TECHNICAL REPORT

(AFESD ICARDA-NARC Jordan Socio-Economic Team)

# ASSESSMENT OF THE BARLEY SECTOR AT THE NATIONAL LEVEL AND DIAGNOSTIC OF THE BARLEY VALUE CHAIN (VC) AT THE COMMUNITY LEVEL

## Quantitative and Qualitative Analysis of Agro-pastoral System-based Value Chains Performance (Barley, meat, and dairy products)

Diversification of agro-pastoral system-based value chains (e.g. dairy products, herbs) (e.g. enhanced household level water management and optimized backyard agriculture)

*Strengthening Innovation and Technology Adoption towards Sustainable Agricultural Productivity in Arab Countries*

January 2020

# Contents

## Introduction:

Barley (Hordeumvulgare) is one of the most important cereals in the world and it is a cereal fodder crop and it was used as food for humans and animals since more than ten BC. Barley and wheat are grown mainly in areas with limited rainfall. Barley is considered a highly tolerant crop for salinity and alkalinity. It is also an acid-sensitive crop. It is one of the most tolerant to cold since it is grown up to latitude of 71 degrees.

Barley ranks fourth in terms of quantity produced and in the area of cereal crop cultivation in the world. The annual global barley harvest in the late century was about 140 million tons of about 55 million hectares (Genetics and Improvement of Barley Malt Quality/2010). Much of the world's barley is produced in areas where grains such as corn and rice do not grow well and barley has good resistance to dry heat compared to other small grains. Barley dominates other grains in some arid and semi-arid developing countries.

The origin of barley is Abyssinia, where this region is very rich in wild species `coated grains and spikes of the Safa, as some scientists believe that barley originated in Southeast Asia, especially China, Tibet and Nepal. Developing countries represent about 18% (26 million tons) of total barley production and 25% (18.5 million hectares) of the total harvested area in the world. For animals and food for human consumption and is the second most used crop "(FAO/ BARLEY: Post-Harvest Operation).

The barley crop occupies the first place for forage crops in Jordan in terms of importance and area planted under rained and irrigated conditions and is considered one of the most important forage crops that animals feed on and can be used in many food industries such as bread and others.

Harvested area is about 391,967.0 thousand donums and it produces 48.954.5 tons of barley grains according to table No. (1).

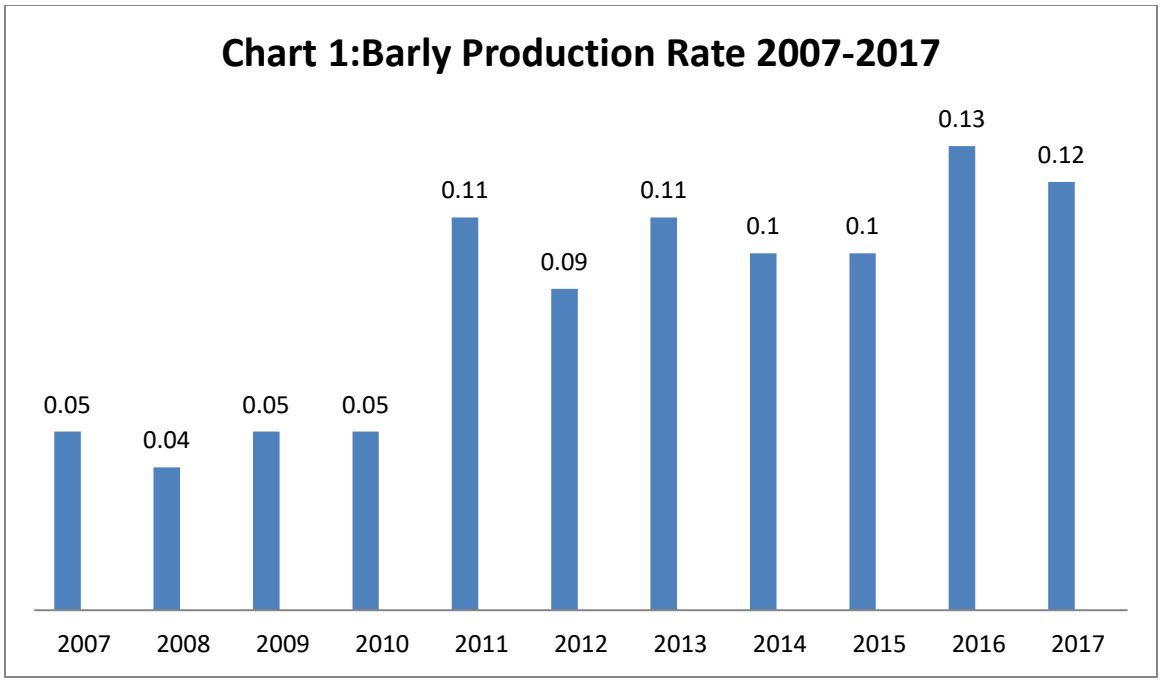
### Barley Genetic Resources in the Arab World

Barley is the second important crop in the Arab countries, and barley originated with wheat assets to North Africa and southern Arabia. In Jordan, the average barley production for the period (2007-2017) was about 2,7million tons as shown in Table No. (1). Graph 1 shows the fluctuation of barley production rate during the period (2007-2017).

Table (1): Barley Statistics (2007/2017)

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Barley Production Tons)) | 13,528.7 | 10,327.5 | 17,061.8 | 10,658.7 | 29,285.4 | 32,050.3 | 40,914.6 | 38,872.7 | 40,485.8 | 37,929.0 | 48,954.5 |
| Harvested Area (Dounum) | 291,528.3 | 271,842.2 | 312,625.7 | 195,024.0 | 277,933.5 | 363,417.1 | 383,818.3 | 381,393.3 | 392,967.7 | 302,352.9 | 391,967.0 |
| Cultivated Area (Dounm) | 468,410.4 | 738,176.9 | 682,717.8 | 831,753.9 | 865,134.7 | 854,615.8 | 895,616.8 | 1,000,653.5 | 953,256.0 | 959,454.3 | 564,582.3 |
| Output Rate Tons / Dounm | 0.05 | 0.04 | 0.05 | 0.05 | 0.11 | 0.09 | 0.11 | 0.10 | 0.10 | 0.13 | 0.12 |
| Imported Quantity/ton | 1,550 | 1777175 | 213458 | 400019 | 197,982 | 305,455 | 505810 | 59000 | 69075 | 294214 | 122320 |

*Source: Department of Statistics,* 2017.




## Local cultivated varieties:

In Jordan, five varieties of barley were adopted, through barley breeding programs at the Crop Research Directorate at the National Center Research Agricultural. These varieties include: Barley RUM, ACSAD 176 and Barley ADROUH of the six rows, MUTA and YARMOUK Barley of the two rows. In addition to other barley varieties include DirAlla 106, a variety developed by researchers in the Ministry of Agriculture and has proven high productivity in rainfed and irrigated areas of six rows, and other municipal varieties such as barley necked barley (The Annual Book of the Ministry of Agriculture, 2016).

## Advantages of Barley Crop[1]:

- **Erosion control**. Use barley as an overwintering cover crop for erosion control. It's well-suited for vineyards and orchards, or as part of a mixed seeding. As a winter annual, barley develops a deep, fibrous root system. The roots can reach as deep as 6.5 feet. As a spring crop, barley has a comparatively shallow root system but holds soil strongly to minimize erosion during droughty conditions.
- **Nutrient recycler.** Barley can scavenge significant amounts of nitrogen. It captured 32 lb. as a winter cover crop following a stand of fava beans (*Vicia faba*) in a California study, compared with 20 lb for annual grass. Intercropping barley with field peas

[1] Source:https://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version/Nonlegume-Cover-Crops/Barley

(*Pisum sativum*) can increase the amount of N absorbed by barley and returned to the soil in barley residue, Barley improves P and K cycling if the residue isn't removed.

