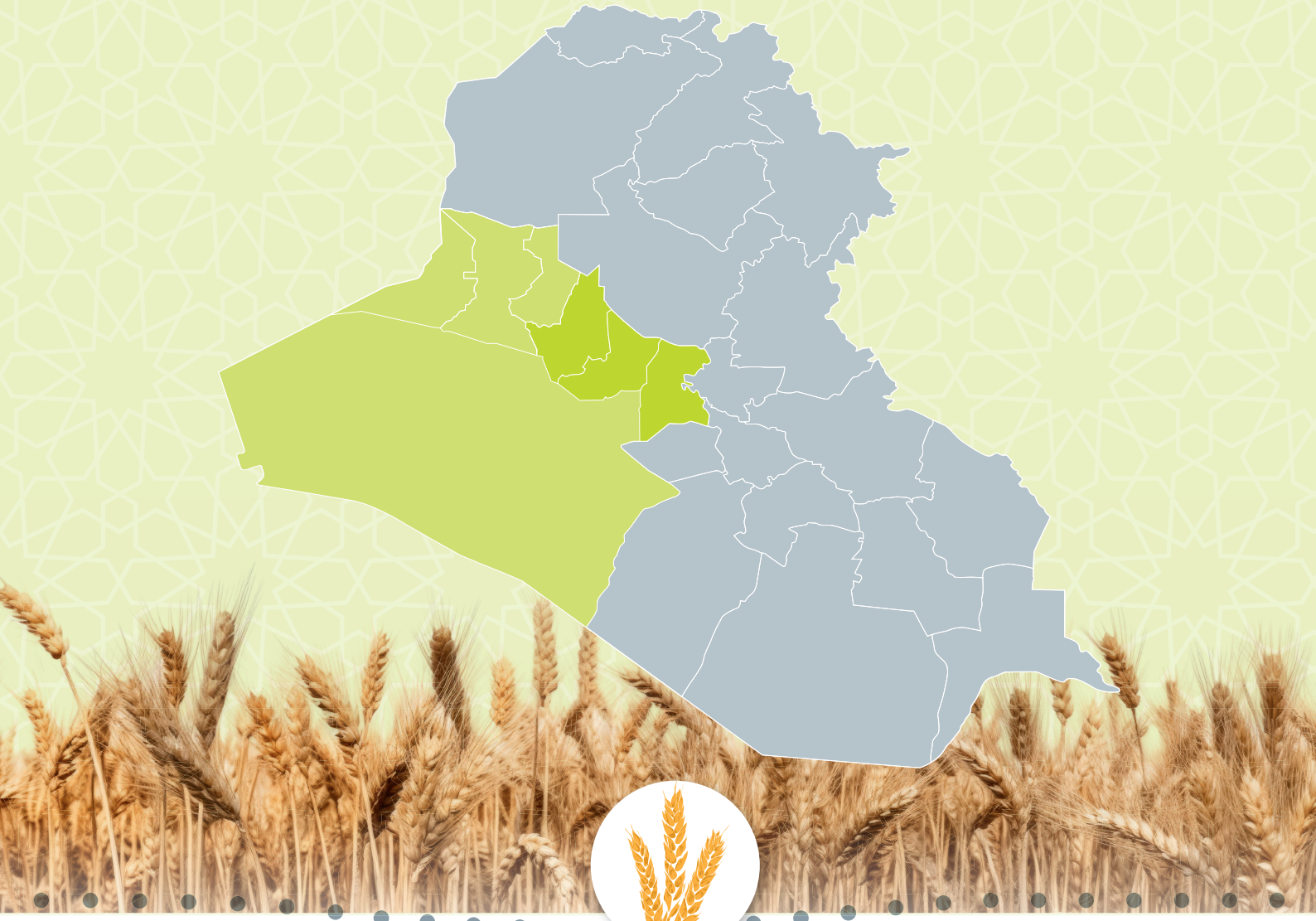
التعاون الألماني
DEUTSCHE ZUSAMMENARBEIT

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
GOPA AFC



Feasibility Study to Support the Wheat Value Chain in Al-Anbar Governorate, Iraq

Restoration of Peace, Livelihoods and Economic Cycles in Anbar (RePLECA)

Feasibility Study to Support the Wheat Value Chain in Al-Anbar Governorate, Iraq

Restoration of Peace, Livelihoods and Economic Cycles in Anbar (RePLECA)

Presented by

GOPA AFC GmbH

Published by

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

January 2024

Table of Contents

List of Tables

List of Figures

List of Acronyms

DAP	Di-Ammonium Phosphate
FAO	Food and Agriculture Organization of the United Nations
IQD	Iraqi Dinar
NPK	Nitrogen, Phosphorus and Potassium
RePLECA	Restoration of Peace, Livelihoods and Economic Cycles in Anbar
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNDP	United Nations Development Program
USD	U.S. dollar
VC	Value Chain/s
VCA	Value Chain Analysis

1 Introduction

This feasibility study is based on the value chain approach and includes an assessment of wheat cultivation in Iraq in general and in Anbar in particular. In addition, resource requirements and the broader context of wheat production in Anbar are being discussed. The study includes a SWOT analysis and outlines strategies to enhance and develop the wheat value chain.

Wheat is one of the most important cereal crops, ranking first globally in cultivated area and second in production after corn. Statistics from the Food and Agriculture Organization (FAO) indicate that wheat is an important staple feeding three billion people, supplying carbohydrates, protein, vitamin B, and several mineral elements essential for humans *(Ghattas 2014)*. Furthermore, wheat gluten is the basis for many types of bread.

1.1 Economic Importance and Environmental Conditions

In Iraq and especially in Anbar, the area cultivated with wheat and the importance of the crop have increased in line with population growth. Even though, wheat varieties adapt to different environmental conditions and a substantial variety of wheat strains exists, productivity decreases in unsuitable conditions. In Iraq, as a result of several factors, such as the continuous failure to provide farmers with fertilisers and high-quality seeds as well as the absence of a coherent water policy wheat productivity remains low.

The most important environmental factors influencing wheat productivity are:

1. Climatic factors: temperature, light, and humidity
2. Soil biological factors
3. Topographical factors, and
4. Economic and social factors.

The success of the crop and the quality of its production are the results of the interaction of these factors. Therefore, farmers work to identify cultivars with appropriate genetic structures for the region as well as suitable production factors *(Shakir 2022)*.

Iraq's somewhat dry and mild climatic conditions are most suitable for growing wheat. One of the reasons for low crop yield is a planting date that is either too early or too late. The wheat planting season in Iraq's central regions is generally mid-November. But against the background of changing climate conditions, the shortening of the cold winter season and the extension of the very warm summer season have affected the growth of the crop, despite cultivation during the specified time-period in each season.

Hashim and Hanaa (2011) confirmed that the yield of wheat production in the central region was 5 t/ha when planted on November 20, on the condition of irrigation every two weeks, i.e., an average of 10-12 irrigation events for the season. Research conducted in Anbar by *Al-Jumaili et al. (2012)* on wheat productivity recommended five irrigation events - by sprinkler system - throughout the cultivation season. Nevertheless, irrigation rates differ between seasons.

