

Analysis of the Moroccan agri-food system through national accounting “2015 Social Accounting Matrix”: The role of the wheat sector in the agri-food complex

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DOI: 10.30682/nm2403f

JEL codes: L16, Q11, Q18

Abstract

This paper evaluates the role of wheat in Moroccan agriculture. A social accounting matrix for 2015 disaggregates soft and durum wheat, focusing on agriculture and the agri-food industry. Results show that soft and durum wheat account for 19% of agricultural product resources. Their production contributes 21% to agricultural value-added, represents 3% of national value-added, generates 16% of agricultural wages, and 17% of agricultural capital. The industrial processing of these wheats contributes only 5% of the total value-added in the agri-food industry, generating 4.3% of labor and 5% of capital in this sector. Multiplier effects indicate that soft and durum wheat impact production activities by 2.66 and 2.6, respectively. An additional 1% injection would lead to an 84% increase in soft wheat production, a 16% rise in value-added, and a 26% increase in household income. For durum wheat, production would rise by 75%, value-added by 13%, and household income by 22%. Comparing the multiplier effects of wheat processing to production activities, the processing industry has a greater impact on production, value-added, and household income. These findings underscore the significant role of wheat in Morocco's agricultural and agri-food sectors, highlighting its economic and social importance. The multiplier effects suggest strategic investments and policy decisions could optimize benefits from wheat production and processing activities.

Keywords: *Agri-food system, Social accounting matrix, Soft wheat, Durum wheat, Wheat transformation, Agriculture.*

Introduction

The Mediterranean region's economic stability heavily relies on the agricultural sector. Agriculture and food security are critical issues since economic growth cannot occur without a strong relationship between agricultural development, environmental preservation, and food security.

Ensuring the food security of the population

is one of the primary challenges of the agricultural sector. The global population continues to grow, and this increase is accompanied by rising food demand, particularly in developing countries where agricultural production does not keep pace with population growth. This situation makes the food system dependent on the international market, which has become increasingly

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unstable with significant price volatility. This dependency worsened after the 2008 global food crisis, which revealed the agricultural sector's vulnerability, as it faces a profound crisis and significant development challenges worldwide (Saidi, 2011). Additionally, with the advent of COVID-19, input and output prices have led to decreased incomes and weak investments (Elame *et al.*, 2023). Food prices have skyrocketed, particularly the prices of cereals, which are the staple food for most populations.

Agricultural activity has been the foundation of food production long before the rise of the agri-food industry. With the advent of the agri-food industry, countries turned to intensifying agriculture to increase yields and ensure food supplies. The agri-food industry emerged to meet this objective. Over various stages of economic growth, this sector has taken an increasingly significant place in the final value of food products and the composition of consumers' shopping baskets, leading to substantial changes in the entire food system (Rastoin and Tozanli, 2008). It constitutes an essential link in the food system by providing products intended for final household consumption.

These two fundamental sectors, agriculture and the agri-food industry, form the backbone of the agri-food complex, ensuring the supply of agricultural raw materials and their transformation and packaging. The contribution of each sector to food production and value creation varies from country to country.

In Morocco, agriculture plays a crucial role in the economy, representing 14% of the national GDP (World Bank, 2016). However, this contribution is highly volatile due to the sector's dependence on climatic conditions. The sector also suffers from very low productivity and insufficiently valued productions (Erraoui & Fort, 2016). As for the agri-food industry, it has established its presence in the market with the creation of numerous companies in the field, with new production units enriching the agri-food system almost every year. These companies account for 27% of Morocco's total industrial production, or 4% of GDP (Erraoui & Fort, 2016).

The agro-industrial food system tends to globalize, meaning that companies and institutions

in this system adopt new organizational forms to adapt to globalization phenomena. This transition places more importance on the agri-food industries, shifting from a rural economy focused on agriculture to an agri-food economy, which prioritizes agri-food industries and distribution to meet consumption needs.