- **Weed suppressor.** Quick to establish, barley outcompetes weeds largely by absorbing soil moisture during its early growing stages. It also shades out weeds and releases allelopathic chemicals that help suppress them.
- **Tilth-improving organic matter.** Barley is a quick source of abundant biomass that, along with its thick root system, can improve soil structure and water infiltration.
- **Nurse crop.** Barley has an upright posture and relatively open canopy that makes it a fine nurse crop for establishing a forage or legume stand. Less competitive than other small grains, barley also uses less water than other covers crops. In weedy fields, wait to broadcast the forage or legume until after you've mechanically weeded barley at the four or five-leaf stage to reduce weed competition.
  As an inexpensive, easy-to-kill companion crop, barley can protect sugar beet seedlings during their first two months while also serving as a soil protectant during droughty periods.
- **Pest suppression.** Barley can reduce incidence of leafhoppers, aphids, armyworms, root-knot nematodes and other pests.
- The crop is grown in winter as an economic crop so that it does not need large quantities of water for irrigation.
- It can afford high salinity and therefore suitable for irrigation with saline water wells.
- Its nutritional value is very high in terms of carbohydrates and a good percentage of protein and lack of fiber.
- A short period planting season during winter for (3-4) months only.

## Obstacles of barley cultivation in Jordan according to the Ministry of Agriculture 2017:

1) Lack of agricultural areas due to the fragmentation of ownership and urban encroachment on arable land
2) The fluctuation of rain and the rainfall is not distributed during the growth stages and due to the successive years of drought
3) Farmers don't use crop pattern
4) Low adoption rate of modern technologies by farmers
5) Reluctance to engage in agricultural work and to most of the youth migrates to cities.

## Chemical composition

Barley seeds contain high levels of dietary fiber and selenium compared to wheat and the amount of protein. The barley contains essential amino acids for humans and vitamins in particular vitamin B group and minerals such as potassium, calcium, magnesium, phosphorus, iron and zinc as shown in table 2.

Table (2): The nutritional value per 100 g of raw barley

| | | |
|---|---|---|
| Energy | 352 KCAL | Thiamin (Vitamin B2) |
| Carbohydrate | 77.7gm | Riboflavin (vitamin B2) |
| Sugars | 0.8gm | Niacin (vitamin B3) |
| Dietary fibers | 15.6gm | Pantothenic acid (B5) |
| Oil | 1.2gm | Vitamin B6 |
| Protein | 9.9gm | Folic acid (vitamin B9) |
| Zinc | 2.1mg | Calcium |
| Iron | 2.5mg | Magnesium |
| Phosphorus | 221mg | potassium |

(Source: USDA Food Database)

## Types of barley:

### The cultivated barley in the world is divided according to several considerations:

- Date of planting: winter or spring.
- Al Safa type: smooth and rough.
- Number of chromosomes: Binary barley contains 2n = 14, quadruple barley contains 2n = 28 and hexagonal barley contains 2n = 42 chromosome.
- Presence of casings: with casings (covered) Hulled.
- Number of rows in the spike: there is barley with six rows and four rows and two rows.

There is an urgent need to provide green fodder to feed animals, where farmers do the mowing process for barley fields once during the growing season to provide part of their needs for green fodder for this reason focused efforts to provide and develop varieties of barley have the ability to give several insects and then leave the field to give Grains, where studies have shown that different varieties of barley tolerate mowing operations to different degrees, where it was noted that some varieties do not give an acceptable grain yield after mowing operations, especially early varieties in the formation of spikes of existing growth, where the production is reduced significantly up to 80% after There are some varieties of barley that can give a good and high yield of cereals even after it has been harvested for two or more consecutive times, especially the medium or late flowering varieties with semi-predatory and predatory growth. That you give when you are not exposed to the process of mowing. These varieties are called multipurpose varieties, which are used for the purpose of processing green fodder, especially in January and then left to produce grain.

Barley fields can also be grazed directly by animals such as cattle and sheep. Barley land must be dry or low moisture when mowing or grazing so that the roots of the plant are not affected. Manure added manually at a rate of 50 kg / dunum of urea after each mowing. Watering the

fields after 1-2 days of the process of mowing and fertilization, and farmer must stop mowing the fields or grazing before the month of March if he wants to get grain product.

## Enabling environment

### Heat

Barley is grown on a broader environmental scale than other grains. Hockett (1990) found that barley grows better under cold dry conditions, but barley can withstand hot dry or cold wet weather. It is one of the most cold-tolerant crops grown up to latitude of 71 degrees as noted previously. The crop stays in the ground for 150-160 days. The optimum temperature for barley growth varies depending on its growth phase.

Barley bean sprouted at a maximum temperature between 28-30 ° C and a minimum temperature between 3-4 ° C. The optimum temperature for germination is 20 ° C. If the plant is in the process of forming the grain to high temperature and dryness, the grain becomes completely unfilled and therefore reduced production. When the temperature drops to -8 ° C or less, it leads to the death of barley plant.

There are two main groups of barley according to the effect of temperature on the nature of the growth of vegetative forests:

* Winter barley: where it needs a period of cold not less than two months to form vegetative branches before the beginning of elongation and grown in cold areas as a winter crop.

* Barley spring: does not require a period of cold to form the vegetative branches and cultivated as a winter crop in the temperate and subtropical regions of which all Iraqi varieties and as a spring or summer crop in the cold region.

### *Light*:

Barley is a long day plants where it needs a relatively long day of 14 hours to reach the stage of reproductive development and the formation of inflorescence and finally to flowering and formation of seeds.

### *Soil:*

Barley is cultivated in good mixture of fertile drainage with PH 6-7 grade and comes with abundant crop. Since barley is cultivated in all lands where wheat cultivation does not succeed, farmers are therefore used to allocate the best land for wheat and barley the weakest. Barley is an acid-sensitive crop with a pH of 7-8 degrees

### *Agricultural cycle:*

Barley is considered to be an early maturing winter crop, which is found to alternate successfully with other leguminous crops, grasses, etc. It can be successfully grown after yellow corn, sunflower and some summer vegetable crops.

### *Date of planting:*

The most suitable date for planting barley is mid-November to December as this date is suitable for agriculture in terms of moderate temperature so that it is close to 13 ° C at night and 24 ° C in the day so that after the completion of the seeding process germination occurs well and regularly because of moderation Temperatures therefore give the plant the opportunity to form vegetation forests before the cold in January and February.
Jordan has a dry and semi-arid Mediterranean climate where rainfall does not exceed 200 mm per year in more than 90% of its area. Al Majidyya is located at the middle Badia of Jordan is a rural village 70 km south of Jordan's capital city of Amman with a small population of 40 household heads and approximately 250 inhabitants, Al Majidyya community members traditionally use their lands for grazing.

Land degradation in the area is mainly attributed to continuous grazing which affects biodiversity, vegetation composition, and availability of essential biomass to sustain livelihoods. As an adaptation strategy, farmers have switched to barley cultivation because barley is a government-subsidized crop (farmers receive barley with lower prices than the world prices), and because despite its small yield potential due to water scarcity, nonetheless both the seed and the stalk offer farmers a good source of fodder for their livestock.

### Soil preparation for planting:

Soil preparation should be completed by the end of October to prepare for planting.
Agricultural operations include preparing the land, seed quantities and the fertilization.

### First: Preparing the Land for Agriculture:

The preparation of the land for agriculture aims to secure the appropriate cradle of the seed, and requires in the preparation of the good land:
The soil should be loose and homogeneous so that the soil grains are adhered to the seed and cover it well. The soil should be free of stones as much as possible, and of weeds and remnants of previous crops.

