of the syllabuses alongside inspiration taken from the recovery plans of the country. The proposal is focused on theoretical and practical knowledge, which students obtain during the course of studies. During their studies, students will be connected to the labour market through, e.g. job fairs and career centres. Having already made connections in the work field during school will make it much easier for students to find employment after graduation. The proposal contains a wide range of subjects from classic courses such as Agriculture, Entrepreneurship and Mechanics but also offers courses in water management, smithery and toolmaking. In each programme, students are taught the English language, for a higher chance to find employment and because they should be able to find and read the newest research articles from all over the world. In the proposal, military training has no part in the syllabus, which was part in curriculums in 2004 (UNESCO 2004).

It will take some time for the educational sector to be fully restored. In some regions (Al-Falluja, Mosul) war against IS destroyed 62 % of all school facilities (WBe 2018). For the country to thrive, it is vital now, to impose a friendly policy towards the environment, supporting new approaches in the agricultural education and agriculture

sector (Bertelsmann Stiftung 2018). It is also of great importance to employ well trained teachers and experts. Teachers should be motivated and they should follow the syllabuses and do not skip subjects according to their preferences. During the trial run-through of the survey, Iraqi students have reported of this being quite common and happening all the time. Teachers picking only topics of the syllabus they like, purposely ignoring topics they dislike and are not comfortable in teaching, is not exemplary behaviour and leaves bad impressions on the students. All educational buildings should be properly equipped with libraries and other technical equipment, which should be provided by MoP.

Nowadays Iraq has the potential to restore its reputation in education and restore the agricultural sector to become more self-sufficient. With the right resources and educated and motivated people, they could even restore an old system of Floating Basket Homes in Iraq so called "Ma'dan" (Britannica 2018; Piper-Burket E 2011) which is shown in Figure 21. This unique ecosystem has been almost completely lost in 1990s. The conditions of the Tigris – Euphrates marshlands once made it possible for people to cultivate crops and had livestock. In modern Iraq, with now available possibilities and with good agriculture engineering, it is possible to save and restore this example of for people well-functioning agricultural history. Many NGOs are operating in Iraq and their experts are training local people to be able to share their knowledge. Those experts instruct local people on how to apply the newfound knowledge. It is an initial spark; the next steps depend on the Iraqi people and their effort to change something. They will have to pass on their knowledge, show others how to do it. Education destroys barriers and is a key to progress.



Figure 21. The Floating Basket Homes of Iraq - Ma'dan

Source: Britannica 2018

5.1. Limitations of the research

One of the limitations of this research was the willingness of students and teaching staff to participate. Due to the voluntary participation in the survey, the amount of respondents was not very high. Another obstruction appeared in the online survey, concerning the honesty of online partakers. Problems have also risen in open formulated questions, where the respondents should state their answers with one or two words. Some respondents opted to fill in the spaces with comma, full stop, or even emoticons, so open questions could not be evaluated and the results could not be used. The next obstacle is represented in data. A huge amount of the data is outdated and various new data related and relevant to the thesis can be found through different channels, but it is hard to ascertain the correct information. There is not enough scientific articles related to the topic of this thesis, which would be up to date. Due to the low number of respondents, the analyses are not statistically significant and further research for gathering more data would be required.

6. Conclusion

Through war and turmoil, Iraq's self-dependence has suffered. What could be one of the biggest fields of employment has been pushed aside, undeservedly. A country once as progressive as the West and not standing back in any way was thrown into medieval ages, through hardship, oppression and destruction. Since then, Iraq had to resurface, heal its people and land. It is hard to change the mindset of people. Years long of indoctrination through dictatorship, war and tyranny does not suddenly change once war is over. People's minds have to be changed. They have to see that their country can thrive again, if they invest in it, meaning not just one area such as oil, but the whole. People still think that the oil industry is where the money is at, where there are jobs available, that it is the future. They look upon agriculture; they might think it is outdated, hard labour for small wages, having to slave away on a field. The thing is though, that agriculture offers many employment opportunities. There is a wide array of university degrees, training and schooling available, such as listed in the syllabus proposal. Agriculture is a source of employment and food. It will always exist; there will always be a need in it. Oil however, is not a renewable resource. There are not endless quantities of jobs; and if one day petroleum occurrence dies down, those jobs will be gone. Another argument is, oil does not profit the whole country, if so, the country wouldn't need the outside world to help recover from its destruction and would already be thriving again. The oil industry mainly profits the rich, there is a great divide. Iraq relies to 90% on imported goods. Investing in its agriculture and agricultural engineering would further more economical independence. Adapted education to the country's needs will be vital in restoring it. The proposal of syllabuses was also planned regarding the environment. Today, agricultural studies convey means of working the land in economically and environmental-friendly ways. In order to get the most profit out of the land, you have to respect its regional make-up. Students having access to the proposed curriculum will be able to analyse the nature of climate, soil and water and will gain the knowledge on how to adapt the methods of work for a frugal harvest in their specific region.