Following the rise in international market prices, particularly for soft wheat between 2007 and 2008, and the resulting food crises, Morocco has prioritized food availability, leading to increased imports and a chronic trade balance deficit (Rerhrhaye & Ait El Mekki, 2017).

In Morocco, the agri-food system is complex due to the multitude of actors involved and their diverse statuses and sizes; multinationals coexist with family units (Rastoin *et al.*, 2004).

1. Food System in Morocco

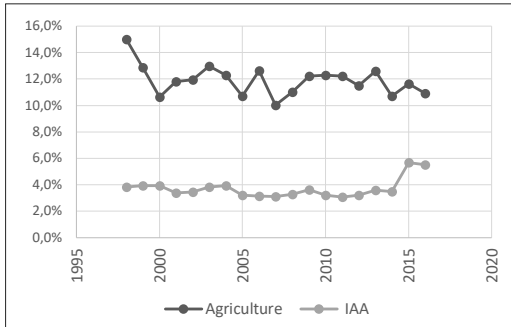
The agri-food system is composed of interdependent and interactive elements. It is a network of actors contributing to the creation of goods and services to meet consumer needs and ensure a country's food security. The concept of a food system describes all the activities involved in food production within a given society, the nature of the foods consumed, and their consumption patterns (Malassis & Ghersi, 2000).

In 2017, the agricultural and fisheries sector in Morocco represented 13.6% of GDP, valued at 131.62 billion DH. Moroccan growth is closely linked to the agricultural sector's performance: the significant fluctuations in the agricultural sector's value-added, reflecting its dependence on climatic conditions, particularly rainfall, affect GDP growth (Harbouze, 2019).

The agricultural value-added in 2015 was double that of the agri-food industries, a trend that has been ongoing for several years, as shown by the graphs below depicting the evolution of the value-added of the two sectors from 1998 to 2016.

We observe that variations in value added affect the agricultural sector more due to climatic fluctuations and international market price conditions. The value added by the agri-food industries averages 3.5% of the national GDP, which is significantly lower than the agricultural sector's share of about 12% on average.

Figure 1 - Evolution of the Share of Agricultural and Agri-Industrial (IAA) Value Added in Morocco's GDP.



Beyond agricultural production, Morocco has developed a diversified and competitive agri-food industry, notably in cereal processing, dairy products, and fruit and vegetable processing. This sector benefits from duty-free imports of raw materials for local consumption (cereals, crude oil, raw sugar) or export after processing, such as white sugar, whose global market sales have significantly increased since 2015. The agri-food industry has also benefited from the Green Morocco Plan through the increased agricultural production that can be processed and through the support granted to this sector (Harbouze, 2019).

According to the Ministry of Agriculture and Maritime Fisheries (MAPM), in 2016, the agri-food industry produced 160 billion DH (MM DH), accounted for 19% of industrial investments, 12% of industrial exports, and employed over 140,000 people.

1.1. Cereal Farming in Morocco's Agri-Food System

In Morocco, the food issue is characterized by the deficit in the solvable demand for staple foods and the significant insufficiency of domestic food supply. The country only partially covers its needs for basic food products such as cereals, milk, oils, meat, and sugar (Rerhrhaye & Ait El Mekki, 2017). A substantial part of food demand is therefore met by imports, which heavily impact the trade balance, especially when food prices rise.

The cereal sector is one of the main agricultural production sectors in Morocco. It plays

multiple roles concerning the annual cultivation of arable land, the formation of the agricultural Gross Domestic Product, rural employment, and the utilization of industrial processing capacities (Aït El Mekki, 2006). It is a predominant crop for almost all agricultural operations and holds an important place in Moroccan consumption, with 180 kg per person per year of wheat consumed, ranking Morocco third in the world after Tunisia and Algeria (FAO, 2013). It also provides feed for livestock (barley and by-products) due to its major interdependence with animal sectors.