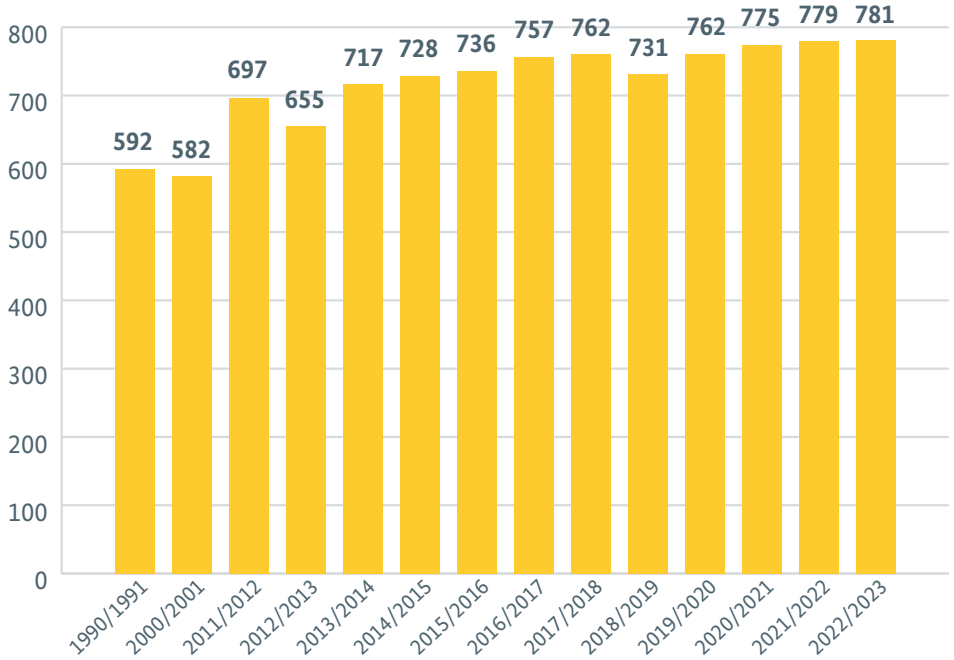
1.2 Political Events and their Impact on Wheat Production

The ongoing war between Russia and Ukraine casts a shadow over many countries, including in the Arab world *(Ukrainian Nature Conservation Group 2022)*. The effects of the war are evident, as the inhabitants of Arab countries face considerable difficulties because Russia and Ukraine are their leading wheat suppliers.

FAO et al. (2022) confirmed that Russia and Ukraine provide a substantial share of wheat sold in global markets, including to the Middle East and some African countries, based on the classification of the European Bank for Reconstruction and Development. **Figure 1** shows that world wheat production amounted to **774.55 million metric tons in 2020-2021, 779.33 million metric tons in 2021-2022 and 781.31 million metric tons** in the 2022-2023 season. According to the Ministry of Commerce, about 700,000 tons of wheat were imported from Russia and Ukraine.

Figure 1

Global Wheat Production 1990 - 2023 (in millions of metric tons)



Source: Statista 2023, values rounded to 1 Million

1.3 Climate Change and Wheat Production

Declining water levels in the Tigris and Euphrates and a lack of rain have led to a decline in the areas cultivated with wheat, along with lower production levels. A study published by *World-Grain (2022)* warned that wheat productivity could decrease by 7 percent for every degree Celsius of warming. Additionally, it can be expected that the reduced availability of surface water provided by Euphrates and Tigris has a significantly negative impact on irrigated areas n Iraq, a problem expected to be exacerbated by low groundwater levels and lack of rainfall.

1.4 Wheat Fertilisation Requirements

Fertilisation is meant to provide wheat plants with the suitable types and nutrients needed to grow and achieve high yields sustainably. To set the fertilisation schedule, farmers must consider the type of strain to be grown, soil characteristics, the time of seeding, and the amount of irrigation and rainfall. In general, for the best growth and yield, wheat needs the following nutrients: nitrogen (N), potassium (K), phosphorous (P), phosphate (PO_4^{3-}), sulphur (S), magnesium (Mg), iron (Fe), manganese (Mn), zinc (Zn), boron (B), copper (Cu) and calcium (Ca) *(Noori et al. 1990)*.

Soil conditions must also be assessed by testing the soil periodically every year or half year before applying any fertilisation. No two fields in the world are identical, and fertilisation conditions of one field may differ from another field due to different soil textures and overall conditions. However, only some farmers in Anbar regularly check the soil conditions of their fields; instead, they rely on accumulated experience in soil management.

Nitrogen and water are the main factors ultimately affecting the yield of wheat. However, farmers must remember that achieving the highest yield and the best grain quality requires a fertilisation programme that supplies all nutrients required for wheat production. According to the FAO, 25 kg of nitrogen are usually required to produce 1 ton of wheat per ha. However, depending on soil fertility (the organic content in the ground), the total nitrogen required ranges from 20 to 120 kg/ha, depending on region and soil. The recommended or calculated amount of nitrogen fertiliser should be split up. Experience and scientific evidence have shown that higher efficiency and productivity can be achieved by dividing the amount of nitrogen into two or three doses during the growing season *(Noori et al. 1990)*.

Apart from nitrogen, phosphorous and potassium are the most essential nutrients required for wheat production. Usually, the total amount of phosphorous-potassium fertiliser is added to the crop when sowing. Standard formulas of synthetic fertiliser for the three main nutrients (nitrogen, phosphorous and potassium) used in the first fertilisation at the time of sowing are 20-10-0, 24-40-0, 30-15-0, 30-15-5 etc. Phosphorous is generally used as phosphate (PO_4^{3-}), and the typical amount needed to achieve the maximum yield is about 20-40 kg per ha.

1.5 The Interrelationship Between Fertilisation and Irrigation

Crop management is vital to raise productivity and achieve the highest possible grain yield, particularly by paying attention to the requirements for nutrients and suitable quantities of water. Water must be available to transfer these nutrients to the different parts of the plant, in order to fully benefit from the nutrients available in the fertiliser.

In an experiment conducted by *Hashim and Hanaa (2011)* on the response of the growth and yield of wheat to irrigation and nitrogen fertiliser, two cultivars of local wheat (Ibaa 99 and Abu Ghraib) were planted in clayey soil with nitrogen fertiliser levels of 150 kg/ha, 200 kg/ha and 250 kg/ha, added as urea in two batches – the first one at the time of planting and the second one exactly one month after germination. Triple superphosphate fertiliser (P 20%) was added as a source of phosphorous at 52 kg P/ha at planting in triple calcium superphosphate. The planting was conducted on November 30, 2022, with a seeding rate of 180 kg/ha; the number of irrigation events ranged from three to five per season. The results showed that the variety Abu Ghraib with five irrigation events and nitrogen fertilisation of 250 kg/ha resulted in the highest yield of 5.6 t/ha.