The most important and first stage in the preparation of the seed cradle is agriculture, where the surface layer must disintegrate and fluctuate at a depth of 15-20 cm. Studies have shown the usefulness of the tillage process by:
1. Prepare a suitable cradle for seed germination and for good plant growth later.
2. Extermination of weeds and harmful growth that compete the crop for water and food.
3. Dismantling the soil by making it fit to deepen the roots.
4. Soil aeration where agriculture works to exchange ground air and increase oxygen content in the soil.
5. Stir the surface layer and bury plant residues from the previous crop and herbs that will decompose into an organic material that increases soil fertility.
6. Prepare the soil to absorb more rain water and keep it longer.

7. Reduce the spread of fungal and insect pests.

## Second: Seed quantities:

In estimating the amount of seed, the following factors are considered:
1- Small, medium, large grain size.
2. Number of errors
3- Plant height
4 - Type of agriculture: rain fed, irrigated
5 - Date of planting
6 - Method of planting: sowing by hand or mechanical seed.
7- Seed purity and germination percentage.

Applying these factors to local varieties of barley, the seeds of these varieties are of medium and medium size. One dunum can accommodate 240,000 plants, and that one kilogram of local barley seed contains 28,000 grains.

Accordingly, the amount of seed per acre varies from 8-10 kg depending on the purity and vitality of the seed.
100 - Impurity ratio × Germination ratio
Agricultural efficiency of seed = 100/100
Assuming that the impurity rate is 1% and the germination rate is 90%, the agricultural efficiency of sowing is as follows:
99 x 90
------- = 89.99%
100

Accordingly, adjust the amount of seeds up to 1.25 kg to reach the required ratio, and the early date of planting needs a greater amount of seed, and the less the amount of rain reduces the amount of seed.

When planting, it is preferable to use good quality seeds free from diseases, insects, bush seeds, atrophic and broken seeds with high germination and abundance rate. The amount of sowing used varies depending on the method of planting. Farming prose needs more seeds than the amount of seeds sown on lines by seeds. Also, the amount of sowing is affected by the date of planting. Where acres need between 30 kg of barley seeds when planted solely by seed, but in the case of late cultivation or planting by prose should increase the amount of 35-40 kg per acre, preferably using certified seeds that carry the specifications of the full variety for the highest productivity. However, when planted in mixtures with legume crops such as clover or grassland such as oats, this amount is reduced by half and the other half of the seeds of the accompanying crop, whether leguminous or vetiver, are considered. Manual Prose Provided that the prose is a professional worker for regular planting in the field, or

mechanical prose and seeds are covered in this case. After finishing the seeding process, divide the field into slabs using disc salinity. Irrigation systems are also being opened to deliver water to the slabs.

### Third: Fertilization:

1- Rain fed Agriculture
Nitrogen Fertilizer:
The second stabilization zone: 60 pure nitrogen units per hectare are added in two equal batches, the first with agriculture and the second when planting.

The third stabilization zone: 40 pure nitrogen units per hectare are added in two equal batches, the first with agriculture and the second when planting.
B - Phosphorus fertilizer: In the second stability area 40 units of phosphorus is added per hectare at once with the last farming or with agriculture. In the third stabilization zone it is recommended to add 2 phosphorus units per hectare at one time with the last cultivation.

2- Irrigated agriculture:
Nitrogen fertilizer: add 80 units of pure nitrogen per hectare in three equal batches, the first with agriculture.
A - Phosphorus fertilizer: add 50 units of phosphorus per hectare at once with the last farming. This amount is converted according to the concentration of the fertilizer used. If we assume that the fertilizer used urea 46%, the amount of fertilizer required for the second stability area per hectare:

### Important economic and agricultural

Research suggests that barley consumption is beneficial in several ways. It reduces cholesterol levels in the blood, improves the regulation of blood sugar, and has other health benefits too. However, since barley contains gluten, it is not recommended for people with gluten-related disorders.

Barley has several uses, including:

1. Animal Feed: Currently, barley is mainly used as animal feed either in the use of grains (rich in carbohydrates) for direct feeding or in the feed industry for the preparation of rations or for the production of green fodder and hay is used in animal feed. Barley is considered an economic forage crop and a green fodder and fodder concentrate (grain) to provide the needs of livestock. Barley is grown as a green forage crop and is used for green feeding, grazing or conservation in the form of dry or silage, especially in reclaimed and new areas

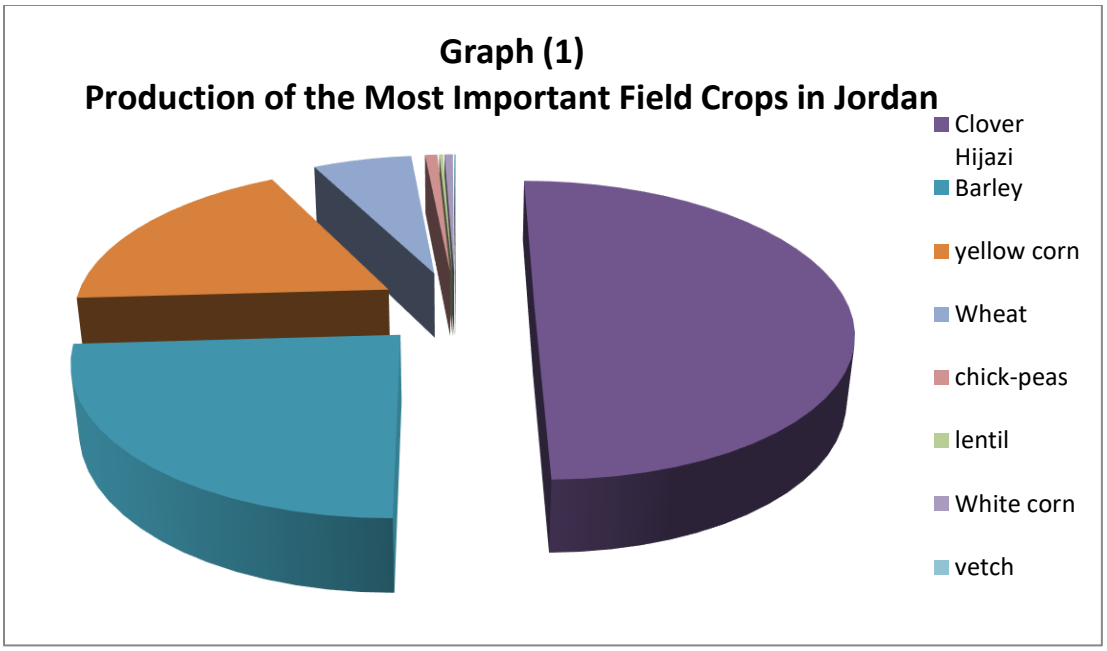
2. Human nutrition: Barley flour is used alone or mixed with wheat flour in the manufacturing of various types of pastries, especially bread, and some peoples prefer to bake barley over wheat bread. Like the Tibetan Plateau, this uses barley as a staple for the population.

3. Food industry: such as beer industry, prefer therefore special barley varieties (rich in carbohydrates and low protein containment). It is also involved in the manufacturing of alcohol and in the manufacturing of biscuits, and an alternative to coffee. Barley is a light laxative and a rich source of vitamins and minerals.