Cereals continue to play a central role among all plant products. This high level of cereal consumption is explained by several factors. Their consumption is encouraged by policies that keep consumer prices low for essential products and by the low incomes of some consumers (Marty *et al.*, 2017).

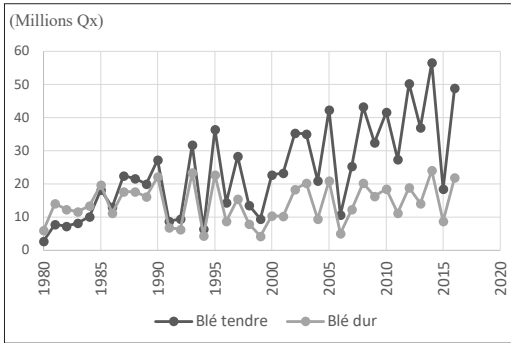
1.1.2. Production and Imports

The upstream sector includes wheat resources from national production and imports. National production is based on the cultivation of an average of 3 million hectares of wheat (soft wheat and durum wheat). These crops are practiced by almost all farmers, representing 60% of the cereals cultivated over the last five agricultural seasons and covering 37% of the UAA (Utilized Agricultural Area) (MAPMDREF, 2017).

In recent years, wheat production has seen significant progress with fluctuations primarily explained by climatic hazards (Figure 2). This progress reflects improved production levels and the gradual changes in consumer living standards and dietary habits, except for the years 2008 and 2010, when there was a significant drop in imports following price shocks in the international cereal markets, particularly the wheat market. However, production does not keep up with demographic growth, indicating a food deficit that increases the need for imports, especially for soft wheat, placing Morocco among the net cereal-importing countries and implying a risk of food insecurity.

The ambitions of the State to reduce soft wheat imports face real obstacles due to the projected decrease in international supply by 2030 and the scarcity of water, which implies a declining na-

Figure 2 - Evolution of Wheat Production in Morocco (MAPMDREF, 2016).



tional production that does not meet the demand (Rerhrhaye & Ait El Mekki, 2017). Wheat imports continue to be at the top of Morocco's agricultural import list, representing 45% of total agricultural imports and 27% of cereal imports in 2016 (MAPMDREF, 2016).

Due to its high dependence on cereal imports, with an independence rate between 40% and 50% (FAO, 2018), Morocco is one of the Arab countries most vulnerable to food price shocks, also influenced by its limited financing capacity.

1.1.3. Wheat Consumption

Morocco's food consumption model is still largely dominated by cereals. In 2014, wheat consumption was 171 kg per person per year, accounting for 73% of consumed grains and processed cereals. Expenditure on unprocessed and processed wheat reached 584 DH per person per year, representing 62.2% of cereal consumption expenditures (HCP, 2014).

Wheat production provides grains intended for direct household consumption or processing at mills, followed by secondary processing in pasta and biscuit industries to produce finished products. Additionally, straw production serves as livestock feed.

Cereal collection is managed by storage organizations. However, this collection system is deficient, as a significant volume of wheat bypasses the formal milling industry and goes through artisanal mills, which are not part of the formal circuit (FNM, 2001).

The milling sector generates an annual turnover of 20 billion DH and employs approximately 10,000 people. It comprises 137 mills that pro-

cess soft wheat, 60 semolina mills that process durum wheat, and 19 barley mills (FNM, 2017).

2. Methodology

Through the disaggregation of the cereal sector, specifically soft wheat and durum wheat, within the Social Accounting Matrix (SAM), this study aims to elucidate the contribution of such staple products to agriculture and the broader economy. We will first define the SAM and its overall structure before beginning its disaggregation.

2.1. Social Accounting Matrix (SAM)

A Social Accounting Matrix (SAM) is a comprehensive table representing the production, distribution, and redistribution process of income among sectors, production factors, economic agents, and the "Rest of the World" (ROW, i.e., external agents to the considered economic system) over a specific period. As a representation of the entire economic system, the SAM highlights interrelations and the circular flow of income between goods, production, factors, and institutions (FAO, 2006).