1.6 Value Chain: Origin and Concept

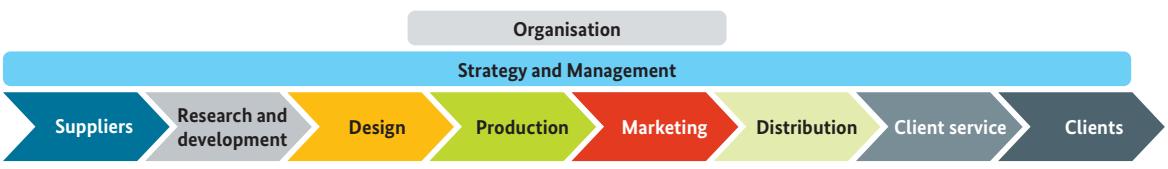
The value chain (CV) concept originated in the 1950s. In France, this concept was applied to vertically integrate processes in agricultural production, addressing the inputs and services needed for a specific product. In general, value chains refer to "a set of related and necessary activities for the production of goods or the provision of services, starting from raw materials until the arrival of the product or service to the consumer" *(Porter 1985)*. In the agricultural field, it has been defined as "the set of activities involved in the manufacture of the product and its transportation from the farm to the dining table" *(Miller and Da Silva 2007)*.

In agriculture, inputs represent the first part of the value chain, including the primary processing of materials such as seeds, fertiliser, pesticides, water and farm equipment. Subsequent sections of the chain include agricultural production, marketing and final consumption. Each part of the chain contains one or more activities with backward and forward linkages; the strength of activities determines the stability of the product or service path within the chain.

Figure 2 shows the value chain concept as a set of activities that create value, starting from the main source of raw materials to the end use of the product or service.

Figure 2

Concept of the Value Chain



Source: Own design

1.7 Value Chain Analysis

Value chain analysis (VCA) is one of the most essential business and cost management strategies, investigating activities from procuring materials and components to the final delivery of the commodity. One of the objectives of the analysis is to explore the main obstacles within the value chain and address them in a way that contributes to increased profitability and product value. In addition, VCA is a means of examining the congruence of the various activities of stakeholders within the framework of the chain, resulting in an assessment of current and potential internal strengths and weaknesses *(Padilla 2014)*.

1.8 SWOT Analysis

SWOT is the acronym for Strengths, Weaknesses, Opportunities and Threats, an analysis employed to evaluate the performance of the value chain and its ability to expand and become competitive. This analysis assumes that opportunities and threats arise from external factors influencing the value chain, while strengths and weaknesses are linked to internal factors. A SWOT analysis can help to determine the positive and negative impact on value chain performance (see below).

1.9 Gross Value-Added Standard

The gross value-added standard is one of the criteria measuring the value added by the project or its value contribution to farm income.

The concept is used to calculate the total added value generated by the project and is based on the following equation:

Total value added = value of production - value of production inputs

In 2018, *Al-Falluji* researched the wheat value chain in Iraq, applying the concept to Baghdad. The research methodology aimed to identify the problems confronting activities within the wheat value chain and define the associated costs and benefits. Data were collected through a questionnaire and personal interviews. The study identified a high share of variable costs in total costs, in addition to numerous problems and obstacles, including processes that impede marketing. The research resulted in a set of recommendations, the most important of which is the role of the state in providing farmers with production requirements at subsidised prices *(Al-Falluji 2018)*.

2 Samples And Data Sources

2.1 Initial Data

Since the work depends on data and other information from primary sources, developing a questionnaire for each value chain activity was necessary. Information was also obtained through interviews with the stakeholders in the value chain, including government agencies and the private sector – from the initial processing of production requirements to production activities, marketing, and processing. **Table 1** gives an overview of the relevant interview partners and locations.

2.2 Places and Destinations of Interview Partners

Table 1: Places and Destinations of Interview Partners

Characteristics	Average
Ramadi	Anbar Agriculture Directorate: Statistics and Agricultural Planning Department
Heet, Ramadi and Fallujah	Sub-Directorates of Agriculture
Ramadi	General Company for Agricultural Supplies
Heet and Fallujah	Private sector companies involved in sale of agricultural inputs and supplies
Ramadi	Department of Grain Stores and Silos
Ramadi	Governmental and private grain mills
Ramadi	Directorate of Water Resources in Anbar
Ramadi	General Authority for Agricultural Extension
Ramadi	University of Anbar: Center for Desert Studies
Baghdad	Food and Agriculture Organisation of the United Nations

Source: Own research

This study focussed predominantly on expert interviews and data obtained by governmental actors. No visits were made to private farms since the survey and interviews did not occur during the wheat growing season. Also, there were no visits to bakeries since the research focussed on difficulties in wheat production and their effects.

3 The Value Chain of Wheat in Anbar Governorate

3.1 Links of the Value Chain

The value chain of wheat comprises several interrelated links, including wheat cultivation requirements, crop service, harvesting, crop marketing, milling, product distribution, and pricing. First, the farmer depends on the agricultural plan announced by the Directorate of Agriculture. This plan is approved by the Iraqi Ministry of Agriculture after joint meetings between the Ministry and other official entities, such as the Ministry of Irrigation, the Ministry of Planning, the Ministry of Finance and the Ministry of Trade, also taking into account the assessment by the Iraqi parliament.