The traditional system for growing wheat and barley depended on the use of the crop as green fodder in the early stages of growth and then left the plants to form grains, and this is often the case in Al Majidiya area. "This tradition has a positive effect, which is that farmers can get a crop of fodder in the winter to bridge the shortage resulting from the decrease in the productivity of alfalfa hejazi and other grains, mites also reduce the negative effects of stagnation in local cultivated strains, where table No. (3) and graph 1 show the most important fodder crops in Jordan, but the introduction of improved short varieties of wheat and High-yield led to this system decline in many countries (Aldous et al., 1997)

Table (3): Field Crop Production Rate in Jordan for 2017
(Ton/dounm)

| Field Crops | Output Rate |
|---|---|
| Clover Hijazi | 100,934.50 |
| Barley | 48,954.50 |
| Yellow corn | 37,179.10 |
| Wheat | 12,110.40 |
| Chick-peas | 1,509.20 |
| Lentil | 439.9 |
| White Corn | 1,023.90 |
| Vetch | 191.3 |
| Total | 202,342.80 |




Winter barley is preferred as green fodder as animals are provided with beloved early green foods. Barley contains different ratios according to the following table (4):

Table (4): Barley Dry Matter Ratio

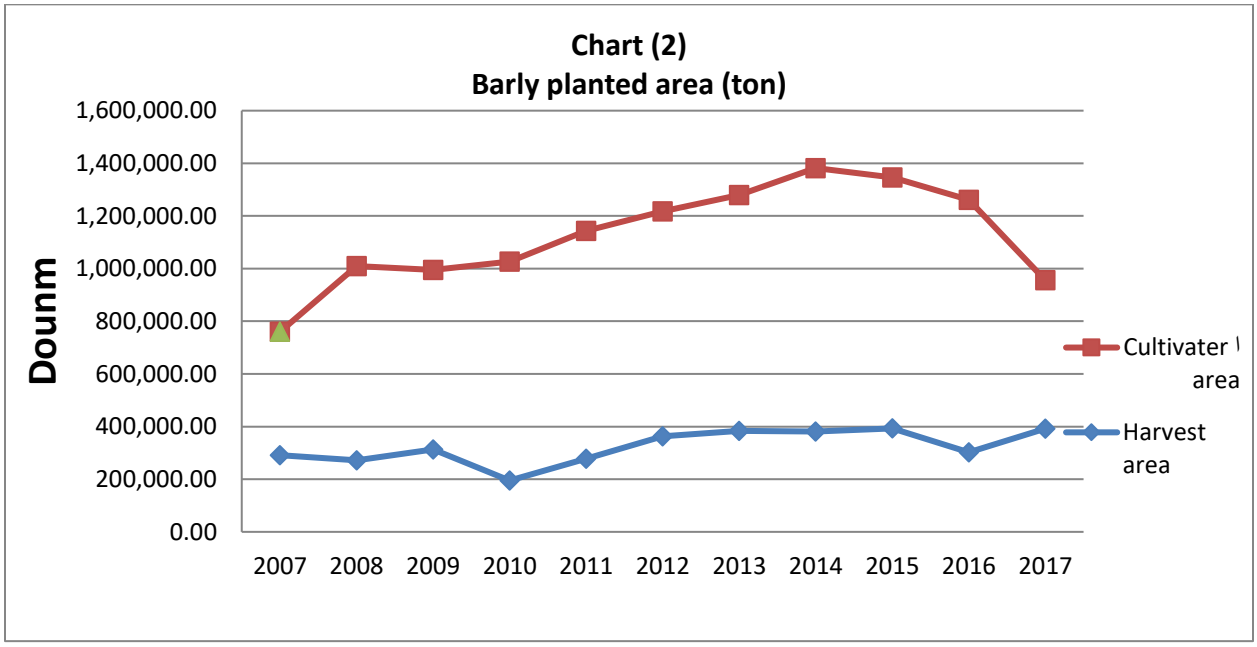
| Dry Matter Ratio | The Ratio of Crude Protein |
|---|---|
| 5.75 | 2.84 |
| 11.49 | 2.52 |
| 19.40 | 2.41 |
| 21.48 | 1.88 |

## Barley production in Jordan:

Barley production in Jordan is negligible. Table (5) also shows the production of the different governorates in Jordan. Chart (2) shows cultivated and harvested areas in Jordan. The main use of barley is grazing for animals and as fodder. The Jordanian Ministry of Industry and Trade, the main importer of barley, studies offers through traders who meet the prescribed criteria and determine the local selling price.

Table (5): Rain fed and Irrigated Barley Production by Governorate (2017)
(Ton/dounm)

| Governorate | Irrigated Barley | Barley Rainfed | Total output |
|---|---|---|---|
| Amman | 200 | 7817 | 8017 |
| Irbed | 0 | 11749 | 11749 |
| Albalqa | 455 | 878 | 1333 |
| Karak | 0 | 2968 | 2968 |
| Maen | 0.7 | 0 | 1820.7 |
| Alzarka | 691.4 | 210.5 | 901.9 |
| Mafraq | 0 | 9200 | 9200 |
| Tafeleh | 0 | 170 | 170 |
| Madaba | 0 | 3438 | 3438 |
| Jarash | 0 | 1998 | 1998 |
| Ajloen | 0 | 29.04 | 29.04 |
| Aqaba | 0 | 0 | 0 |
| Total | 1347.1 | 38457 | 41624 |




The average price of different assets, in addition to storage and handling costs, is repeated, minus a subsidized discount (between $ 10 to $ 50 per metric ton) to reduce the profit potential, when large price fluctuations are expected to reach barley imports (often used for feeding to 780 , 000 tons, unchanged from the year (2017) but about 7 percent below average.

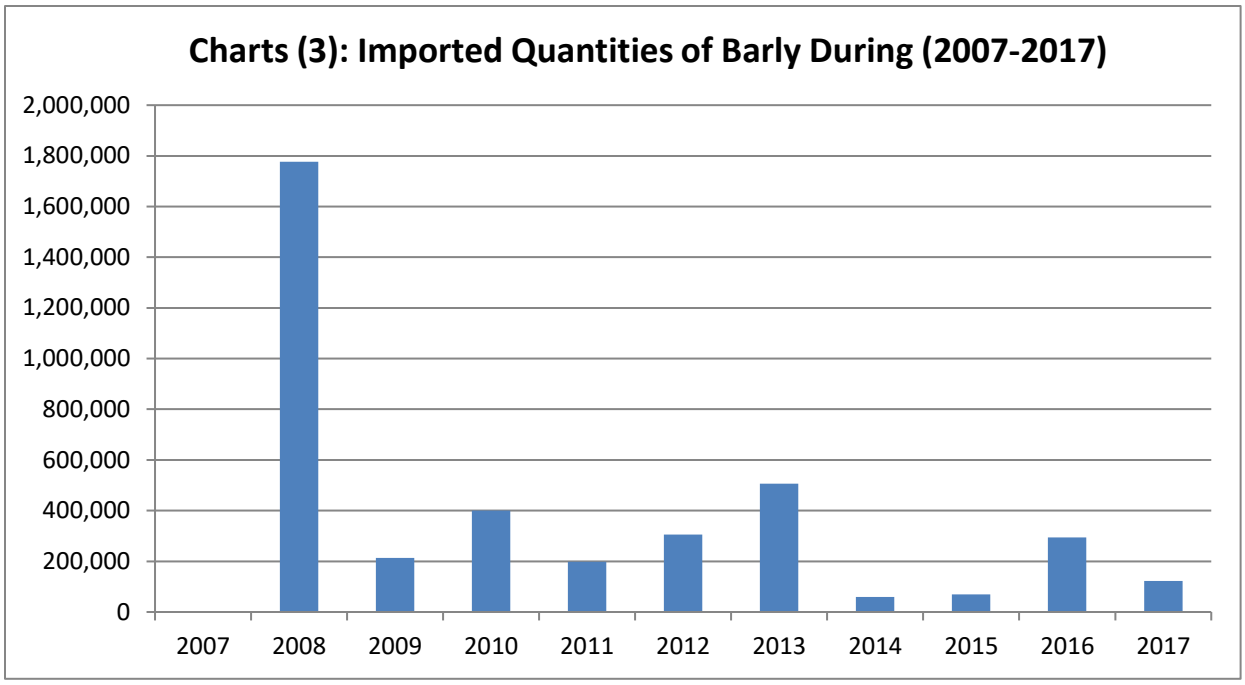
**Subsidized barley:**

The government subsidizes every ton of barley for 49 dinars at a cost of 224 dinars, while it is sold to its holders for 175 dinars, according to the daily opinion according to the number Actual sheep and goats recorded, although It is not low compared to wheat, but some farmers prefer barley because of its early ripening, since the time of barley harvest comes about a year and a half months before the wheat harvest, which encourages farmers to accept barley cultivation despite the low productivity of early summer crops. Wheat is lost due to early summer planting, At the beginning of this year(2019), the government supported livestock breeders, where it reduced the price of a ton of barley due to lack of pasture to become (145 dinars) instead of (175 dinars).