Iraq needs to see its potential in agriculture and the need of better education. The future of many depends on it. All those not having the means or opportunity of a higher education or training would jump at a chance to be involved in developing their country.

The government's investment in rebuilding schools and other educational facilities as well as improving the conditions of buildings and accessibility to further education would directly flow back into the country, once the students graduate and start working. This is a cycle of progress. The government would not be left empty-handed, having only invested in something but not receiving anything in return. The whole nation will be at the receiving end and will prosper.

Agriculture is Iraq's future. The time has come for it and the chances it gives to people, to be acknowledged. The faith of people in their government is weak. The state has to show its willingness to improve and move on in order for people to start trusting in a better future.

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Appendices

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Appendix 1: Questionnaire 1

Iraq - Education in agricultural and environmental engineering

Questionnaire for students to MSc thesis

- 1) Name of your school/University/ اسم مدرستك /ت زانكوكه ناوى
- 2) What is your gender? / الجنس/ز گه ره
 - a) Male /ذكر/نير
 - b) Female /انثى/مى
- 3) How old are you? /نده چه نت مه ته? كم عمرك
 - a) 15-19
 - b) 20-24
 - c) 25-29
 - d) over 29 /اكثر من 29 /رو سه
- 4) Where have you lived most of your life? / بر دووه؟ ر سه به كوئ له ژيانت كاتى زوورترين/ أين عشت معظم حياتك
 - a) Urban /مدینه/شار
 - b) Rural /قرية/لادئ
 - c) Suburb /ضاحية/ شاروچكه
- 5) Do you have a family member that works in agriculture? / له تان كه خيزانه له سيك كه هيچ هل لديك فرد من العائلة يعمل في الزراعة؟/؟ كات ده كار كشتوكالدا بوارى
 - a) Yes /نعم/لى به /من؟ /يه؟ كى /Who
 - b) No /لا/خير نه
- 6) Do you have some previous practical experience in agriculture? /كار كردنت زمونى نه هيچ/ هل لديك بعض الخبرة العملية السابقة في الزراعة؟/كشتوكالدا؟ بوارى له پيشودا له يه هه
 - a) Yes /نعم/لى به
 - i) From previous school/ من المدرسة السابقة/قوتابخانه له

- ii) From part time job/ من وظيفة بدوام جزئي /كار ر سه له
- iii) I am from a farmer family/ جوتيارم خيزانيكى له خوم /أنا من عائلة تعمل في الزراعة
- iv) Other/ أخرى /تر هوكارى/
- b) No/ كلا /خير نه
- 7) How did you enrol to the faculty? كيف التحقت /بخووينيت؟ كشتوكال شى به له دا بريارت چون /بكلية الزراعة ؟
- a) I have a friend in the class/ لدي صديق في الفصل /م هاوريكه ر به له
- b) I am interested in working in agriculture scope/ بكه كار كشتوكال بوارى له م كه ده ز حه /أنا مهتم بالعمل في مجال الزراعة /م
- c) I am interested in agricultural science/ أنا مهتم بالعلوم الزراعية /كشتوكاله زانستى له زم حه
- d) Because of my parents/ بسبب أهلي /باوكم و دايك داواى ر سه له
- e) I was placed in the class/ لقد وضعت في الفصل /دانرام شه به م له خوم ويستى بى به
- f) I believe that agricultural education will benefit me later in life/ وايه رم باوه /أن التعليم الزراعي سوف يفيدني لاحقا في حياتي/نيت يه كه ده بى سودم داهاتودا له كشتوكال بروانامى أعتقد
- g) Because of my degree in high school/ بسبب /ندى دواناوه ي قوتابخانه له م كه نمره هوى به /شهادتي الثانوية
- h) Other/ أخرى /تر هوكارى/
- 8) Are you interested in the environmental engineering? (If yes ... in which sphere) ثايا /أنت مهتم / (بواردا كام له بكه ديارى - لى به ر كه نه) يه؟ هه بى زينكه نذازيابى نه بوارى له زت حه ؟(اذا كانت الإجابة نعم .. حدد في أي مجال) هل بالهندسة البيئية ؟
- a) Water management (water treatment, waste water management, water “harvest”, irrigation etc.) /ثاويه رو باشه بردنى ريوه به ثاو ركردنى سه جاره)رو ثاوه و و ثا بردنى ريوه به /، الري ، المياه "حصاد" ، إدارة مياه الصرف الصحي ، معالجة المياه (المياه إدارة) (هند و ثاودان- كان الخ)
- b) Environmental soil science (soil degradation, soil erosion control, land use, soil contamination, anthropocentric soils, etc) /ر به خاك ي وه بونه شى) خاك بى زينكه زانستى/ علوم التربة / (هند ستركرد ده خاكى خاك بونى بيس خاك هينانى كار به خاك داخورانى ي وه بونه نكار التربة الاصطناعية، تلوث التربة ، استخدام الأراضي ، مكافحة تآكل التربة ، التربة انجراف) البيئية الخ ،
- c) Renewable sources of Energy (solar, wind, water, biomass) /وه بوه نوى ي رجاوه سه / (الطاقة الشمسية) مصادر الطاقة المتجددة /ثاو با خور تيشكى) (وه ي الكتلة الحيوية ، المياه ، الرياح ، الطاقة الشمسية)
- d) No/ لا /نيه كرنك وه مه لا به خير نه