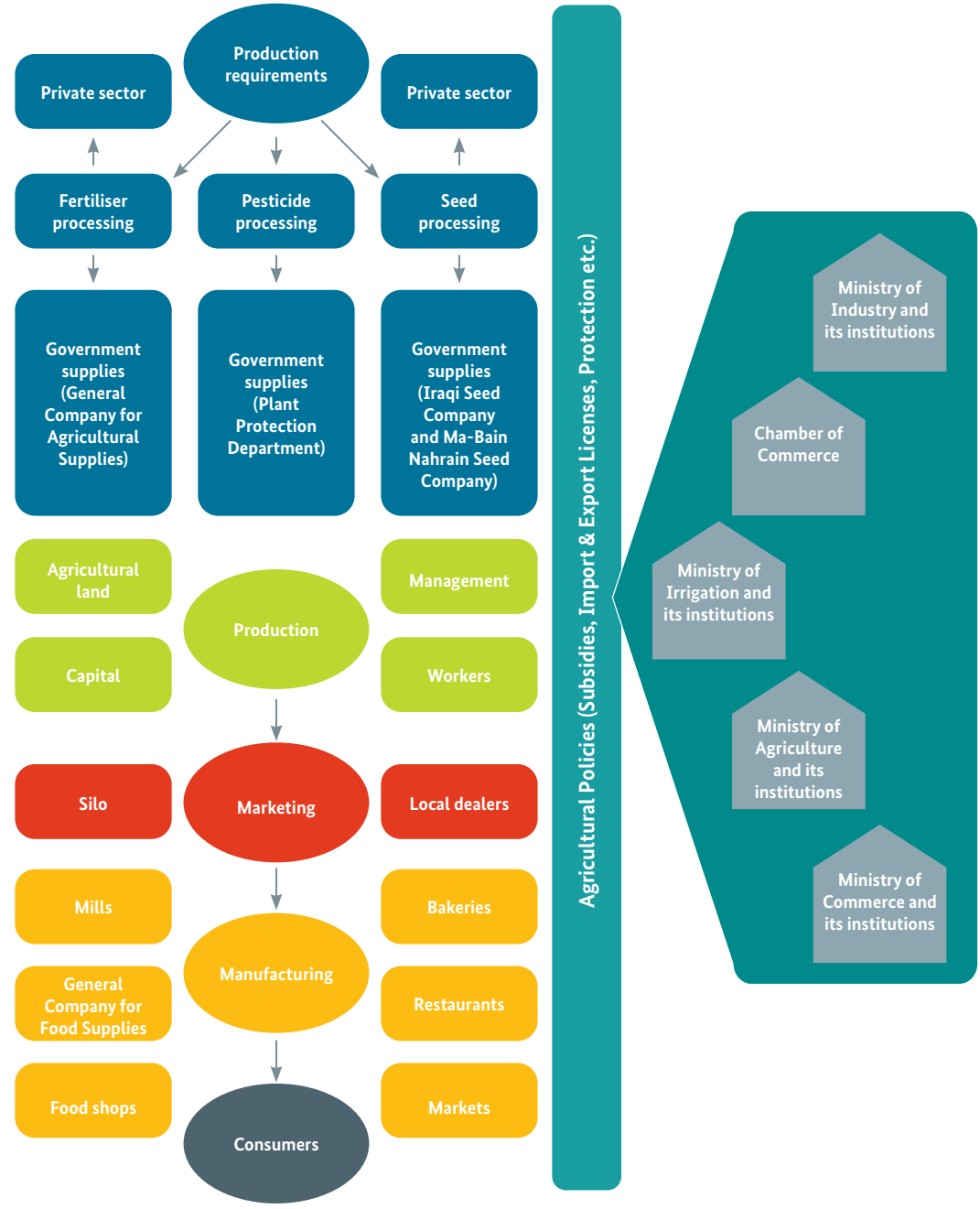
The agricultural plan shows each area assigned for cultivating a particular crop, pointing to the amount of water needed to irrigate the crop, the quantities of fertiliser and the expected final yield. Accordingly, farmers receive several seeds in line with the area under cultivation, generally 120 - 160 kg/ha. The seeds are provided either by the seed company affiliated with the Ministry of Commerce or by farmers themselves who may have saved the appropriate amount from the previous harvest.

The General Company for Agricultural Supplies distributes fertiliser, soil preparation equipment, irrigation equipment and other agricultural inputs to farmers. Farm equipment and irrigation systems are sold to farmers as needed and paid in instalments. The quantities and prices of the respective equipment depend on availability at this company during each season. As for pesticides, these are supplied to farmers as needed, depending on the condition of the field or farm. The distribution of pesticides reflects the infection status of the crop. It is carried out under the auspices of a specialised committee in the Directorate of Agriculture in cooperation with the Directorate of Plant Protection.

The Agricultural Directorate monitors agricultural work and solves farm problems through specialised committees, such as the Plant Protection Committee, the Agricultural Areas Committee, the Irrigation Systems Committee and other committees responsible for various activities. Farmers generally seek assistance from the headquarters of the directorate or its subdivisions in case of problems or specific needs.

Figure 3

Value Chain Map of Wheat in Anbar Governorate



Source: Own design

The role of the Silo affiliated with the Ministry of Commerce is to receive the harvested crop (wheat grains) from farmers and to hand over the payment due to them. The Ministry of Commerce sets the farm-gate purchase price for each crop season. Decisions by the Ministry of Commerce usually reflect the efforts of farmers, enabling them to cover their needs and secure their livelihood. The price set for the latest season amounted to 850,000 IQD/ton, equivalent to USD 560, exceeding the price obtained during the 2020-2021 season, which reached 650,000 IQD/ton, equivalent to USD 500. The Silo distributes the wheat grain to the government mill and the eight private mills in Ramadi. From there, the flour is distributed based on an estimated quota of 9 kg per person and month by the rationing agent and the General Company for Food Supplies. Some Wholesalers also buy the product from farmers to sell it to mills. Private bakeries depend on buying flour at retail prices. Previously (before 2003), they received flour at prices subsidised by the government (Ministry of Commerce). According to sources in the Ministry of Commerce, 5 million tons of wheat per year are required to cover the needs of the Iraqi population.

4 The Initial Processing of Production Requirements

Farmers must obtain the necessary production inputs to embark on the production process. The government supports wheat production by providing supplies through the Ministry of Agriculture and its affiliated departments per the annual agricultural plan. In case of shortages of government supplies, farmers source their inputs from private companies.

4.1 Wheat Seed Pre-Processing Activity

Farmers receive seeds either from the Al-Nahrain State Seed Company or from the Iraqi Seed Company, between 120 and 160 kg/ha, depending on soil conditions: the varieties are Ibaa 99 and Abu Ghraib, both provided at the subsidised price of about 300,000 IQD/ton, equivalent to 200 USD/ton. As for the private sector, represented by Dubana Company, Ard Al-Rafidain and others, farmers are offered seeds from Turkey, Syria and Iraq, the most critical varieties being Adana (900 USD/ton), Barcelona (850 USD/ton), Al-Wafia (800 USD/ton) and Sham 6 and Ibaa 99 (600 USD/ton).

4.2 Primary Processing Activity for Chemical Fertiliser

Compound fertiliser (NPK, DAP) and urea fertiliser are used in wheat cultivation. At the sowing stage, the complete compound fertiliser and half the urea fertiliser are used; the remaining urea fertiliser is added three months after germination. Most of the fertiliser used by farmers is imported but supplied at subsidised prices in the recommended amounts by the government through the General Company for Agricultural Supplies. High-quality NPK fertiliser is imported from Jordan, Saudi Arabia and India at the estimated price of 800,000 IQD/ton, subsequently provided to farmers at the subsidised cost of 530,000 IQD/ton. Urea fertiliser is imported at a price of about 560,000 IQD/ton and supplied to farmers at the subsidised price of about 280,000 IQD/ton. Depending on soil conditions, fertiliser requirements were 140-160 kg/ha of compound fertiliser and 120-150 kg/ha of urea fertiliser.

Private sector companies provide fertiliser to farmers at around double the price (compared to the prices charged by government agencies), and farmers rely on their offers in the case of shortages of government supplies. The fertiliser sold by the private sector is imported from Jordan, Saudi Arabia, Qatar, UAE and Turkey.

4.3 Pre-Treatment Activity with Pesticides

Farmers are supplied with insecticides, pesticides, and herbicides through the Plant Protection Department of the Ministry of Agriculture or through agricultural agencies affiliated with private sector companies. However, even pesticides purchased from private sector agencies comply with recommendations from the Ministry of Agriculture. Pesticide application is subject to recommendations and supervision by representatives of the Ministry of Agriculture, conducted in the context of survey tours by ministry committees, in order to ensure the safety of the fields. The agricultural extension also plays a critical role by arranging extension courses and seminars to introduce the control of diseases or insects and the use of imported pesticides.