The Council of Ministers also decided to approve the start of purchasing wheat and barley crops from farmers of the agricultural season 2018 to 2019 at the expense of open trade with the Ministry of Industry, Trade and Supply in coordination with the Ministry of Agriculture and the Jordanian cooperative institution, as in previous years. Table (6) shows the most important barley exporting countries from which Jordan imports barley and charts (3) shows the imported quantities.
16 listed countries shipped 92.8% of global barley exports in 2018 in value terms.

Table (6): The Barley Exports by 16 Countries
2018

| Country | Exports/dollar | Total exports |
|---|---|---|
| Australia | 1.4 billion$ US | ٪18.1 |
| France | 1.3 billion$ US | ٪ 17.4 |
| Russian Federation | 1.0 billion$ US | ٪13.3 |
| Ukraine | 681.9Million$ | ٪ 8.9 |
| Argentina | 561.8Million $ | ٪ 7.3 |
| Canada | 527.2Million$ | ٪6.9 |
| Germany | 378.6Million$ | ٪4.9 |
| Kazakhstan | 291.9Million$ | ٪ 3.8 |
| Romania | 278.4Million$ | ٪3.6 |
| United Kingdom | 194.4Million$ | ٪2.5 |
| Denmark | 157.9Million$ | ٪2.1 |
| Hungary | 80.2Million$ | ٪1 |
| Czech Republic | 78.1Million$ | ٪1 |
| Sweden | 73.8Million$ | ٪1 |
| Spain | 67.8Million$ | 0.9% |




The Council of Ministers decided to approve the purchase prices of 500 dinars per ton of wheat seeds, 420 dinars per ton of barley, 420 dinars per ton of wheat ports and 370 dinars per ton of barley ports.

The Cabinet agreed to continue to authorize the Central Committee to purchase grain and announce the purchase price for the next season to encourage farmers to cultivate their land and the Ministry of Agriculture buys feed and grains of barley at different prices from farmers as a type of support for growing it, according to Table No. (7).

Table (7): The Quantity and Price of Barley Purchased from Farmers (2006-2017) (JD/ton)

| Year | Seed Quantity | Forage Quantity | Total | Price (seed) | Price (forage) |
|---|---|---|---|---|---|
| 2006/2007 | 373.8 | 1904.43 | 2278.23 | 160 | 150 |
| 2007/2008 | 1035 | 5198 | 6233 | 180 | 170 |
| 2008/2009 | 150 | 296.18 | 446.18 | 380 | 330 |
| 2009/2010 | 832.73 | 6048.05 | 6880.78 | 380 | 250 |
| 2010/2011 | 1391 | 14798 | 16189 | 290 | 270 |
| 2011/2012 | 92 | 6116 | 6208 | 365 | 225 |
| 2012/2013 | 815.3 | 9963 | 10778.3 | 209 | 288 |
| 2013/2014 | 598 | 5859 | 6457 | 370 | 320 |
| 2014/2015 | 426 | 36096 | 36522 | 370 | 320 |
| 2015/2016 | 689.6 | 8750 | 9440 | 370 | 320 |
| 2016/2017 | 852.6 | 8275 | 9127.6 | 420 | 370 |

*Source: Ministry of Agriculture, 2006-2017*

The decision included selling of improved wheat and barley seeds to farmers for the 2018-2019 season at the purchase price and the treasury bears the cost of screening and sterilization which is 75 dinars per ton of quantities expected to be sold to farmers.

The Cabinet, the Higher Council for Science and Technology and the Prime Minister's Decision Support Unit, were tasked to study the global best practices in supporting local farms, and explaining the cost to the farmer and the fair price when buying in the coming years, according to the Ministry of Agriculture.

The Ministry of Industry and Trade has issued instructions for the purchase of municipal grains, issued annually, so that they are priced based on the average purchase prices based on international prices and added 50 percent.

The sources indicated that the percentage of wheat and municipal barley constitutes a small percentage of the annual consumption of the Kingdom, and in terms of wheat ranges between 1.5 to 1.5 percent of the total consumption of the Kingdom, and for municipal barley about 5 percent of the annual barley consumption volume, where table (8) shows Jordan Barley Domestic Consumption.

Table (8): Jordan Barley Domestic Consumption By year (1000 MT)

| Market Year | Domestic Consumption | Unit of Measure | Growth Rate |
|---|---|---|---|
| 2007 | 650 | (1000 MT) | -16.67 % |
| 2008 | 550 | (1000 MT) | -15.38 % |
| 2009 | 525 | (1000 MT) | -4.55 % |
| 2010 | 500 | (1000 MT) | -4.76 % |
| 2011 | 600 | (1000 MT) | 20.00 % |
| 2012 | 750 | (1000 MT) | 25.00 % |
| 2013 | 950 | (1000 MT) | 26.67 % |
| 2014 | 850 | (1000 MT) | -10.53 % |
| 2015 | 930 | (1000 MT) | 9.41 % |
| 2016 | 920 | (1000 MT) | -1.08 % |
| 2017 | 870 | (1000 MT) | -5.43 % |
| 2018 | 1000 | (1000 MT) | 14.94 % |
| 2019 | 1100 | (1000 MT) | 10.00 % |

Source: https://www.indexmundi.com

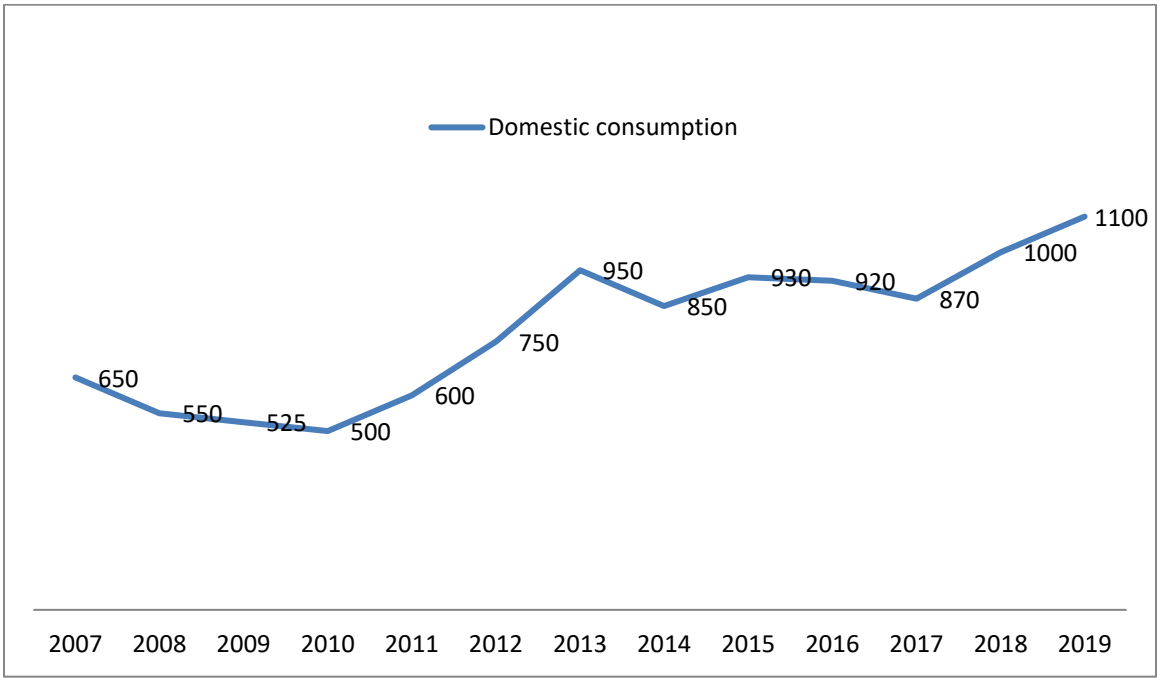



Chart 4: Domestic Consumption

These instructions regulate the work of the committees that supervise the receipt process, so that the receipt is from joint committees between the Ministry of Agriculture, the Ministry of Industry and Trade, the Jordan Cooperative Corporation and the Audit Bureau, distributed over three regions in Jordan for a period of two months.