- 9) Would you recommend a friend to take agricultural education classes?/ ده بيشنيار نايا / هل تنصح صديقك بدراسة الهندسة الزراعية؟/بخوينيت؟ كشتوكال شى به له كه ت هاوريكه بو يت كه
 a) Yes/ نعم /لى به
 b) No/ لا/خير نه
- 10) Do you have some practical training during your study?/ هه بيت كرده راهينايكى هيچ نايا / هل اكتسبت بعض التدريب المهني من خلال دراستك ؟ /تدا؟ كه خويندنه ى ماوه له به
 a) Yes, just 1/ نعم مرة واحدة فقط /جارك يه نها ته لى به
 b) Yes, 2 and more/ اكثر من مرة /جاريك له زيآتر
 c) No/ كلا /خير نه
- 11) Can you get scholarship at your university? /زانكو؟ له كريت رده وه ماددى كى هاوكاريه هيچ ؟ هل يمكنك الحصول على منحة دراسية في جامعتك ؟
 a) Yes/ نعم /لى به
 b) No/ لا /خير نه
- 12) Do you have some agricultural specialist (environmental engineer) as a teacher from other countries? وه ولاتيكيتره له كه يه هه ت زانكوكه له كشتوكال بواري له پسپور ماموستاى نايا ؟ هل لديك بعض المتخصصين الزراعيين (مهندس بيئي) كمدرس من دول اخرى ؟ /هاتبيت؟
 a) Yes/ نعم /لى به Where from? له ؟ /كوى؟ له ؟
 b) No/ كلا /خير نه
- 13) Have you been studying at some university abroad? (if yes, specify)/ هيچ له نايا / هل كنت تدرس في جامعة في الخارج ؟ /خويندوته؟ زانكو ولاتيكيترله
 a) Yes/ نعم /لى به
 b) No/ كلا /خير نه
- 14) If you would have an opportunity, would you go to study agricultural and environmental engineering education abroad?/له يت كه ده ز حه بيت هه بواري ر كه نه/ إذا سنحت لك الفرصة ، فهل /بخوينيت؟ يى زينكه ندازياري نه و كشتوكال زانستى كى ره ده ولاتيكي سترس تعليم الهندسة الزراعية والبيئية في الخارج ؟
 a) Yes/ نعم /لى به
 b) No/ لا/خير نه
- 15) How much do you feel you have learned in this study programme? و له بويت فير ند جه ؟ كم تشعر بأنك تعلمت في هذا البرنامج الدراسي ؟ /خوينيت؟ ده تبيدا كه ى شه به

- a) An Exceptional amount/ كمية كبيرة /زور زور
- b) More than usual/ أكثر من اللازم /بيويست له زياد
- c) About as much as usual/ كالمعتاد /بيويست شى به
- d) Less than usual/ أقل من المعتاد /بيويست له متر كه
- e) Almost nothing/ لا شىئ /يوم نه فير هيچ

