European Commission

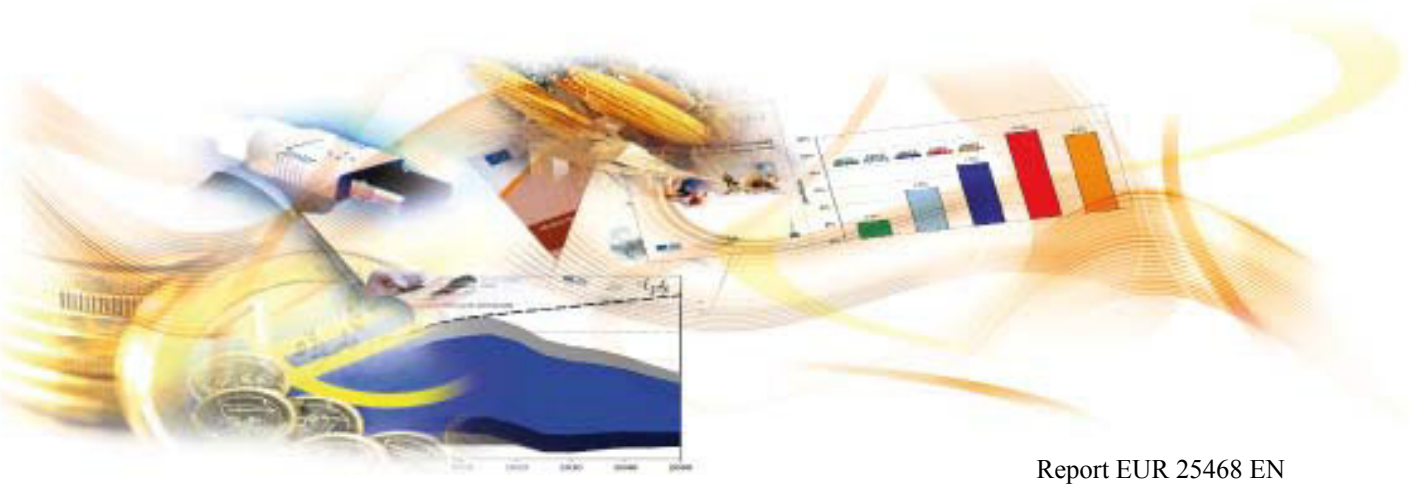
JRC SCIENTIFIC AND POLICY REPORTS

An approach to describe the agri-food and other bio-based sectors in the European Union

Focus on Spain

M. A. Cardenete, P. Boulanger, M. C. Delgado, E. Ferrari, R. M'Barek

2012



Report EUR 25468 EN

Joint Research Centre

European Commission
Joint Research Centre
Institute for Prospective Technological Studies
Contact information
Address: Joint Research Centre, Edificio Expo. C/Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954 488318
Fax: +34 954 488300

http://ipts.jrc.ec.europa.eu/
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This publication is a Reference Report by the Joint Research Centre of the European Commission.

JRC72097

EUR 25468 EN

ISBN 978-92-79-25927-2

ISSN 1831-9424

doi:10..2791/95751

Luxembourg: Publications Office of the European Union, 2012

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Authors

M. A. Cardenete

P. Boulanger

M. C. Delgado

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Summary

The European agri-food and other bio-based sectors exceed 2 000 billion euros a year in turnover and employ roughly 22 million workers. This paper adopts an inclusive definition of the agri-food and other bio-based sectors that encompasses agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of industries that use natural and renewable resources in their production processes, i.e. the chemical, biotechnological and energy industries. However, the focus is clearly on the sectors directly linked to agricultural production and the food industry.

Having a comprehensive understanding of extended agri-food economic linkages is critical when designing pertinent policies which aim to deliver the full potential of strong European agri-food and other bio-based sectors. In turn, this requires a more disaggregated view.

The JRC-IPTS (AGRILIFE unit) has developed a set of Social Accounting Matrices (SAM) for the EU-27 with a highly disaggregated agricultural sector (AgroSAMs) (Müller et al., 2009) for the year 2000.