The SAM is a double-entry table presenting the accounts of the Nation. It provides a comprehensive quantified overview of its structure and economic circuits. The SAM is an analytical tool that presents the accounts of the national accounting system in a matrix form, illustrating interrelations between the resource-use table and institutional sector accounts.

The flexibility of the SAM allows for the disaggregation of activities, institutional units, and production factors. It not only schematizes the real sphere of an economy but can also incorporate the financial sector or non-economic production activities as defined by SNA 93 (household domestic production). Including these activities does not necessarily require modifying the initial SAM structure if satellite accounts are used for this purpose (FOFANA, 2007).

From national accounts, we can define the branches identifying the agri-food complex. Upstream, primary branches supply raw materials, including agriculture, forestry, fishing, and

aquaculture, along with agro-supply sectors involved in food production, encompassing inputs such as energy, chemicals, agro-equipment, construction, and services like transport and trade. Downstream, we find the agri-food industries, hotels, and restaurants as the primary clients within the agri-food system.

Technically, the SAM is a square double-entry table that includes a series of account categories (FAO, 2006), typically:

- *Goods and Services Accounts*: These accounts provide an overview of the sources of final goods available in the economic system (production activities and imports) and their destinations (intermediate consumption activities and institutions).
- *Production Activities Accounts*: These primarily correspond to the production activities of the studied economy and generally refer to defined sectors.
- *Production Factors Accounts*: These accounts illustrate the remuneration of production factors by productive activities (receipts) and the allocation of these remunerations to institutions (expenses). They typically distinguish between labor and capital but may include natural resources like land and water.
- *Institutional Accounts (Economic Agents)*: Mainly households, businesses, and the government, these accounts record receipts in rows and expenditures in columns.
- *Capital Account or Savings-Investment Account*: This account records the allocation of resources for capital formation and the use of these resources for purchasing investment goods and stockpiling goods.
- *Rest of the World Account or External Account*: This account records payments made to and received from the rest of the world.

The disaggregation takes into account the wheat production chain from the farm to its initial processing into flour at industrial mills. Data collection for the secondary processing was challenging due to the confidentiality of the data that organizations are reluctant to disclose.

The updated social accounting matrix corresponds to the year 2015, so we chose 2015 as the reference year to present the most recent

possible results. This year was characterized by favorable climatic conditions.

Data collection for filling out the SAM was conducted centrally at various departments of the Ministry of Agriculture and Maritime Fisheries, the Directorate of Statistics, the High Commission for Planning, offices (ONICL, ONCA, ORMVA), the National Federation of Milling (FNM), the National Federation of Grain Traders (FNCL), the Office of Exchange, industrial mills, and grain importing companies. Additionally, we relied on studies and surveys already conducted at the national level, which were useful in completing the database.

2.2. Disaggregation of the SAM

The definition of the various accounts considered all sectors involved in the production process at the farm level and the initial processing at the agro-food industries level up to final consumption by all resident institutions in various forms.

For goods and services, we distinguish between agricultural products and agro-industrial products.

- *Agricultural Products*: For the wheat SAM, we defined four accounts: two accounts for wheat (soft wheat, durum wheat), one account for straw, and one account grouping all other agricultural products.
- *Agro-Industrial Products*: These accounts correspond to wheat-derived products from their initial processing at industrial mills. We cite six accounts: two accounts for soft wheat products, namely F.N.B.T and free flours (luxury flour and FRS), and two accounts for durum wheat products, namely semolina, given the main product of this type, in addition to durum wheat flour, one account for bran, and one account for other agro-industrial products.

For production activities, we distinguish between agricultural production and agro-industrial production.

- *Agricultural Production*: For our case, only one group of activities is considered for disaggregation. We distinguish two production activities: soft wheat production and durum wheat production, whether rainfed or irrigated.