It is noteworthy that Jordan was one of the exporters of wheat; in 1960 Jordan exported 60 thousand tons, and stopped exporting wheat and barley completely since 1989, except in 1997, which showed the export of about 2000 tons of barley because most of the livestock keepers sell their herds due the end of government feed support in 1996.
The year 1987 showed a major export boom for the wheat crop, which exported 5846 tons (source: http://assabeel.net/23526).

Malt barley, due to its limited usage and high-quality requirements, is a unique niche product in international grain market representing about 1.5% of the total world grain production (USAID, 2014). It is particularly interesting in the context of smallholder commercialization and food security since it has high value as both cash and food crop. Table (9) shows the approximate costs of barley cultivation.

Table (9): Costs of Cultivation of Dounm of Barley

| Variable costs | Kilograms / dounm | Price (JD) |
|---|---|---|
| Seeds | 10 | 3.7 |
| Fertilizers | 2kg DAP + (4-6) urea | 10 |
| Tilling | For every plowing | 2.5 |
| Farm door price | | 348.65 |
| Selling price | | 354.55 |

Table 10 and chart 5 show the production of the top 20 barley countries in the world.

Table (10): Top 20 Countries in Barley Production (tons) for 2017

| No | Country | Production |
|---|---|---|
| 1 | Russian Federation | 20598807 |
| 2 | Australia | 13505990 |
| 3 | Germany | 10853400 |
| 4 | France | 10545427 |
| 5 | Ukraine | 8284890 |
| 6 | Canada | 7891300 |
| 7 | United Kingdom | 7169000 |
| 8 | Turkey | 7100000 |
| 9 | Spain | 5785944 |
| 10 | Denmark | 3992300 |
| 11 | Poland | 3793032 |
| 12 | Argentina | 3741158 |
| 13 | Kazakhstan | 3305224 |
| 14 | Iran (Islamic Republic of) | 3100000 |
| 15 | United States of America | 3090010 |
| 16 | Morocco | 2466462 |
| 17 | Ethiopia | 2031661 |
| 18 | Romania | 1906700 |
| 19 | China, mainland | 1897318 |
| 20 | India | 1750000 |

*Source: FAOSTAT*

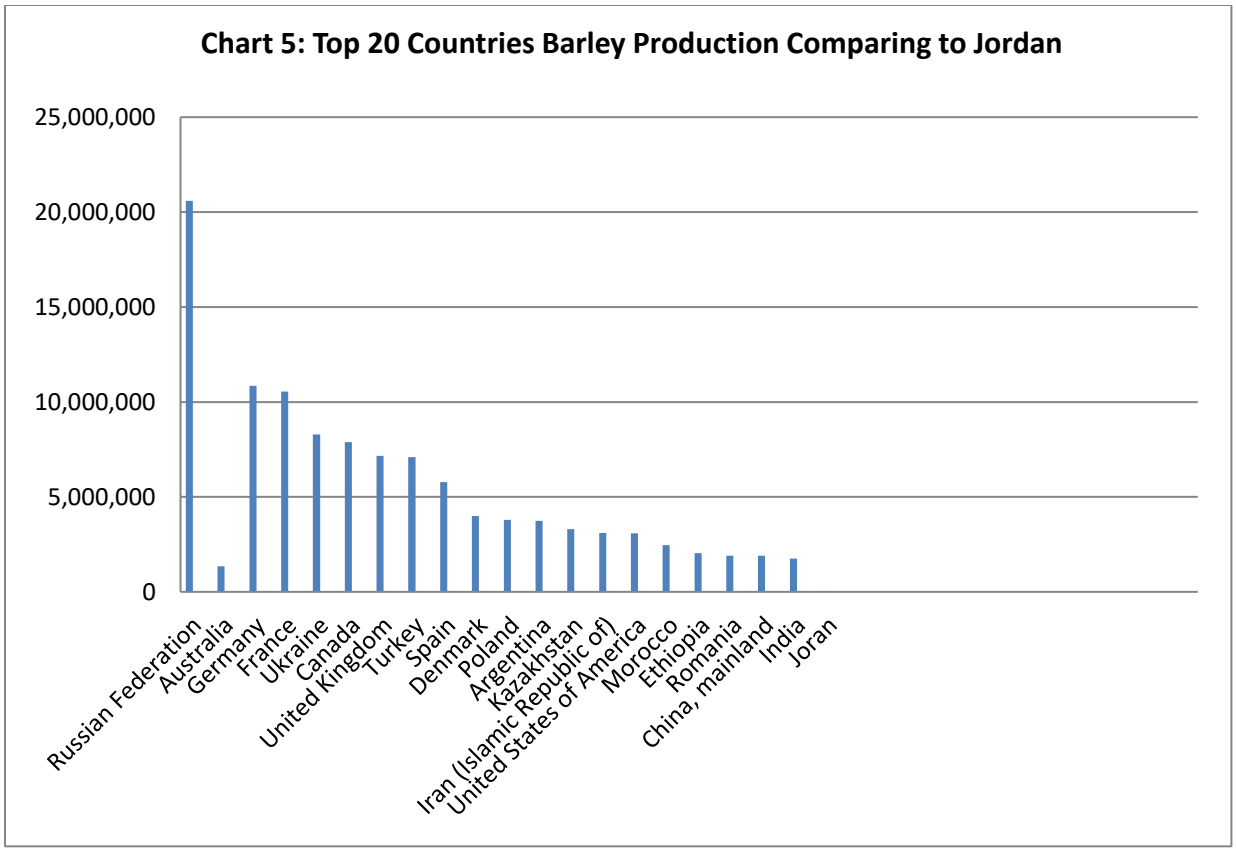
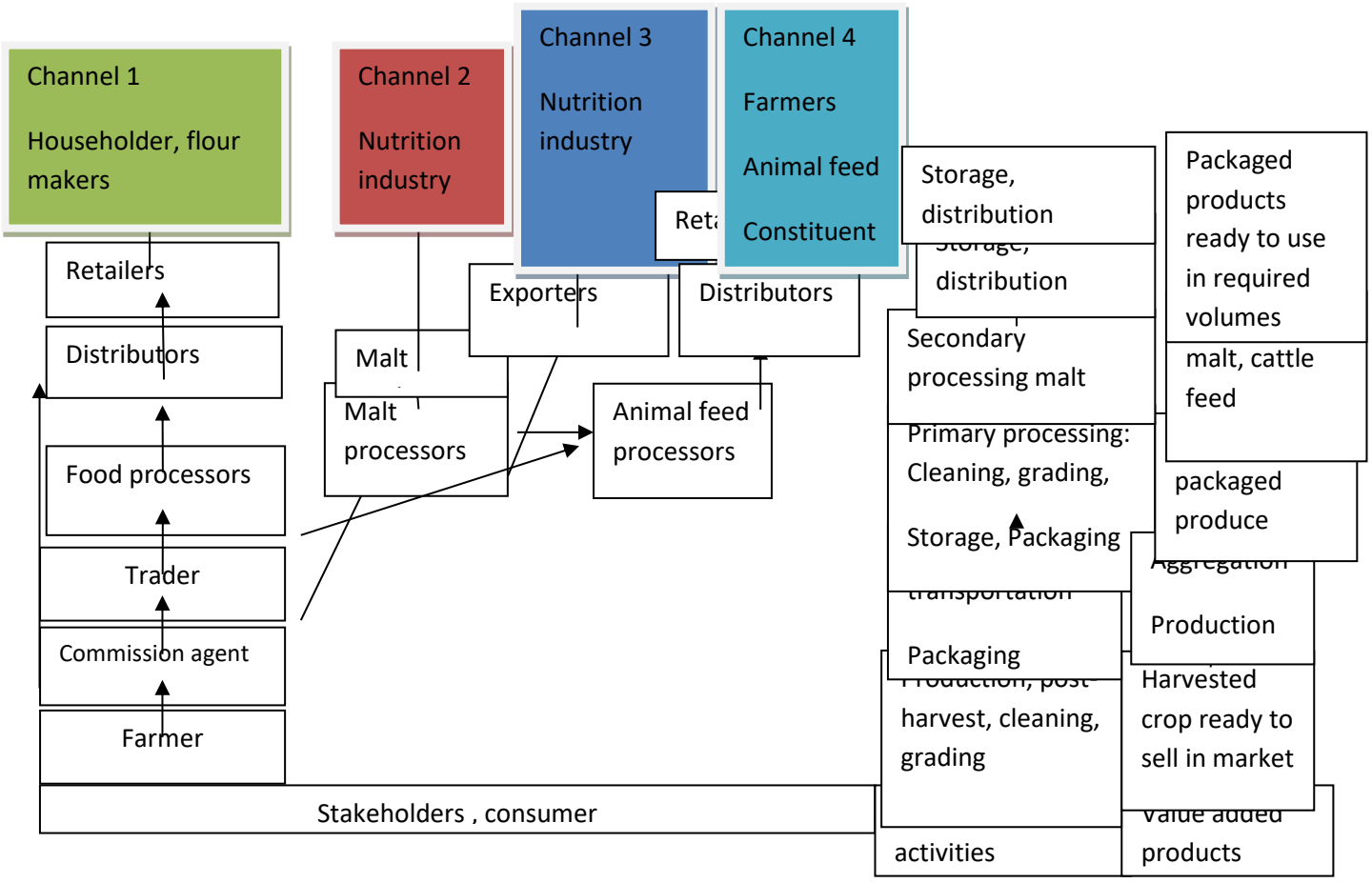