The government provides pesticides and herbicides to farmers free of charge. Farmers also can purchase pesticides from private sector companies at their own cost. Both herbicides and insecticides are usually imported from Britain, France, Cyprus or India.

5 Wheat Production

The wheat cultivation season in Anbar begins around November 15, and the harvest season covers the end of May and the beginning of June. In most rural areas, particularly in Al-Furat and Al-Baghdadi, wheat is cultivated with traditional methods without using mechanical seeders. As for the areas around Al-Jazeera (close to Ramadi) and Saqlawiyah (southeast of Ramadi), the crop is cultivated with mechanical equipment support.

Given the dry climate in these areas, rainfall is minimal, forcing farmers to rely on surface irrigation and sprinkler irrigation. Irrigation in and around the Heet area is mainly based on surface and sprinkler irrigation of 2.5 - 10 ha systems. As for Al-Jazeera and Saqlawiyah, farmers in these areas mostly use stationary sprinkler irrigation systems, covering 3 - 10 ha and centre pivot sprinkler systems covering 15 - 20 ha.

In general, wheat production depends on resources, such as agricultural land and finance, and activities, such as fieldwork and management, with productivity depending critically on soil texture and structure. Natural soil is alkaline and needs permanent supplies of fertiliser and nitrogen. In 2022 the cost of imported fertiliser – a mixture out of NPK (DAP) and Urea – is estimated to be 357 USD/ha. Imported seeds add about 200 USD/ha to the costs of agricultural input.

Some soils used in the cultivation of wheat and other crops have a calcareous texture requiring careful ploughing, soil preparation, and continuous irrigation with sprinkler systems. Machines and equipment are necessary for soil preparation, including ploughing and levelling operations, sowing, irrigation and fertilisation, pesticide spraying and harvesting. According to the questionnaire results, machine costs, including rent, maintenance, fuel as well as labour and theft are calculated to reach 490 USD/ha. These tasks take an average of 7-9 hours/per day, depending on the area. Labour costs are often artificially decreased by the use of unpaid family labour.

6 Marketing

The marketing process in Anbar comprises two branches, Silos and the activities of local traders.

In terms of cost and potential profit both branches differ. Costs include marketing services, transportation, loading and packing, unloading, and waste. Direct marketing by farmers to the government Silo entails relatively high costs due to the number of stages passed by the crop between the farm and the Silo. Government support through its price policy plays a critical role in supporting farmers, defining the purchase price in the 2022 season at 560 USD/ton. This price needs to cover the production and marketing costs incurred by farmers, including loading and packing, transportation and unloading of the crop, and fees (**Table 2**).

Table 2: Marketing Costs for Wheat in the 2022 Season

Marketing to the Silo		Marketing to Wholesalers	
Process	**Cost (IQD/ton)**	**Process**	**Cost (IQD/ton)**
Grain finisher	20,000	-	-
Fees	25,000	-	-
Late receipt of the crop	10,000	-	-
Crop transportation	10,000	**Crop transportation**	10,000
Loading and packing	5,000	**Loading and packing**	5,000
Unloading the crop	5,000	**Unloading the crop**	5,000
Total	**75,000 (= USD 58)**	**Total**	**20,000 (= USD 15)**

Source: own research

6.1 Silos

The crop is sold to the official Silo immediately after the harvest, with farmers bearing the transportation costs of around 8 USD/t depending on load capacity and the distance to the Silo. The government purchases the crop from farmers for 560 USD/ton, the wheat is subsequently delivered to a government-owned or private mill. The main silos are situated in Ramadi and Fallujah, with adequate crop storage being critically important. The success of warehouse marketing depends on competent management, particularly timely payments to farmers.

According to the director of the government Silo, losses reach about 30%, incurred either during loading and transportation from the farm to the Silo or while unloading at the Silo. Moreover, the crop, when stored, is exposed to damage risk due to moisture, heat, insects, fungi or exposure to rodents, requiring continuous monitoring by Silo staff.

In addition to the domestic harvest, wheat is imported from the United States, Australia and sometimes Canada at market prices. The General Company for Grain Trade delivers both local and imported wheat to government-owned and private mills. In cooperation with the General Company for Food Supplies, the mills prepare the flour and distribute it to consumers in each residential locality through their agents – selling it at 20 cents/kg, for up to 9 kg per person and month. Types and prices of imported flour are shown in **Table 3**.

Table 3: Prices of Imported Flour, October 2022

Exporting country	Price in USD/ton
Argentina	457
United States	370
Australia	370
Germany	355
France	341
Bulgaria	334
Romania (grade A)	322
Romania (grade B)	305
Ukraine (grade A)	305
Ukraine (grade B)	296
Russia (grade A)	304
Russia (grade B)	276

Source: Prices established at the port of Basra on 26 October 2022.

6.2 Local Trader Activities

The harvested crop is distributed either by direct sale to the government Silo or through sales to intermediary merchants. Farmers prefer selling their wheat to intermediary merchants, in order to avoid the cost of transportation and the waiting time in front of the Silo.

Cooperatives do not play an active role in the sale of wheat, but provide information on prices and sales logistics, including preferable merchants. Local merchants buy the crop from farmers at farm gate, and sometimes farmers take their wheat to the market themselves. Prices for direct sales are lower than the sale price achieved at the Silo; however, following direct sales, farmers do not have to endure a waiting period of about six days before being paid. The government Silo purchase price of the crop during the latest season was 560 USD/ton. By contrast, the price for wheat sold to merchants amounted to 500 USD/ton.

Marketers have extensive experience and command high-level skills in purifying seeds and marketing wheat to central silos. Following a bargaining process, marketers buy the crop at a price below the advertised market price; subsequently, the crop is purified with the help of purification machines (mostly from Turkey) to obtain first-grade seeds that can be sold to the Silo at a high price. Depending on the quality of the crop the trader can achieve similar prices at the wholesale market, but will often get lower prices.

7 Processing and Manufacturing

Processing and manufacturing activities constitute the fourth link in the value chain, consisting of two components, mills and bakeries. The processing of flour is carried out either manually or automatically in homes or ovens, leading to the production of local bread in regular loaves or in other forms. In addition to home baking, end-consumers depend on bakeries for their daily bread consumption as well as cakes and pastries.

Ramadi is home to one central government mill and seven private mills. There are other mills under construction, one in the Haditha area (northwest of Heet), and two in the Karma area (southwest of Ramadi). The grain trading and manufacturing companies supply these mills with wheat. However, the price of a loaf of bread from bakeries (around USD 0.10) is higher than that of home-baked bread, based on the flour provided as monthly rations at USD 0.20 per kg.

8 Consumption

Consumption constitutes the last link in the wheat value chain, being the final activity, based on the preceding stages of the VC. Consumer satisfaction regarding this staple, consumed as bread by all age groups, is critical.

6.2 Local Trader Activities

The harvested crop is distributed either by direct sale to the government Silo or through sales to intermediary merchants. Farmers prefer selling their wheat to intermediary merchants, in order to avoid the cost of transportation and the waiting time in front of the Silo.