Table 1 - Table of product resources 2015 (billions of DHs).

<i>Products</i>	<i>Production</i>	<i>Imports</i>	<i>Trade and transport margins</i>	<i>Taxes</i>	<i>Total resources</i>
Soft wheat	16,4	5,5	3,7	0,57	26
Durum wheat	8,78	3	2,88	0,42	16,4
Straw	10	-	0	-	10
Free flours	8,4		0,48		8,9
FNBT	1,8		0,029		1,8
Wholemeal flour	1,9		0,066		2,04
Semolina	0,67		0,026		0,7
Bran	1,85		0		1,85

- *Agro-Industrial Production*: Within the agro-industrial branch, we disaggregate the initial cereal processing industry. This involves the activity of industrial mills nationwide, responsible for wheat milling. For this activity, we open production activity accounts for F.N.B.T, free flour production, durum wheat flour, and semolina.

For production factors used in the production of goods and services, we consider the value of land, agricultural and non-agricultural labor, agricultural and non-agricultural capital, and institutions including households (with an account for rural households with five income classes and urban households with five income classes), the state, and companies involved in the production and processing of soft and durum wheat. Finally, the rest of the world represents external exchanges, including Morocco's imports and exports of soft and durum wheat, alongside other product exchanges.

3. Results and discussion

3.1. Analysis of the Results of the Disaggregated Matrix

3.1.1. Product Resources

In 2015, the resources for soft wheat and durum wheat were estimated at 26 billion DH for soft wheat, representing 12% of total agricul-

tural resources, while durum wheat resources were valued at 15.32 billion DH, accounting for 7% of total agricultural resources. These crops occupied 42% and 18% of the area, respectively, and contributed to 48% and 20% of total cereal production.

These resources mainly consist of domestic production. The 2014-2015 agricultural season experienced record production, leading to a reduction in imports, estimated at 5.5 billion DH for soft wheat (28% of agricultural imports) and 3 billion DH for durum wheat (16% of agricultural imports).

The value of domestic production was approximately 23.4 billion DH for soft wheat production and 11.7 billion DH for durum wheat production, including the value of grain and straw production.

Regarding wheat processing activities, the total milling at industrial mills in 2015 was estimated at 53.7 Qx, with 84% for soft wheat and 13% for durum wheat. The total resources from this processing were valued at 15.34 billion DH, comprising 58.17% free flour, 13.3% durum wheat flour, 12% FNBT¹, 12% bran, and 4.5% semolina. The production of the primary wheat processing industry represented 8.6% of the total production of the agri-food industry.

The product resources derived from the disaggregated matrix are presented in billions of DH in Table 1.

¹ FNBT: subsidizes common wheat flour, known as "National Flour".

3.1.2. Value Added

Agriculture contributed 13.13% to the national value added for the 2014-2015 agricultural season. Within this sector, the value added from soft wheat cultivation was estimated at 15.75 billion DH, with a production of 56.7 million quintals, representing 13.7% of agricultural value added and 2% of the value added across all sectors of the national economy. Durum wheat cultivation generated a value added of approximately 8.2 billion DH, with a national production of 24 million quintals, accounting for 7.13% of agricultural value added and only 1% of the national value added.

As for the value added by the primary processing industry of soft and durum wheat, it represents 5% of the value added in the agri-food industry sector. Free flours generate the highest value added, estimated at 2 billion DH,

Table 2 - The value added of soft wheat and durum wheat and their share in agriculture and at the national level.

	Added value (Billions of Dhs)	Share in agricultural VA (%)	Share in national VA (%)
Soft wheat	15,75	13,7	2
Durum wheat	8,2	7,13	1
Other agricultural products	90,9	79,17	97
Total	114,8	100	100

Table 3 - The value added by the primary processing industry.

Products	Added value	Share in the VA of the food industry (%)
Free flours	2 073	3,7
FNBT	244	0,43
Wholemeal flour	283	0,05
Semolina	40,62	0,007
Total	2 640	5

followed by durum wheat flour with a value added of approximately 283 million DH, FNBT with 244 million DH, and semolina with 40.6 million DH.