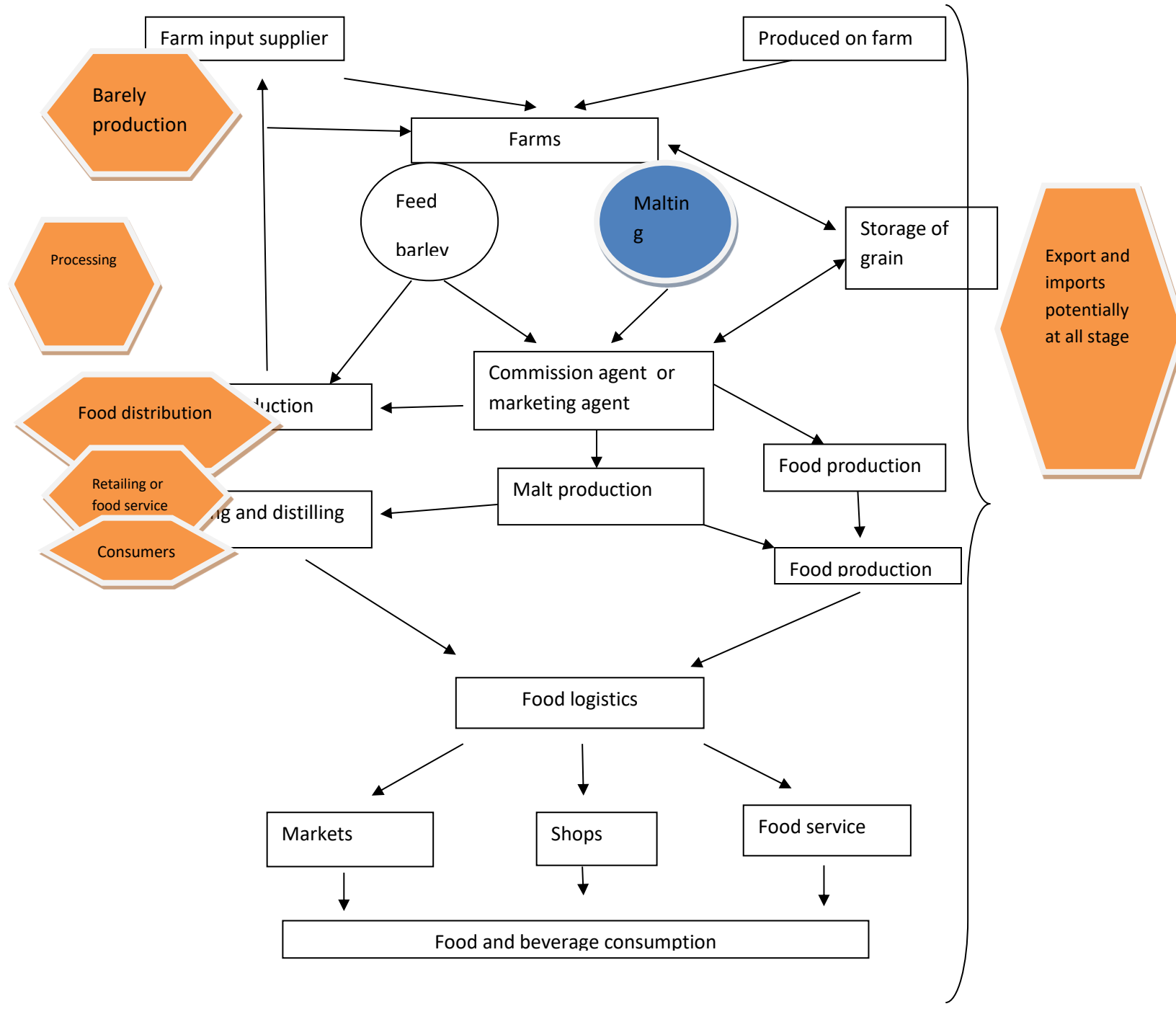

Chart 6 shows a map of the barley's value chains in general and in the world, chart 7 shows the value chains of barley regarding the farmer and chart 8 shows the Barley Value Chains at Al Majidyya.