16) What would you like to do after graduating?/ ماذا /خويندن دواى له يت بکه چى يت که ده ز حه
تريد أن تفعل بعد التخرج ؟

- a) Study at another University/ أدرس في جامعة أخرى /بخوينم کيتر زانکويه له
- b) Work in agricultural/ أعمل بالمجال الزراعي /م بکه کار کشتوکالدا بواری له
- c) Work in a scientific career/ أعمل بالمجال العلمي /م بکه کار زانستيدا بواریکی له
- d) Work in a technological career/ أعمل بالمجال التكنولوجي /لوجى کنه ته بواری له م بکه کار
- e) Gainer/ کاسب /کاسبى
- f) Join the army/ التحق بالجيش /م بکه سوپاوه به ندى يوه به
- g) Go abroad/ أسافر خارج البلاد /ولاتى وه ره ده برومه
- h) Do business/ أمارس الأعمال /م بکه بازرگانى
- i) Work as a teacher/ أعمل كمدرس /ماموستا به بيم

17) Does your school help to you in finding a job in the agricultural or environmental sector?/ هل /کشتوکال؟ بواری له کار لى هه ى وه دوزينه بو کات ده هاوکارييت ت خويندنگاکه نایا /
تساعدك مدرستك في العثور على وظيفة في القطاع الزراعي أو البيئي؟

- a) Yes/ نعم/لى به
- b) No/ كلا/خير نه

18) How much is your willingness to work in agriculture or environmental engineering sphere?/ ما مدى /يت بکه کار پيدا زينکه ندازيارى نه يان کشتوکال بواری له خوازيت ده ند جه تا نایا /
استعدادك للعمل في مجال الزراعة أو الهندسة البيئية؟

- a) Very high/ كبير جدا/زور بريکی به
- b) High/ كثير /باش بريکی به
- c) Neutral/ متوسط /ند مامناوه
- d) Low/ قليل /خوازم ده م که
- e) No willingness/ غير مستعد /ناخوازم

19) Your overall knowledge about agriculture and environment is / بواری له زانياريت ناستى /
كم مقدار معرفتك عن مجال الزراعة و البيئة ككل ؟ /نده؟ چه دا زينکه و کشتوکال

- a) Very good/ جيد جدا /باشه زور
- b) Good/ جيد /باشه
- c) Satisfactory/ متوسط /نده مامناوه
- d) Poor/ ضعيف /لاوازه

- e) Very poor/ لاوازه زور /ضعيف جدا
- f) Not at all/ نازانم هيچ /لا املك أي معلومات

20) Your overall experience of working in agriculture and environment is:/ زمونی ئه ند چه

تجربتك العامة في العمل في الزراعة والبيئة هي/دا؟ زينکه و کشتوکال بواری له به هه کارت

- a) Very good/ جيد جدا /باشه زور
- b) Good/ جيد /باشه
- c) Satisfactory/ منوسط /نده مامناوه
- d) Poor/ لاوازه /ضعيف
- e) Very poor/ لاوازه زور /ضعيف جدا
- f) Not at all/ ليس لدي أي معلومات /نازانم هيچ

