Effect of Food Industries on Iraqi GDP – Cheese Industries as a case study

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3. The load of Food Import Paragraph on Iraq GDP
4. Cheese Industries as a case study
5. Technical Parameters in Cheese Industries
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Definition Gross Domestic Product:

- Gross Domestic Product (GDP)'s technical definition is the total value of the production and consumption of all the goods and services of the country.

- Gross National Product (GNP)'s technical definition is the combined value of all the final goods and services produced in a country during an accounting year, including net factor income from foreign countries.

- GNP = GDP + Net factor income from abroad.
To understand this, let's look at the sources of economic growth....where does production come from?

\[ Y = F(A, K, L) \]

Real GDP

"is a function of"

Productivity

Capital Stock

Labor

**Real GDP** = Constant Dollar (Inflation adjusted) value of all goods and services produced in the United States

**Capital Stock** = Constant dollar value of private, non-residential fixed assets

**Labor** = Private Sector Employment

**Productivity** = Production unaccounted for by capital or labor
Rate of investment in Iraq, 1949-2010

Source: Hashim, J., 1990, Table IV-2, p. 7; and MoF / COSIT, Iraq
Iraq within MENA, 2010

**Gross domestic product**
(US$ bn; market exchange rates)

- Saudi Arabia
- Iran
- United Arab Emirates
- Israel
- Egypt
- Algeria
- Kuwait
- Qatar
- Morocco
- Iraq
- Libya
- Sudan
- Oman
- Syria
- Tunisia
- Lebanon
- Yemen
- Jordan
- Bahrain

Sources: Economist Intelligence Unit estimates; national sources.

**Real GDP growth**
(% change)

Source: Economist Intelligence Unit.
Outcomes from Industrial Investment

1. The project that keep foreign currency inside Iraq
2. Increase the value of local material that support the local industries
3. Create jobs
4. Increase additional value.
Central of Iraqi Statistics Organization (CSO)

CSO is a directorate in Ministry of Planning and specialized in statistical processes concerning with population census, sampling census and all statistical operations such as agricultural, industrial, economic, social, financial and monetary, cultural and other that related to formal and semi formal, public and private institutions, companies in general and Individuals. In addition to citizens status and their activities that serve planning, national development and scientific research.
Iraqi Imports during 2010

3417 MUS$ Petroleum Products

45724 MUS$ Non-Petroleum Products
Figure 1: Samples of Iraqi Imports during 2010

- Pipes and fittings: 5,545
- Rice: 4,555
- Wheat: 2,509
- Meat: 1,5
- Automobiles: 3,58
- Machines and Tools: 3,412
- Food: 7
- Other: 17

Million US$
Figure 2: Samples of Iraqi Imports during 2010
Figure 3: Samples of Iraqi Imports during 2010

- Powder Milk: 415 Thousand $
- Yogurt: 34 Thousand $
- Butter: 0.212 Thousand $
- Cheese: 51 Thousand $
Figure 4: Types of sweets and backing imported at 2011

- Sweet biscuits: 38,290 thousand $
- Cake, gateau and similar: 6,969 thousand $
- Sugar confectionary, candy drops, with wrapping: 5,219 thousand $
- Sugar confectionery (including white chocolate), not containing cocoa: 3,988 thousand $
- Toffee (caramels), Turkish delights, nougat: 929 thousand $
- Chewing gum, whether or not sugarcoated: 584 thousand $
- Powders for making table jelly: 103 thousand $
- Stuffed Chocolate in blocks, slabs or bars: 24 thousand $
Figure 5: Types of drinks and juices imported at 2010

- Orange, Apple, and other juices: 28,040 thousand $
- Natural mineral water not containing added sugar or other sweetening matter nor flavoured: 49,610 thousand $
- Ice cream and other edible ice, whether or not containing cocoa: 11,964 thousand $
- Drinks sweetening containing flavoured fruit: 1,528 thousand $
Figure 6: Summary of Food Industries Priority
Food Industries:

Through research, educational programs, and industry collaboration, it is a leading source of knowledge on how food reaches consumers efficiently and contributes to safe and healthy lives. The Food Supply Chain is perhaps the most fundamental industry with respect to consumer needs. The degree or grade of excellence of a food product related to its safety, nutrition, organoleptic properties and acceptance by the consumer
Cheese Industries

Cheese is the fresh or matured solid or semisolid product represent mainly the casein protein obtained by one of the following methods:

a) Coagulating milk, skimmed milk, partly skimmed milk, cream, whey cream, or buttermilk, or any combination of these materials, through the action of rennet or other suitable coagulating agents, and partially draining the whey that results from such coagulation.

b) processing techniques involving coagulation of milk or materials obtained from milk which give an end product that has the same essential physical, chemical, and organoleptic characteristics as the product defined in (a).
History

- 7000 BC: Ancient Sumerian and Mesopotamian cultures of the Tigris-Euphrates basin raised cows and sheep and engaged in dairy production