Cooperatives do not play an active role in the sale of wheat, but provide information on prices and sales logistics, including preferable merchants. Local merchants buy the crop from farmers at farm gate, and sometimes farmers take their wheat to the market themselves. Prices for direct sales are lower than the sale price achieved at the Silo; however, following direct sales, farmers do not have to endure a waiting period of about six days before being paid. The government Silo purchase price of the crop during the latest season was 560 USD/ton. By contrast, the price for wheat sold to merchants amounted to 500 USD/ton.

Marketers have extensive experience and command high-level skills in purifying seeds and marketing wheat to central silos. Following a bargaining process, marketers buy the crop at a price below the advertised market price; subsequently, the crop is purified with the help of purification machines (mostly from Turkey) to obtain first-grade seeds that can be sold to the Silo at a high price. Depending on the quality of the crop the trader can achieve similar prices at the wholesale market, but will often get lower prices.

7 Processing and Manufacturing

Processing and manufacturing activities constitute the fourth link in the value chain, consisting of two components, mills and bakeries. The processing of flour is carried out either manually or automatically in homes or ovens, leading to the production of local bread in regular loaves or in other forms. In addition to home baking, end-consumers depend on bakeries for their daily bread consumption as well as cakes and pastries.

Ramadi is home to one central government mill and seven private mills. There are other mills under construction, one in the Haditha area (northwest of Heet), and two in the Karma area (southwest of Ramadi). The grain trading and manufacturing companies supply these mills with wheat. However, the price of a loaf of bread from bakeries (around USD 0.10) is higher than that of home-baked bread, based on the flour provided as monthly rations at USD 0.20 per kg.

8 Consumption

Consumption constitutes the last link in the wheat value chain, being the final activity, based on the preceding stages of the VC. Consumer satisfaction regarding this staple, consumed as bread by all age groups, is critical.

9 Economic Indicators of the Wheat Value Chain

Through the surveys conducted by the research team and interviews with farmers and governmental or private entities, the initial stages of the value chain – linked to production requirements – were identified as main stumbling blocks for wheat production. Based on the questionnaires, information on costs and revenues in the wheat value chain were obtained (**Table 4**), and strengths, weaknesses, opportunities, and threats were identified (**see Annex 2, p. 25**).

Table 4: Costs and Revenues of Wheat Production in the 2022 Season*

	Costs (in U.S. dollars)
Seeds (per ha)	200
NPK (DAP) (per ha)	230
Urea (per ha)	127
Ploughing, seeding and harvesting: machine rent and cost of labour (per ha)	220
Fuel and lubrication for tractor and generators (per ha)	150
Maintenance of generators, pumps and tractor (average per ha)	120
Harvest transportation by trailer (per ton / per ha)	8 / 24
Total cost (ha)	1,071
	Revenues (in U.S. dollars)
Price (per ton)	560
Selling price of wheat to the Silo (per ha)	560 x 3 = 1,680
Profit (per ha)	**1,680 – 1,071 = 609**

* *One hectare produces 3 tons of wheat; the exchange rate IQD/USD was calculated with 1,300.*

Source: own research

The data confirmed that farmers prefer imported seeds to local ones because of higher product quality; the cost calculations shown in **Table 4** for seeds and fertiliser are thus based on imported categories. Prices for Seeds and fertilizer could be lower in case farmers use subsidized governmental fertilizers and seeds. On average, the total cost of purchasing imported seeds and fertiliser was 557 USD/ha in 2022.

Independent from productivity, the additional costs of renting agricultural equipment and machinery; maintaining pumps and generators; purchasing fuel; and labour reached about 490 USD/ha. Assuming an average production of 3 t/ha (please regard **Table 5, p. 20**) transportation costs can be estimated to be 24 USD/ha (8 USD/t). Therefore, the total production costs amount to 1,071 USD/ha. As described in chapter 6.2 the price set by the Ministry of Commerce for purchasing high-quality grain at the government silo was 560 USD/t, leaving farmers with a turnover of 1,680 USD/ha, and a profit of 609 USD/ha. Profit is defined as the sales price minus the costs of inputs, wages, maintenance and transportation. Profit margins can be considerably

improved by increasing production output per hectare or by decreasing production costs as well as by increasing sales prices.

According to the information provided by farmers, 140-160 kg/ha of local seeds (Ibaa 99) result in a yield of 2 t/ha, while 80-100 kg/ha of Turkish seeds (Adana) or Spanish seeds (Barcelona) give a yield of 4-6 t/ha when using pivot sprinkler irrigation. The yield associated with imported seeds declines to 3 t/ha with traditional irrigation when stationary sprinkler irrigation is used. In exceptional cases, a 7 t/ha yield was achieved using high-quality imported seeds, such as the Turkish varieties (Adana), and a good fertiliser. However, farms with infertile soils and insufficient fertiliser have recorded less than 1 t/ha productivity. Increasing productivity from 3 to 7 t/ha increases the turnover 3,920 USD/ha, leaving the farmer with a profit of 2,817 USD/ha.

The irrigation methods used in wheat production are stationary and movable sprinkler irrigation, as well as flood irrigation. The price of a pivot irrigation systems for 30 hectares, purchased from the General Company for Agricultural Supplies is IQD 72 million, equivalent to USD 55,400 (1,846 USD/ha). The first instalment of about 50% of the price, in the amount of IQD 30 million (equivalent to USD 23,077) is due two years after the purchase. As for subsequent instalments, IQD 8 million per year are due (around USD 6,154). Leading to a repayment period of around 7,25 years. The wheat yield for pivot systems ranged from 4 to 7 t/ha. The costs associated and the rather big land size suggest that the forming of production groups for the joint management of the pivot system are advisable. Additionally, producer groups enable farmers to share costs as well as minimize associated financial risks associated with loaning.

Regardless of the different irrigation systems used, water is supplied from wells or irrigation channels near the fields. The pumps used rely on diesel fuel or, sometimes, on electricity. For example, a pump with a capacity of 60 hp needs about 10 litres of diesel per hour. Since the pump would be operated for about five hours per day, the daily diesel requirement amounts to 50 litres. The price per litre of fuel fluctuates around IQD 600 (equivalent to USD 0.46), in line with decisions by the Ministry of Oil. Pump use thus entails costs of about IQD 30,000 per day (600 x 50 = IQD 30,000, equivalent to USD 23.07 per day). Additional costs occur for the use of wells: the approval fee for a well may reach USD 300, depending on depth, usually in the range of 10 to 50 meters.

The operating hours of the pump for irrigation purposes depend on plant requirements and the availability of other water sources. They are therefore regulated by farmers in line with plant needs and soil and weather conditions. Fuel expenses ultimately reduce farmers' profit. In **Table 4**, fuel costs are calculated per ha assuming 5 – 6 irrigation events per season. Introducing water saving technology, decreasing generator size or increasing diesel efficiency as well as using alternative energy sources could potentially decrease fuel costs and therefore improve farmers' profit margin.