Appendix 2: Questionnaire 2

Iraq - education in agricultural and environmental engineering 2

Questionnaire for teachers to MSc thesis

- 1) Where your graduates are most employed? ده خويندن دواى له تان كه كوليجه رچوانى ده /
أين يتم توظيف الخريجين من كليتك عادة؟ /ن؟ كه كارده كوى له زورى
 - a. Ministry and regional Office/ كان ناوخوييه شوينه و تى رايه به ريوه به له /
الإقليمي
 - b. Industry and agricultural services/ كان كشتوكاليه تگوزايه خزمه و كارگه له /
الخدمات الزراعية و الصناعية
 - c. Extension and advisory/ كان كشتوكاليه رينمايه تى رايه به ريوه به له /
الارشاد و التمدد الزراعي
 - d. Teaching/ التدريس /ماموستا بنه ده
 - e. Research and Development/ البحث و التطوير/ندن سه شه گه و وه تويژينه شى به له
 - f. Farming/ الزراعة/جوتيار بنه ده
 - g. Other/ أخرى /تر كارى
- 2) In which sector are graduates most needed? ده خويندكارى به پيوستى زياتر ريك سيكته چ /
أي قطاع زراعي يحتاج للخريجين أكثر؟ /به هه رچو
 - a) Agriculture mechanization/ المكننة الزراعية/كشتوكال كردنى نامير به
 - b) Soil and water engineering/ هندسة التربة و المياه /و نا و خاك نذازيارى نه
 - c) Storage and processing/ المعالجة و التخزين /وچاكردن لگرتن هه
 - d) Rural structures/ الهياكل الريفية/نشين گوندى بيكهاته
 - e) Management and planning/ الإدارة و التخطيط /دانان پلان و كارگيرى
 - f) Other/ أخرى /هيتر
- 3) In which sector is the biggest lack of Agricultural engineering graduates? ر سيكته / كام
أي من القطاعات يعاني نقصا في خريجي الهندسة /يه؟ هه كشتوكالى نذازيارى نه به پيوستى زياتر
الزراعية؟
 - a) Agriculture mechanization/ المكننة الزراعية/كشتوكال كردنى نامير به
 - b) Soil and water engineering/ هندسة التربة و المياه /و نا و خاك نذازيارى نه
 - c) Storage and processing/ المعالجة و التخزين /وچاكردن لگرتن هه
 - d) Rural structures/ الهياكل الريفية/نشين گوندى بيكهاته
 - e) Management and planning/ الإدارة و التخطيط /دانان پلان و كارگيرى

- f) Other/هتير/أخرى
- 4) In which sector is the biggest lack of Agricultural technicians? (trained to diploma or certificate) أي من كان ييه بيشه شه به رجوانى ده بو يه هه بيويستى ترين وره كه ر سيكته م كه له (مدربة على الدبلوم والشهادة الجامعية)القطاعات يعاني من النقص في الفنيين الزراعيين \
- a) Agriculture mechanization/المكننة الزراعية/كشتوكال كردنى ئامير به
b) Soil and water engineering/هندسة التربة و المياه/و ئا و خاك نذازيارى ئه
c) Storage and processing/المعالجة و التخزين/وچاكردن لكرتن هه
d) Rural structures/الهياكل الريفية/نشين گوندى بيكهاته
e) Management and planning/الإدارة و التخطيط/دانان پلان و كارگيرى
f) Other/هتير/أخرى
- 5) What relationship is between students and agriculture science? قوتابى نيوان ندى يوه په / ما هي العلاقة بين الطلاب و العلوم الزراعية چونه؟ كشتوكال زانستى و
- a) Big interest/علاقة قوية/هيزه به زور
b) Quite positive/علاقة ايجابية/رينيه ئه كى نيه يوه په
c) Nothing/لا توجد علاقة/نيه ك نديه يوه په هيچ
d) Negative/علاقة سلبية/رينيه نه كى نديه يوه په
e) They study because of degree/يدرسون لتحصيل الشهادة/خويند ده كه بروانامه ر به له نها ته فقط
- 6) Are there enough resources to modernize the agricultural sector? ى رچاوه سه ئايا؟ هل هنالك موارد كافية /وه؟ ته وله ده ن لايه له كشتوكال رتى كه كردنى ميانه رده سه به بو يه هه بيويست لتحديث القطاع الزراعي ؟
- a) Yes/نعم/لى به
b) No/لا/خير نه
c) Agriculture sector is not the point of interest/لا /نادريت پى كرنكى كشتوكالى رتى كه يوجد اهتمام بالقطاع الزراعي
- 7) Is the state willing to make changes?/يکات؟ گورانكارى وبيت يه ده ت وله ده ئايا تو بوچونى به / هل الدولة على استعداد لأجراء تغييرات ؟
- a) State Invest to schools/الدولة تستثمر في /دات ده خویندنگان به گرنكى زياتر ت وله ده/المدارس
b) State Support students/الدولة تدعم الطلاب /کات ده خویندنکاران پشتگيرى ت وله ده