This study uses for the first time fully disaggregated AgroSAMs in order to provide a descriptive analysis of the agri-food and other bio-based sectors. The limits of this approach are evident, as many changes in the EU economies have taken place within a decade. However, the AgroSAMs are the only Pan-European database providing details of all the sectors mentioned. An update of the AgroSAMs for the year 2007 is ongoing and will provide more recent data and results.

To capture the key agricultural and related sectors revealing likely growth and job creation, the SIMSIPSAM tool (Parra and Wodon, 2009) is applied. The focus is on Spain; nevertheless, a review for every EU Member State is first performed to detect potential key sectors.

The methodology adopted in this study allows automated reviews, in space and time, of the European agri-food and other bio-based sectors.

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Acronyms

AgroSAM Social Accounting Matrix with a Disaggregated Agricultural Sector

BL Backward Linkages

CAP Common Agricultural Policy

CAPRI Common Agricultural Policy Regionalised Impacts

CGE Computable General Equilibrium

EC European Commission

EU European Union

FL Forward Linkages

GDP Gross Domestic Product

GTAP Global Trade Analysis Project

GVA Gross Value Added

ICT Information and Communication Technologies

IOT Input — Output Tables

NACE General Industrial Classification of Economic Activities within the European Communities

PE Partial Equilibrium

PPI Producer Price Index

PRODCOM Product/commodity classification system for the European Community

R&D Research and Development

SAM Social Accounting Matrices

SIOT Symmetrical Input — Output Table

SUT Supply and Use Tables

1 Introduction

The European agri-food and other bio-based sectors exceed 2 000 billion euros a year in turnover and employ roughly 22 million workers (Table 1). The broad definition applied covers agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of the chemical, biotechnological and energy industries. In 2009, compared to the agri-food sector, the bio-based industries had a relatively low turnover — i.e. about 57 billion euros by contrast to more than 2 000 billion euros for the whole agri-food sector.

Table 1 — Agri-food and other bio-based sectors in the European Union

Sector	Annual turnover (million €)	Employment (thousands)	Data source
Food	965 000	4 400	CIAA
Agriculture	381 000	12 000	COPA-COGECA, Eurostat
Paper/Pulp	375 000	1 800	CEPI
Forestry/Wood ind.	269 000	3 000	CEI-BOIS
Fisheries and Aquaculture	32 000	500	EC***
Bio-based industries			
• *Bio-chemicals and plastics*	50 000 (estimation*)	150 (estimation*)	USDA, Arthur D Little, Festel, McKinsey, CEFIC
▪ *Enzymes*	800 (estimation*)	5 (estimation*)	Amfep, Novozymes, Danisco/Genencor, DSM
• *Biofuels*	6 000 **	150	EBB, eBio
Total	2 078 000	22 005	

*Estimate for Europe for 2009; **Estimate based on a production of 2.2 million tonnes bioethanol and 7.7 million tonnes of biodiesel at average market price in Europe; ***EC, Facts and figures on the CFP, Basic Statistics Data, ISSN 1830-9119, 2010 Edition

Source: European Commission Staff Working Paper accompanying (COM(2012) 60 final).

Fostering the European agri-food and other bio-based sectors is crucial for addressing major societal challenges:

- Ensuring food security and food safety
- Mitigating and adapting to climate change
- Managing in a sustainable way natural resources (water, soil, etc.)
- Providing new sources of energy while reducing dependency on fossil resources
- Creating jobs and fostering economic growth

One of the decisive ways to meet these challenges is to increase agri-food productivity in a sustainable way. This dual challenge requires an increase in targeted research and development (R&D) activities. However, one should highlight that funds allocated to R&D in agriculture are inadequate, especially when comparing with those devoted to income support within the Common Agricultural Policy (CAP). In May 2011, the Commission proposed to allocate during the 2014-2020 financial period 281.8 billion euros for the first pillar of the CAP (income support and direct payments) and 89.9 billion euros for the second pillar of the CAP (rural-development measures). This funding will be complemented by a further 15.2 billion euros, including 4.5 billion euros for supporting research and innovation on food security, the bioeconomy and sustainable agriculture within the Common strategic framework for research and innovation (Horizon 2020).[1] By contrast, for the 2007-2013 period, programmes for research and technological development on food, agriculture and fisheries, and biotechnology were allocated 1.9 billion euros.[2] This implies a significant increase in research and innovation funding for the next financial period.