3.1.3. Household Expenditures

Household expenditures for the final consumption of soft wheat grain amounted to 471.36 million DH, with 77.6% of these expenditures made by rural households, averaging 14 DH per person per year. Urban households accounted for 22.4% of these expenditures, with an average spending of 5 DH per person per year. However, household expenditures on durum wheat grain reached 1,274.3 million DH, with 52% spent by urban households at an annual average of 30 DH per person, and 48% by rural households with an average annual expenditure of 39 DH per person.

In terms of quantity, urban households consumed an annual average of 1.55 kg per person of soft wheat and 8.44 kg per person of durum wheat, while rural households consumed 4.6 kg per person of soft wheat and 11.9 kg per person of durum wheat annually.

Household expenditures on processed wheat products reached 15.24 billion DH, with 6.6 billion DH dedicated to the consumption of free flours, 4.9 billion DH for durum wheat flour, 1.8 billion DH for FNBT consumption, and 1.7 billion DH for semolina.

These expenditures highlight the significant role of wheat and its processed products in the diet and economy of Moroccan households, with notable differences in consumption patterns between urban and rural areas.

3.1.4. National Flour Consumption and Expenditure Analysis

National flour is primarily intended for low-income households, with 62% of expenditures made by rural households and 38% by urban households. The expenditures are higher among the less affluent household classes. For other wheat products, urban households tend to spend more, and the expenditures increase with the household income.

Expenditures on wheat grain consumption represent 2% of agricultural product expenditures, while expenditures on processed wheat

Table 4 - Household expenditure by standard of living class (in millions of DHs).

	<i>Soft wheat</i>		<i>Durum wheat</i>		<i>Free flours</i>		<i>Wholemeal flour</i>		<i>FNBT</i>		<i>Semolina</i>	
	<i>Value</i>	<i>%</i>	<i>Value</i>	<i>%</i>	<i>Value</i>	<i>%</i>	<i>Value</i>	<i>%</i>	<i>Value</i>	<i>%</i>	<i>Value</i>	<i>%</i>
<i>Urban households</i>	105.68	100	668.4	100	4,179	100	2,916	100	692	100	1,037	100
C1	12.3	11.6	81.4	12.17	602	14.4	328.6	11.27	164.3	23.7	131.38	12.6
C2	22.8	21.5	124	18.55	796.5	19	469.4	16	156.5	22.6	167.2	16.12
C3	24.6	23.27	141.7	21.2	867.3	20.7	580.3	20	156.3	22.6	207.7	20
C4	25.5	24.12	164.5	24.6	1,004	24	729	25	114.3	16.5	231.78	22.35
C5	20.5	19.4	156.65	23.4	909	21.7	794.3	27.24	99.3	13.35	297.3	28.6
<i>Rural households</i>	365.68	100	605.94	100	2,460	100	1,993	100	1,133	100	826	100
C1	46.54	12.7	64.25	10.6	243.34	10	208.6	10.4	214.4	19	80.4	9.7
C2	58.7	16	107.27	17.7	395.8	16	305	15.3	217.55	19.2	119.15	14.4
C3	72.88	20	123.67	20.4	441.5	18	416.8	21	228.12	20.13	156.5	19
C4	82.28	22	140	23	591.7	24	443	22.2	228	20	179.6	21.7
C5	105.28	28.7	170.91	28.2	788	32	615.16	30.8	246	21.7	286.24	34.6
<i>Total expenses</i>	471.36		1,274.3		6,640		1,825		4,910		1,864	

flour consumption account for 11% of food product expenditures.

3.2. Analysis of Production Activity Multiplier Effects

3.2.1. Direct Upstream Multiplier Effects

Once calculated, this effect measures the intermediate demand for goods and services of an activity from other activities providing the necessary inputs to increase production by one unit in the sector considered.