As **Table 4** shows, the profit derived from direct sales to the Silo for an assumed productivity rate of 3 t/ha amounted to USD 609 USD/ha. However, in case of sale to a trader, the sale price reached for one ton will be reduced to USD 500 - shrinking the farmers' profit margin to 429 USD/ha. Nevertheless, long waiting tines of up to 6 days in front of the Silo are costly for farmers. Costs occur due to extended periods of daily wages to be paid to the carriers. In addition, extended storage periods increase the risk for crop damages related to a decline in value. Therefore, many farmers are forced to sell their crop directly to merchants, even though this might lead to a decrease in profit. By improving the sale process at the governmental silo as well as ensuring a transparent and fair process a sustainable impact could be made on farmers general profit.

10 Summary

Data from the Directorate of Agriculture and its departments and divisions responsible for the visited areas cover the cultivated area and wheat production during 2019-2022. The Iraqi Ministry of Agriculture and the Ministry of Planning/ Directorate of Agricultural Statistics data show the cultivated area, average yield, and wheat produced in Anbar from 2019 until July 2022 (**Table 5**).

Table 5: Harvested Area, Average Yield (ton/ha) and Wheat Production in Anbar Governorate, 2019 - 2022

Year	Cultivated area (ha)			Production (ton)	Yield
	Total Area	Harvested Area	Damaged Area		(Production in ton/ Harvested Area)
2019	94,220.0	93,946.5	273.5	261,880	2.79
2020	123,485.5	107,845.5	1,564.0	285,088	2.64
2021	70,258.5	65,863.7	4,349.7	202,754	3.08
2022 (first seven months)	161,178.5	145,055.0	16,123.5	182,484	1.26

Source: Central Organization of Statistics of the Ministry of Planning, Department of Agricultural Planning.

Data indicate the fluctuating wheat production and yields for harvested areas in Anbar Governorate for 2019-2022, also due to political and environmental conditions in the governorate. Despite the spread of the COVID epidemic in 2020, the cultivated area exceeded that of the preceding year, 2019. This is explained by the planting date for wheat in Anbar in November, implying that grain for the June 2020 harvest was planted in November 2019 and thus before the epidemic. In the year of the epidemic, reluctance to follow up on the crop resulted in a large share of damaged areas in 2020, negatively affecting the yield of cultivated areas, despite farmers' access to fertiliser and irrigation.

The 2020 epidemic affected the following planting season negatively, as shown by a cultivated and harvested area in 2021 that was considerably smaller than in 2019-2020 and 2022. However, although the area under cultivation was much smaller than in the other three years, the yield was higher – likely explained by continuous serious efforts on the side of motivated farmers, leading to significant production in cultivated/harvested areas.

The data show an increase in the cultivated and harvested areas for 2022. However, simultaneously, a sizeable, damaged area (16,123 ha) and low production (182,484 t) were recorded. The Ministry of Agriculture, through the General Company for Agricultural Supplies, decided to supply farmers with less than one-tenth of the recommended amount of DAP fertiliser. Previously, farmers received DAP fertiliser at a rate of 320 kg/ha for wheat cultivation. By contrast, in the 2021-2022 season, only 20 kg/ha were distributed. The insufficient amount of fertiliser distributed by the government affected farm productivity negatively, prompting farmers to purchase fertiliser at double prices from commercial agencies.

In addition, the Ministry of Water Resources reduced the prescribed irrigation quotas per cultivated area, inducing farmers to dig wells to cover water needs without outside support. Decisions issued by the Directorate of Water Resources stipulate signing a contract between the farmer and the Directorate, following a site inspection of the farm and the approval by the committee in charge of permissions to dig a well. Procedures were affected by bribes and extortion, and many farmers have refrained from making legal and illegal payments, with adverse effects on the availability of water and wheat production – at the same time as rising temperatures require additional water supplies.

Farmers who constructed a well on their farm despite all stumbling blocks usually faced additional problems related to fuel quotas for the generators operating the water pumps. Although some farmers overcame the multi-layered obstacles, they were confronted with increased fuel prices as the Ministry of Oil decided to reduce quotas for fuel supplies – leaving fuel purchases at market prices as the only option. Additionally, the complex set of obstacles to successful wheat cultivation is exacerbated by payment arrears on the side of the Silo vis-à-vis farmers – motivating other farmers to sell their crops to more reliable wholesalers, albeit at a lower price.

11 Recommendations

Wheat production problems and obstacles in Anbar require short-term, as well as medium- and long-term solutions.

1. Water scarcity and the associated aggravating problems, such as the reduced cultivated area and water quotas, call for adequate solutions, including raising farmers' awareness concerning sprinkler irrigation systems. Solar energy could be used to reduce expenses on generators and water pumps. Remote sensing techniques and water harvesting projects can be used to develop water storage facilities. The related information could be disseminated through extension courses cooperating with the Agricultural Extension Department in Ramadi.
2. Collaboration with local banks is essential for developing financial services and loan facilities for farmers.
3. Cooperation with the Desert Studies Centre located in Ramadi should result in an integrated curriculum on cultivating and propagating drought-resistant wheat varieties (BORA 1 and SHAM 6), reflecting the water consumption rationalisation programme.
4. Support farmers with high-efficiency fertiliser suitable for local soil conditions.
5. Development of reliable wheat purchase mechanisms and storage stations in the central agricultural areas of Heet, Ramadi, Fallujah and Saqlawiyah.
6. Providing farmers with machinery and equipment for wheat cultivation at subsidised prices, including targeted training courses.
7. Identifying administrative solutions to the problem of grain delivery to the Silo.
8. Enhance farmers' awareness through training courses on harvesting and water collection and disseminate information on using recycled drainage water mixed with regular irrigation water. (When surface water is scarce, it is customary for farmers to use drainage water mixed with river water for irrigation purposes.) This solution is legal and encouraged by the Iraqi authorities.
9. Organising courses and experiments to educate farmers on the optimal use of fertiliser.
10. Provide job opportunities for graduates of the College of Agriculture through the establishment of small projects in the field of food processing.

12 References

- **Al-Falluji**, S. J. (2018). Value Chain of Wheat Crop in Baghdad Province/Iraq, an Applied Study for the Year 2017. Iraqi Journal of Agricultural Sciences, 49 (5).

- **Al-Jumaili, Jasim M. A., Ibraheem, M. M. and Abdullah, A. Shihab** (2012). Response of Growth and Yield of Bread Wheat to Irrigation and Nitrogen Fertiliser, Journal of Kerbala University. The second scientific conference of the College of Agriculture, pp. 435-443.

- **FAO, IFAD, UNICEF, WFP and WHO** (2022). The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. https://doi.org/10.4060/cc0639en.

- **Ghattas, H.** (2014). Food Security and Nutrition in the Context of the Global Nutrition Transition. Food and Agriculture Organization. Rome, Italy.

- **Hashim, E. K. and Hanaa, K. H.** (2011). The Role of Sowing Dates and Irrigation Intervals in Yield and its Components of Bread Wheat. Iraqi Journal of Agricultural Sciences, 42 (4), pp. 43-51.

- **Miller, C., and Da Silva, C.** (2007). Value chain financing in agriculture. Enterprise development and microfinance, 18 (2-3), pp. 95-108.