In the Communication on the CAP after 2013, the Commission put forward three objectives of the future CAP in which the agri-food and other bio-based sectors are directly targeted, i.e. (i) viable food production, (ii) sustainable management of natural resources and climate action, and (iii) balanced territorial development.[3] Within the first pillar of the CAP, greener and redistributed direct payments may contribute to fostering an extended agri-food sector in the long-term. A range of rural development measures set together within the second pillar of the CAP may promote the agri-food and other bio-based sectors such as those focusing on competitiveness, innovation, pilot and demonstration projects, business development, knowledge transfer, advisory services, etc.

In the light of social challenges, the present economic slow down and budget constraints, it could be argued that public investments should target sectors that generate more income than the average sector in the economy. Thus, increasing productivity within key sectors should become a priority.

[1] The European Innovation Partnership (EIP) on 'Agricultural Productivity and Sustainability' confirmed the importance of R&D in addressing societal challenges relating to producing *more and better*. The agricultural EIP will be implemented through action under two EU policies: the CAP on the one hand; the EU research and innovation policy (Horizon 2020) on the other hand.

[2] See Council of the European Union, Press release16887/06.

[3] European Commission Communication on The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future (COM(2010) 612 final) .

This study proposes to scrutinise backward and forward linkages as an indicator to identify agri-food and other bio-based key sectors, based on a set of Social Accounting Matrices (SAM) with highly disaggregated agricultural and food industry sectors (AgroSAMs). Section 2 presents the methodology and the database. Section 3 provides an overview of *potential* agri-food and other bio-based related key sectors in all EU Member States. Section 4 proposes an analysis of the extended agri-food sectors for Spain, together with the analysis of the employment multipliers of these sectors. Section 5 concludes.

2 Methodology and Database

2.1 SAMs and IOTs: a brief introduction

Input-Output tables (IOT) allow a structural analysis of the composition of the economy and the production system as a whole. This analysis, albeit in a static form in each period, analyses at several successive moments of time, so we can consider this analysis to be evolutionary comparative statistics, very close to economic dynamics.

Based on the input-output framework, Social Accounting Matrices (SAM[4]) are databases representing all economic transactions of an economy. SAMs contain information on economic agents, such as producers, consumers, government and foreign sectors, and on productive factors. The Social Accounting Matrix attempts to integrate social statistics in the Input-Output Model, showing the productive sectors' interdependence and representing in a matrix format an extension of the input-output framework.

Input-Output Tables present the interdependence between productive sectors and their relation to final demand. In addition, the SAM includes all the transactions between productive factors and components of final demand, thereby expanding the information provided by input-output tables and completing the circular flow of income in a square matrix.

SAMs depict an economy at a certain point in time and can be used to describe monetary flows of an economy. Secondly, SAMs are necessary databases for quantitative models (e.g. SAM linear models and Computable General Equilibrium models) able to assess the socioeconomic impact of different economic policies. Besides their statistical content, SAMs are a useful tool to evaluate political interventions in national or regional frameworks.

[4] For more information see Pyatt (1988).

In a SAM, each account is represented by a row and a corresponding column. By convention, rows show sources of income and columns how these revenues are allocated as expenditure. All the values in the cells are monetary flows. Therefore, each non-zero value of a cell reflects a transaction or cash flow between accounts registered in a single record, meaning a cost to the column and an income for the row.

The SAM structure is flexible and can take different forms depending on the scope of the study. The number of accounts can vary and they may be more or less disaggregated. The disaggregation and the order of the different accounts depend on the model that will be built with the SAM and its implementation, with greater emphasis on those accounts that will be analysed.