At the national level, a one-unit increase in soft wheat production activity leads to an increase in the use of seeds by 0.44 units, agrochemical products by 0.26 units, soil working machinery and equipment by 0.22 units, irrigation water by 0.07 units, and textile products for sacking by 0.05 units. The total direct upstream multiplier effect is 1.34 units. This implies that a 1% increase in soft wheat production activity will result in a 134% increase in intermediate consumption.

A 1% increase in durum wheat production activity increases the input demand by 124%, with the most significant increases in seed demand

Table 5 - Direct upstream effects by activities.

<i>Activity</i>	<i>Direct upstream effects</i>
Soft wheat	1.34
Durum wheat	1.24
Free flours	1.5
FNBT	1.6
Wholemeal flour	1.87
Semolina	1.96

(41%), agrochemical products (24%), and agricultural machinery and equipment (19%).

An increase of one unit in wheat processing activity results in an additional demand for wheat, which is the primary input. The growth in free flour production implies an additional demand of 1.03 units of soft wheat for milling, 0.12 units of energy, and 0.15 units of materials and equipment. The total upstream multiplier effect is 1.5 units.

3.2.2. Downstream Multiplier Effects

Soft wheat is a basic input, particularly for the primary processing industry. An increase in this activity will lead to a rise in the demand for soft

Table 6 - Downstream ripple effect.

<i>Activity</i>	<i>Downstream effect</i>
Soft wheat	3
Durum wheat	3.02
Straw	0.0087
Free flours	0.29
Wholemeal flour	0.20
Semolina	0.077
Bran	0.016

wheat by 2.17 units for the production of soft wheat flours and 0.42 units for other agri-food industries. For durum wheat, the input supply for the production of semolina and durum wheat flour is 2.3 units, and 0.38 units for other agri-food industry products.

For straw and bran, which are used as livestock feed, an increase in livestock activity will induce a rise in demand for straw by 8.7% and 1.6% units for bran.

The flours are further processed and used in the production of pasta, biscuits, and other products. An increase in this activity will generate additional demand for flours with the following proportions: 29% for free flours, 20% for durum wheat flour, and 7.7% for semolina.

3.3. The Multiplier Matrix

Production multipliers measure the impact of a unit change in a sector on its production (direct

effect) and on the production of other sectors in the national economy (indirect effect). They help determine the impact of a change in the final demand for a given product on the economy's production.

3.3.1. Production Multipliers

For cereals, soft wheat and durum wheat have effects of 2.66 and 2.6, respectively, on production activities.

Analyzing the distribution of these effects across different economic sectors reveals that an injection into one of the activities, namely soft wheat and durum wheat, induces a greater increase in the production of that activity itself compared to other sectors, achieving significant direct effects. An injection of 1 billion DH into the soft wheat production activity would result in an additional increase of 2.66 billion DH in the production of all activity sectors, including 0.84 billion DH for the soft wheat activity itself. For durum wheat, an injection of 1 billion DH into this activity would result in an additional increase of 0.75 billion DH.

An injection into these two products leads to a significant increase in the primary wheat processing industry much more than in other agri-food industries, with 0.33 as the effect for soft wheat and 0.25 for durum wheat. The direct effects of processed products are more significant, with 1.19 for free flours, 1.06 for FNBT, 1.14 for durum wheat flour, and 1.03 for semolina. Table 7 presents the direct and indirect effects of