## Barley value chain actors and linkages:

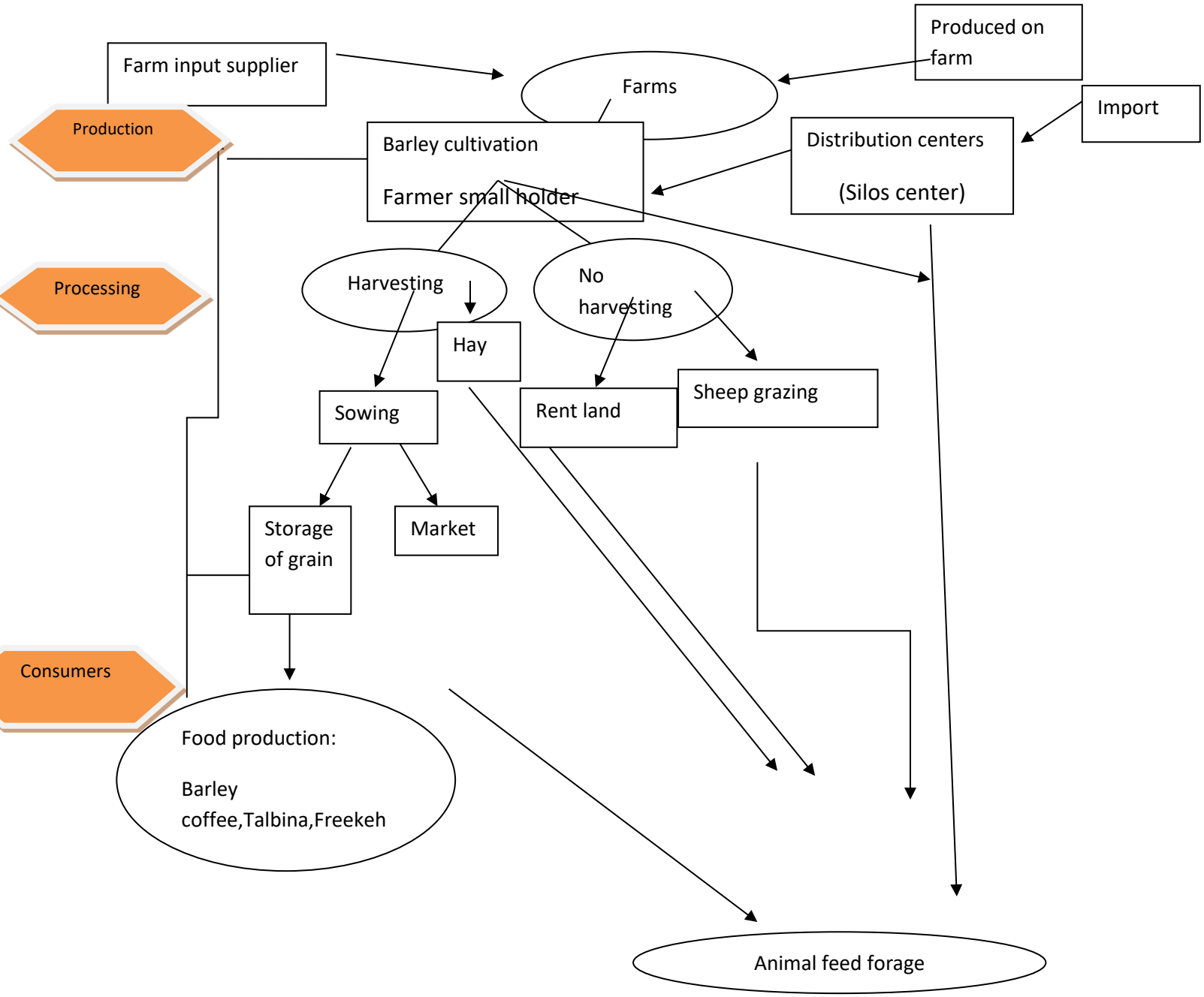
### Chart 6: Value Chains Maps :



## Chart 7: Barley value chains:



## Chart 8: Barley Value Chains at Al Majidyya:



## Annex: Economic and financial valuation of “Marab” technique:

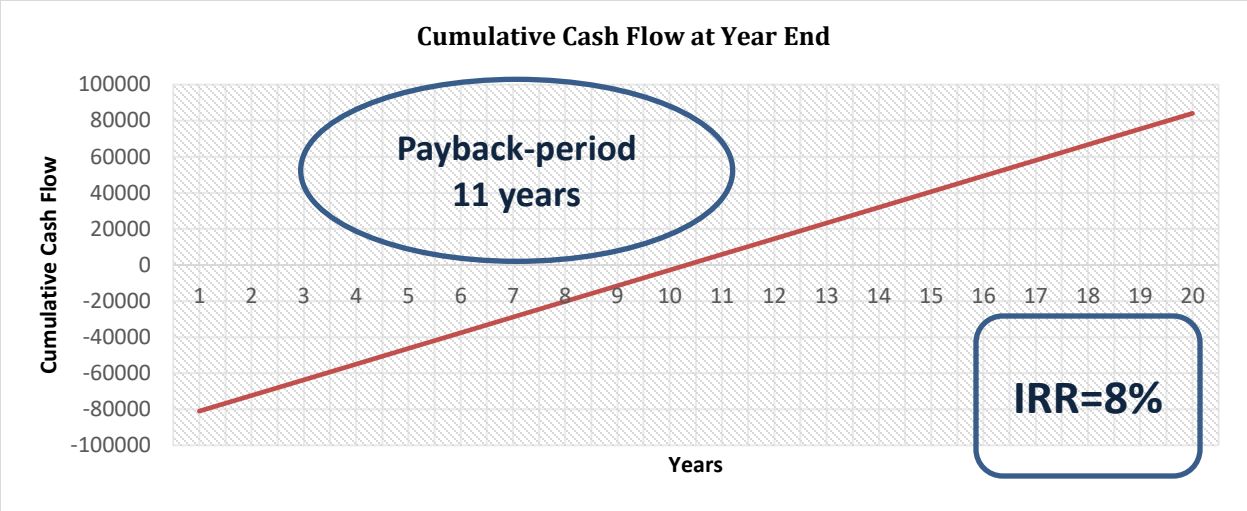
Table 1: Economic valuation of “Marab” technique

| cost of planting barley by using Marab water-harvesting technique | | | | | |
|---|---|---|---|---|---|
| **Costs** | **Unit** | **Quantity** | **Price (JD/ Unit)** | **Value (USD)** | |
| **Fixed costs** | | | | **years 20** | **years 10** |
| site selection | | | | **25** | **50** |
| design | | | | **35** | **70** |
| implemetation( marab I | (JD/10 ha) | 1 | | **200** | **400** |
| - Land Rents | (JD/10 ha) | 100 | 4 | **400** | **400** |
| - Depreciations | | | | **0** | **0** |
| - Interest | percentage | 0 | 0 | **0** | **0** |
| implemetation( construction of spilways) | | | | **225** | **450** |
| **Total fixed cost** | | | | **885** | **1370** |
| **Variables cost** | | | | | |
| deep plow | (JD/10 ha) | | | **1000** | **1000** |
| seed | (JD/10 ha) | | | **600** | **600** |
| fertilizers | (JD/10 ha) | | | **500** | **500** |
| harvested cost | | 100 | 6 | **600** | **600** |
| **Maintenance** | (JD/10 ha) | 1 | | **1000** | **1000** |
| **Total Variables Cost** | (JD/10 ha) | | | **3700** | **3700** |
| Total Cost | (JD/10 ha) | | | **4585** | **5070** |
| **Revenue** | | | | | |
| seeds | | | | 5700 | 5700 |
| Hay | | | | 52 | 52 |
| Straw | | | | | |
| residues after harvesting | | 100 | 1.5 | 150 | 150 |
| Total revenue | | | | 5902 | 5902 |
| Profit | | | | 1317 | 832 |
| B/c ratio | | | | 1.287241003 | 1.164103 |

Table 2: Financial valuation of “Marab” technique

| Marab Facts | Costs (JOD) |
|---|---|
| Capital cost (JOD) | 89700 |
| Life cycle (Years) | 20 |
| Maintenance costs (JOD/year) | 1000 |
| Variable costs (JOD/year) | 2100 |
| Total revenue (JOD/year) | 16273 |

| Designation | *Marab* |
|---|---|
| **Implementation level** | Community |
| **Environmental impact** | High |
| **Upfront cost of investment** | High |
| **Complexity of the technology** | Slightly complex |
| **Profitability of the technology** | Long term |
| **Financial indicators**<br>**NPV**<br>**IRR**<br>**CBA** | NPV= -62263.15 JOD<br>IRR= 8%<br>**CBA= 1.28 (20 years)**<br>**CBA= 1.16 (10 years)** |


Cumulative Cash Flow at Year End
Cumulative Cash Flow
100000
80000
60000
40000
20000
0
-20000
-40000
-60000
-80000
-100000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Years
Payback-period
11 years
IRR=8%