- 3000 BC: First historical reference to cheese, found in a Sumerian frieze

- 800 BC: Homer mentions cheese in his Iliad

- 329 BC: Greek historian Xenophon wrote about a goat cheese that had already been made for centuries

- 54 BC: Julius Caesar invades Britain and finds the Britons making Cheshire cheese
1815 AD: The first factory for the mass production of Swiss cheese opens in Bern

1824 AD: Colby cheese developed in Vermont, USA

1851 AD: The first American cheese factory is established in Rome, New York

1865 AD: Marin French Cheese Company opens in Petaluma, California

1876 AD: McCadam Creamery opens in Heuvelton, New York (moved to Chateaugay, New York, in 1934)
Kinds of Cheese:

1. Cured or ripened cheese is cheese which is not ready for consumption shortly after manufacture but which must be held for specified time, temperature, and under other conditions. The necessary biochemical and physical changes in the characteristic of the cheese will occur.

2. Mold-cured or mold-ripened cheese is a cured cheese in which the curing has been accomplished primarily by the development of characteristic mold growth throughout the interior or on the surface of the cheese.

3. Uncured, un-ripened, or fresh cheese is cheese which is ready for consumption shortly after manufacture.
Classification of Cheese:
The individual cheeses are ascribed according to important classification criteria:

1. Source of Milk
   - Sheep
   - Goat
   - Buffalo
   - Mare
2. Kind of milk Coagulation

- precipitation of casein by rennet, lactic acid, or a mixture consisting of rennet and lactic acid at 30 – 35 °C
- precipitation of casein and whey protein by lactic acid at 90 – 92 °C
### Milk composition analysis, per 100 grams

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Unit</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
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<tr>
<td>Water</td>
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<td>87.8</td>
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</tr>
<tr>
<td>Protein</td>
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<tr>
<td>Fat</td>
<td>gm</td>
<td>3.9</td>
<td>6</td>
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<tr>
<td>----Saturated fatty acids</td>
<td>gm</td>
<td>2.4</td>
<td>3.8</td>
</tr>
<tr>
<td>----Monounsaturated fatty acids</td>
<td>gm</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>----Polyunsaturated fatty acids</td>
<td>gm</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Carbohydrate (i.e the sugar form of Lactose)</td>
<td>gm</td>
<td>4.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>mg</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Calcium</td>
<td>mg</td>
<td>120</td>
<td>170</td>
</tr>
<tr>
<td>Energy</td>
<td>kcal</td>
<td>66</td>
<td>95</td>
</tr>
</tbody>
</table>
Classification of Cheese:

3. Consistency
   - Extra Hard 51% moisture on a fat-free basis
   - Semi-hard 54 – 63 %
   - Semisoft 61 – 69 %
   - Soft over 67 %

4. Fat Content
   - High fat over 60 % fat on the dry base
   - Full fat 45 – 60 %
   - Medium fat 25 – 45 %
   - Low fat 0 – 25%
   - Skim below 10%
Classification of Cheese:

5. Ripening of Fresh Cheese
   - Cured cheese with or without rind with a smeared surface
   - With or without white or blue mold on the rind or in the cheese

6. Potential of Use
   - Grating, scratching, cutting, or spreading; Mel table cheese
   - Cheese as raw material for cheese products (cheese preparations, processed cheese).
Raw Material:

The raw materials for cheese manufacture are:

1. Fresh raw milk as produced by regular and thorough milking of healthy, normally fed dairy animals.

2. The milk of several mammals can be used, but the major sources are cows, sheep, goats, buffaloes, and mares.

3. Cheese is also made from cow’s milk mixed with milk from any of the other sources.
Raw Material Requirements:

1. Cheese milk must comply with general food hygiene requirements for consumer milk (i.e., it must be free from microorganisms pathogenic to humans, toxins, hazardous foreign matter, and undesirable flavors).

2. It must meet certain standards regarding its chemical composition, coagulation properties, and microbial condition.

3. It must contain no antimicrobial residues, particularly antibiotics.
The cheese yield depends primarily on the followings:

a) The fat and protein contents of the milk.

b) The salt (particularly calcium salts).

c) Protein concentrations, as well as the acidity, are very important for coagulation.
Cheese Production and bacteria affect:

The microbial requirements for cheese milk

- Pasteurized Milk → The heat resistant spore-formers, e.g., the butyric acid bacteria (*Clostridium tyrobutyricum*)
- Raw Milk → Type of bacteria and the bacterial count are essential to the quality of the product.
The quantitative and qualitative compositions of the microbial milk flora depends on:

1. The hygienic conditions of milk production.
2. What the animals were fed.
3. To comply with the microbial standards of cheese milk, the growth of these microorganisms must be prevented by appropriate cooling and prompt processing of the milk.
4. The improper use of animals drugs may impair the fermentation processes essential for cheese making and ripening.
Cheese Making Technology:

- Casein Protein (main Component of cheese)
- Protein in Milk
- Whey Protein

Most production techniques are intended to:

1. Selectively increase the casein, fat, and dry matter contents in cheese by expelling whey.

2. Permit lactic fermentation and ripening to develop in a way that is specific to each type of cheese.

3. The principal cheese quality criteria are odor, taste, body texture, shape, appearance, and in some cases eye formation.
Production Process Steps:

Removal of Bacteria

1. Milk Treatment:
   Fat Treatment

   Pasteurization at about 62 - 65°C for 10 - 20 minutes

   a. Removal of Bacteria
      Centrifugation (Bactofugation)
      Catalase treatment by peroxide
      The addition of nitrate, skim milk powder, whey protein, and ultrafiltration.
b. Fat Treatment:

Disc Bowel Centrifugal separator:
Sterilization:
2. Starter Cultures:

Cheese quality depends largely on the *starter cultures* added to the milk to induce lactic fermentation and ripening before processing. The starters used for lactic fermentation consist of lactic acid bacteria and are introduced in amounts ranging from 0.05 to 5wt %. Some types of cheese require additional admixtures of mold spores (mold-ripened cheese) or propionic acid bacteria, e.g., Emmentaler.
3. Coagulation:

The cheese making process begins with coagulation of the milk in a vessel (kettle, vat, or cheese making machine).

- Enzymes, acid, or combinations of enzymes and acid
- Rennet (a substance that makes milk thick and sour)

Generally, the coagulation takes place at a temperature of 28 – 35 °C and lasts 10 – 50 min.

In some cases with the addition of an organic acid (cottage cheese which is soft white cheese with small lumps in it).
4. Curd Making:

1. As soon as the coagulum has attained the desired consistency, it is cut into cubes. In this curd-making process, water exudes from the rennet coagulum along with dissolved lactose, whey protein, and salts. The solid curds are thereby separated from the liquid whey.

2. The diameter of the curd particles varies between 1mm and 3 cm. Under the influence of the rennet enzymes and the acid produced by the lactic acid bacteria, the curd particles shrink and become firmer. This process is called syneresis.

3. Whey expulsion is subsequently regulated according to the final water content desired in the ripe cheese.
5. Curd Making:

The properties of the cheese affected by:

a) Large curd surface area (small curd particles),

b) Long and vigorous stirring,

c) Strong acid development,

d) Cooking of the whey – curd mixture favor curd drying.

For some hard cheese varieties, the cooking temperature is raised to 60 °C and stirring is continued at this temperature for some time.
6. Curd Separation:

When the curd is firm enough, it is separated from the whey by a process called **dipping or hooping**. There are three different methods.

a) The settled curd mass can be transferred in a cloth to the hoop (a large ring of plastic or wood).

b) The whole curd – whey mixture can be transferred to a perforated metal or plastic mold.

c) The curd can be scooped out into the mold. In the mold, the curd particles fuse together, and the cheese obtains its proper shape. The mass of the hooped cheese varies from 100 g for soft cheese to over 100 kg for Emmentaler.
7. Whey Drainage:

The next stage is whey drainage. This depends on the development of lactic fermentation, which in most cheese types is most rapid in the hours following dipping. Pressing and turning of the cheese in the mold enhances the expulsion of whey.
8. Salting:

All cheese types are salted, except fresh cheese. Salt absorption influences:
1. The flavor.
2. Keeping quality.
3. Body characteristics.
4. Bacterial flora of the cheese.
5. Cheese ripening.

Normally, the cheese is put into a brine bath. Sometimes the salt is added to the curd (e.g., Cheddar) or applied to the cheese surface in the form of a solution.
a) In Cheddar manufacture:

The whey is removed and replaced by warm water. The acidification takes place within blocks or in the curd mass. When lactic fermentation is sufficiently advanced, the curd is ground and salted (cheddaring) and subsequently pressed.

b) In pasta filata cheese (e.g., Provolone):

The lactic fermentation also takes place in the mass of fused curd particles. This mass is treated with hot water or hot whey (at > 60 °C), and the curd is then worked by twisting and stretching it until it forms a moldable stringy mass, and finally it is given the desired shape.
9. Ripening:

After salting, the cheese is submitted to further curing and ripening procedures, depending on the specificity of each variety. Ripening takes place in special rooms, mostly cellars, where temperature, relative air humidity, air motion, and treatment of the cheese are essential factors. The following processes, more or less intense according to the cheese type, determine the characteristics of the end product.
Conclusions and Recommendations:

1. The Food item is about 7 Millar US$ in Iraqi balance sheet 2010. It represent about 16 % from Imported non-petroleum products.

2. Dairy products represent about 22 % of imported food.

3. Powder milk is the highest requirement from dairy products, liquid milk, cheese, yogurt, cream and butter.

4. Industries of cheese is biochemical Industries, so the selection of milk type, starter, operating conditions, enzymes, bacteria salting procedure and ripening process play a big role to draw the taste and consistency of cheese, so the cheese industries includes many secrets.

5. It is very important to establish food research center. This center leads the food industries to be more competitive.
References:


6. [https://www.milk.org/Corporate/Processors/Milk_Class_Table.aspx](https://www.milk.org/Corporate/Processors/Milk_Class_Table.aspx)