Table 7 - Multiplier effects on sectors of activity

		<i>Soft wheat</i>	<i>Durum wheat</i>	<i>Free flours</i>	<i>FNBT</i>	<i>Wholemeal flour</i>	<i>Semolina</i>
Cereals	Soft wheat	0,847	0,182	0,638	0,721	0,179	0,186
	Durum wheat	0,17	0,75	0,165	0,174	0,625	0,669
Other agricultural activities		0,123	0,122	0,133	0,132	0,128	0,128
Cereal processing industry	Free flours	0,248	0,237	1,191	0,259	0,235	0,246
	FNBT	0,081	0,074	0,073	1,063	0,07	0,074
	Wholemeal flour	0,19	0,18	0,184	0,195	1,145	0,185
	Semolina	0,073	0,069	0,07	0,075	0,067	1,033
Others Agri food industry		0,149	0,148	0,162	0,16	0,156	0,155
Other sectors		1,05	1,076	1,07	1,065	1,08	1,12
Total		2,66	2,6	3,7	3,84	3,7	3,8

Table 8 - Multiplier effect on added value.

	<i>Agricultural products</i>		<i>Agri-food products</i>			
	<i>Soft wheat</i>	<i>Durum wheat</i>	<i>Free flours</i>	<i>FNBT</i>	<i>Wholemeal flour</i>	<i>Semolina</i>
Effect on Land Rent	0,05	0,038	-			
Effect on Labor	0,046	0,043	0,27	0,28	0,26	0,27
Effect on Capital	0,07	0,058	0,68	0,59	0,63	0,57
Effect on VA	0,16	0,13	0,95	0,87	0,89	0,84

investment in unprocessed and processed wheat products.

3.3.2. Value Added Multipliers

Similar to production multipliers, value added multipliers measure the impact of a unit change in a sector on the value added.

The increase in agricultural value added primarily affects agricultural capital. Similarly, in the wheat processing industry, the increase in non-agricultural value added has a greater impact on non-agricultural capital, followed by non-agricultural labor.

These multipliers indicate that an additional unit injection would create an additional wealth of 16% in the case of soft wheat, with 7% for capital and 4.6% for wages, and an increase of 13% in value added for durum wheat, with 5.7% for capital.

The value added of the primary wheat processing industry will see an increase of 3.55 units after the injection of an additional unit into this activity.

3.4. Income Distribution Multipliers

For soft wheat and durum wheat, the effects of an injection on household income are 0.26 and 0.22, respectively. For these two crops, the income effects benefit rural households much more than urban households.

The effects that primarily concern urban households are those from injections into wheat-based processed products, with a greater effect seen with FNBT injections, followed by free flours, durum wheat flour, and semolina.

4. Conclusion

The disaggregated SAM for soft wheat and durum wheat has highlighted their significance in agriculture and the primary processing industry, revealing interdependencies between activities and the multiplier effects of monetary injections on activities, value added, and household income.

The value added from soft wheat represents 13.7% of agricultural value added and 2% of national value added. Of this, 76% compensates

Table 9 - Multiplier effects on income distribution.

	<i>Effects on rural households</i>	<i>Effects on urban households</i>	<i>Effects on households</i>
Soft wheat	0,17	0,09	0,26
Durum wheat	0,15	0,07	0,22
Free flours	0,22	0,27	0,49
FNBT	0,28	0,24	0,52
Wholemeal flour	0,21	0,26	0,47
Semolina	0,22	0,27	0,49

capital, 18% compensates land, and 5.7% compensates labor. For durum wheat, its share of agricultural value added is 7.13%, with 81% compensating capital, 13% land rent, and 5.6% labor. These two crops generate 10.4% and 5.33% of agricultural wages and 11.3% and 6.25% of agricultural capital, respectively.

Regarding the primary wheat processing industry, it accounts for only 5% of the total value added in the agri-food sector, with free flours generating the highest value added. The milling sector, with its various products, generates 4.3% of the labor created by the agri-food sector and 5% of the sector's capital.

Based on multiplier effects, soft wheat and durum wheat have effects of 2.66 and 2.6, respectively, on production activities. An additional unit injection would lead to an 84% increase in soft wheat production and a 16% increase in the value added of the activity, while for durum wheat, production increases by 75% with a 13% increase in value added.

The multiplier effect is most significant when injected into FNBT, followed by free flours, semolina, and finally durum wheat flour.

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