- c) Investments to development of Agriculture sector / شه گه بوكات ده هينان ر به وه / استثمارات لدعم القطاع الزراعي / كشتوكال رتي كه بيداني
- d) No, petroleum is the point of interest/ دريت ده پي گرنكي وت نه نها ته / كلا, الدولة تهتم فقط في النفط
- e) . Other/ هيتير / أخرى .
- 8) Should the study program be shorter / compact/ more tailored to the region needs? ده زراندي دامه بو كردوه دياري نديك هه ت كه ناوچه نايا كه؟ هل ناوچه له كان پيوستيه ر سه بخاته رنج سه زياتر لام به بيت تر كورت خويندن ي ماوه پيوسته نايا | يجب أن يكون برنامج الدراسة أقصر / مضغوط / أكثر ملاءمة لاحتياجات المنطقة
- 9) Does your region have established any official requirements for agricultural graduates to employ in agriculture? ده زراندي دامه بو كردوه دياري نديك هه ت كه ناوچه نايا | هل وضعت منطقتك أي متطلبات رسمية للخريجين الزراعيين للعمل في كوليحي رجواني كشتوكال؟ هل | هل وضعت منطقتك أي متطلبات رسمية للخريجين الزراعيين للعمل في كوليحي رجواني الزراعة؟
- a) Yes/ نعم /لى به
- b) No/ لا/خير نه
- 10) Is the present system of education in Agriculture Engineering in your region well suited for conditions at an appropriate level to serve the farming community? نايا هل نظام / جوتياران؟ چيني تكردي خزمه بو گونجاوه كشتوكالي نذازياري نه بواري له فيركردن مي سيسته التعليم الحالي في الهندسة الزراعية في منطقتك مناسب تمامًا للظروف على مستوى مناسب لخدمة المجتمع الزراعي
- a. Yes/ نعم /لى به
- b. No/ لا /خير نه
- c. Not entirely/ ليس كلياً /نا واوى ته به

Appendix 3: Schools in Iraq

Province	Primary schools	Secondary schools	Universities	Other institutes
Province of Baghdad	2100	1074	4	Private Universities Technical institutes
Province of Diyala	840	409	1	Private Universities Technical institutes
Province of Saladin	1046	390	1	Teacher's centres Vocational institutes
Province of Kirkuk	988	338	1	Vocational institutes
Province of Nineveh	1560	483	1	Teacher's centres Libraries Vocational institutes
Province of Irbil				Private Universities
Province of Duhok	440	215		Private Universities Teacher's centres Libraries Vocational institutes
Province of Sulaimaniyah	600	310	1	Private Universities Vocational institutes
Province of Anbar	1046	469	2	Teacher's centres Private Universities Vocational institutes
Province of Wasit	754	222	1	Private Universities Vocational institutes
Province of Babylon	830	300	2	Teacher's centres Private Universities Vocational institutes
Province of Holy Kerbala	457	188	2	Teacher's centres Vocational institutes
Province of Holy Najaf	546	245	1	Teacher's centres Vocational institutes
Province of Muthanna	500	130	1	Teacher's centres Vocational institutes
Province of Diwaniyah	631	221	1	Teacher's centres Vocational institutes

Province of Thi Qar	1183	413	2	Teacher's centres Vocational institutes
Province of Maysan	616	134	1	Teacher's centres Vocational institutes
Province of Basra	988	441	1	Teacher's centres Vocational institutes

Source: NIC 2014

Appendix 4: Pictures survey

Agriculture in Iraq - al-Mishkab region



Photos: Haidar Hamdani | AFP 2018

Female Iraqi farmer in Diwaniyah



Photo: Haidar Hamdani | AFP 2018

The University of Mosul before and wrecked by IS



Source: BBC 2017



Source: Reuters 2017

Library of the University of Mosul



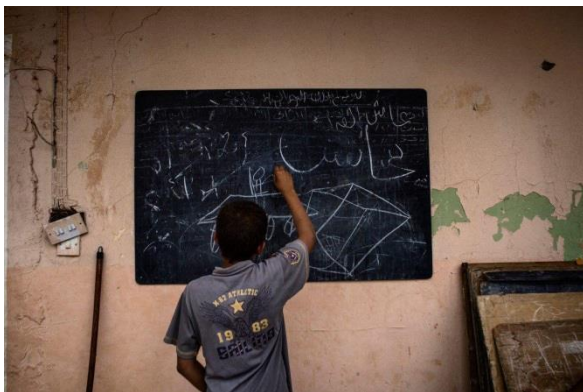
Source: CNN 2017

Mosul



Source: UNICEF 2017

School converted into a shelter for refugees



Source: CNN 2017

Abandoned school in northern Iraq – after airstrike



Source: CNN 2017

Rebuilding education in Mosul



Source: Borgennproject 2018

UNICEF 2018

Children in Mosul



Source: BBC 2017

School children in a tent school in Anbar



Source: Theirworld 2018

Irrigations system in Kirkuk wrecked by IS



Source: FAO Iraq 2016

Iraqi soldier guarding opium field



Source: The independent 2008