- **Noori Abdel Qader, Hassan Yousef Al-Dulaimi and Latif Abdullah Al-Ithawi** (1990). Soil fertility and fertilisation. Baghdad University Press.

- **Padilla, R.** (2014). Strengthening value chains as an industrial policy instrument. Methodology and experience of ECLAC in Central America. ECLAC. Santiago, Chile.

- **Porter, M. E.** (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York, Simon and Schuster.

- **Shakir, W. M.** (2022). The Effect of Increasing Periods of Drought on The Growth and Development of Two Cultivars of Wheat. Journal of Agricultural, Environmental and Veterinary Sciences. Volume (6), Issue (2): June 30, 2022, pp. 44.

- **Statista** (2023). Global wheat production 1990 - 2022, in millions of metric tons, https://www.statista.com/statistics/267268/production-of-wheat-worldwide-since-1990/.

- **Ukrainian Nature Conservation Group** (2022). A third of Ukrainian crops could be abandoned or inaccessible. https://uncg.org.ua/en/almost-a-third-ua-crops/.

- **World-Grain** (2022). Group warns of climate change's impact on wheat. https://www.world-grain.com/articles/17141-group-warns-of-climate-changes-impact-on-wheat.

Annex 1: Problems and Obstacles Faced in Initial Processing

Wheat Seed

1. Drivers are negatively affected when transporting seeds through security controls with lengthy waiting periods. The fare for transporting the seeds is prepaid, and drivers are not compensated for any delays or additional fuel requirements.
2. Company owners suffer from complex customs procedures and corruption.
3. The cost of imported seeds is high compared to local seeds.
4. The earning capacity of small-scale farmers is limited, restricting their ability to buy high-quality seeds, particularly in the absence of loan facilities.
5. Seeds are sometimes provided to farmers with a delay, thus not reaching them in time before the optimal planting date.

Fertiliser

1. Handling urea fertiliser is considered dangerous due to its dual use for fertilisation and as an active substance in explosives. Therefore, the transportation and distribution of this fertiliser faces difficulties, especially in the presence of strict security measures.
2. In line with seed transportation, fertiliser transportation costs are high, exacerbated by extended waiting periods at security checkpoints.
3. Insufficient supply of recommended quantities of fertiliser from government entities forces farmers to conduct purchases at high and soaring market prices.
4. Government agencies' delays in approving the agricultural plan have triggered subsequent delays in distributing fertiliser to farmers.

Pesticides

1. The lack of stores offering pesticides in cities and in the vicinity of public stores.
2. The absence of seminars and courses on disease control and the correct application of pesticides.

Irrigation

1. Productivity of wheat cultivation varies considerably, depending on whether flood irrigation or sprinkler irrigation is used, the latter allowing for the highest yields.
2. Water from wells is costly due to the high cost of pumps, fuel and maintenance costs.
3. The declining availability of surface water in view of climate change and associated higher temperatures has reduced the area under cultivation, also reflected in a decision by the Ministry of Irrigation.

Annex 2: Analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT)

The following tables (6 – 8) summarise the SWOT analysis for wheat production, marketing and milling.

Table 6: Wheat Production SWOT Analysis

Strengths	Weaknesses
■ The Directorate of Agriculture and its affiliated institutions supply farmers with wheat seeds (50% subsidy) and fertiliser (100% subsidy). ■ The cultivated area increased substantially during the 2022 season. ■ Wheat is purchased from farmers at the set price of 850,000 IQD/ton.	■ Delays in providing farmers with inputs. ■ Insufficient amounts of fertiliser and seeds. ■ High market prices of fertiliser and seeds. ■ High prices of agricultural equipment, both purchased and rented. ■ Complex administrative routine and slow procedures. ■ Long waiting time for crop carriers at the Silo. ■ Wide-spread corruption in some government departments. ■ Delays in processing payment to wheat farmers.
Opportunities	**Threats**
■ Early implementation of the agricultural plan will allow prompt distribution of supplies. ■ Providing farmers with sprinkler irrigation systems and solar-powered water pumps will reduce production costs and mitigate water scarcity.	■ Traditional irrigation methods entail the loss of large quantities of water. ■ Lack of awareness of recommended fertiliser use. ■ As a result of excessive production costs and scarcity of both seeds and water, some farms were sold or abandoned. ■ High administrative hurdles associated with the extension of loans for agricultural purposes. ■ Delayed payments to farmers. ■ Lack of information on seminars on the cultivation and marketing of wheat.

Source: own research

Table 7: Wheat Marketing SWOT Analysis

Strengths	Weaknesses
■ Establishment of new terraces in Silos to accommodate the quantities of crops received. ■ Long hours of operation at the Silo immediately after harvest. ■ The General Company for Grain Trade buys wheat at a price higher than the border price.	■ Waiting for grain carriers and queuing at the Silo for extended periods of time, resulting in high costs. ■ Payment delays. ■ Inaccurate quality control.
Opportunities	**Threats**
■ The establishment of harvest collection centres near the Silo will enhance processes and allow for the controlled protection of the crop. ■ Purchase of wheat that does not comply with specifications at a lower price, to be used as fodder crop. ■ Training courses for Silo workers and the re-cruitment of younger staff will lead to smoother processes.	■ The lack of courses and training for current Silo staff has reduced work motivation. ■ Supported by bribery, local merchants sell third-grade grain as first-class grain. ■ Lack of loan facilities to cover the cost of marketing.

Source: own research

Table 8: Wheat Milling SWOT Analysis

Strengths	Weaknesses
■ Testing of flour quality by a specialised government entity. ■ The General Company for Grain Trade supplies grain to mills at a subsidised price of 17,000 IQD/ton.	■ High transportation costs for private mills due to their distance to the Silo. ■ Declining wheat processing for government grain rations by mills due to the large number of private mills.
Opportunities	**Threats**
■ Supporting processing of wheat for grain rations to safeguard employment. ■ Compensation for mills for impurities of grain received from the Silo. ■ Permitting private mills to produce first-class commercial flour and assisting them in selling it.	■ Not benefiting from staff in private mills due to the lack of support for these mills has led to unemployment. ■ The resignation of many workers and increased unem-ployment since workers often do not receive their wages in full or continuously.

Source: own research

Imprint

Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn | Germany

Restoration of Peace, Livelihoods and Economic Cycles in Anbar (RePLECA)
Tim Polster-Kasiske
GIZ Office Baghdad
TDA-Anbar@giz.de
www.giz.de/en/worldwide/89722.html

Text
GOPA AFC GmbH
Baunscheidtstr. 17 | 53113 Bonn, Germany
T +49 228 923940 00 | F +49 228 923940 98
info@afci.de | www.afci.de

Design and layout
Barbara Reuter | Oberursel, Germany | barbarareuter-grafik@web.de

Photo credits
Photo on the cover and back page © AdobeStock, Perfect PNG
Photo on page 11 © AdobeStock, abdlkerim | photo on page 21 © AdobeStock, sabino.parente

As at
January 2024

GIZ is responsible for the content of this publication.

On behalf of
Federal Ministry for Economic Cooperation and Development (BMZ)