2.2 Key sector analysis

Two approaches have been commonly used in the literature for measuring the role that a sector plays within the economy. The classical one involves measuring multiplier effects based on estimated square multiplier matrices (Rasmussen, 1956, Chenery & Watanabe, 1958) with extensions identifying backward and forward linkages (Shultz, 1977, Cella, 1986, Clements, 1992, Heimler, 1991, Sonis et al, 1995, 1997, Dietzenbacher, 2002). Sophisticated as they may be, multiplier effects can be seen to be average ripple effects of a given economic structure. Once a multiplier matrix has been estimated, cells in columns and rows provide information on the bilateral linkage between each possible pair of sectors. By aggregating and averaging the entries in columns (or rows, for that matter), a hierarchy of sectors can be established according to the impact that an inflow in a given sector will transfer, on average, to the companion sectors through the mechanisms of mutual economic interdependencies. In the multiplier approach, all transmitted effects are quantified in terms of a hierarchy of positive contributions to output.

Key sector analysis makes it possible to extract the main tendencies in the behaviour of an economy and to develop the corresponding structural view of it. For this purpose, all sectors of an economy can be ranked according to a hierarchy derived from two types of indexes: a *backward linkage* (*BL*) and a *forward linkage* (*FL*), traditionally obtained from a symmetrical input-output table (SIOT).

The backward linkage indicator (*BL*) analyses the effect on the rest of the economy of a change in the final demand of a sector. The forward linkage indicator (*FL*) evaluates the effect of a joint change in the final demand of all sectors on the production of a specific sector.

From these indicators, it is possible to determine the key sectors of an economy. Key sectors, because they generate a high multiplier and fostering effect on production, make it possible to design economic policies and development strategies based upon the most relevant industries of an economy.

Rasmussen (1956) proposed a methodology for identifying key sectors: based on the inverse associated matrix $B_t = (I - A_t)^{-1}$, where I is an identity matrix of size *n*, we obtain the expression of the *BL*:

$$B_{.j} = \sum_{i=1}^{n} b_{ij} \qquad j = 1...n$$

b_{ij} denotes the elements of the associated inverse matrix B_t and sub- indexes *i, j* make reference respectively to the rows and columns of the corresponding matrix

Once this indicator is normalised, these coefficients can be easily interpreted. If the backward linkage is greater than one (*BLj* greater than 100% in percentage terms), a unit change in the final demand of sector *j* will generate an increase above the average in the economy's global activity.

In 1976, Jones stated that obtaining the *FL* as defined by Rasmussen did not have the quality of being a symmetrical measure in relation to the *BL*, and, from a similar perspective, Augustinovics (1970) had already defined the obtaining of *FL* as the row sum of the Goshian inverse, where the distribution coefficients (δ_{ij}) — obtained from the SIOT through dividing each cell by the row total, not the column total — replace the technical coefficients. This way, *FL* is calculated as $O_{i.}$:

$$O_{i.} = \sum_{j=1}^{n} \delta_{ij} \qquad i = 1...n$$

from which we can value the joint effect on all sectors of altering the supply of primary inputs in a particular sector. Again, after its normalisation, if the forward linkage is above one (*FLi* greater than 100% in percentages terms), a unit change in all sectors will generate an increase above the average in sector *i*.

By definition, a key sector is a sector in which both indexes are greater than one. In this study, we adopt the concept of *potentia*l key sectors that can be defined as sectors with a BL greater than 0.9, independently of the FL level. Thus, developing the FL of these agri-food and other bio-based sectors would convert them to *true* key sectors.

In addition to BL and FL analysis, an additional multiplier identifies the accounts that generate more employment when they receive a unitary exogenous injection of income. The *employment multipliers* are the result of a new diagonal matrix called *E*. This matrix includes the quotients between the volume of employment and the total resources for each productive sector. As a second step, we multiply this matrix by the part of *Ma* that incorporates the rows and columns corresponding to the productive sectors. When increasing the income of an endogenous account, we obtain the impacts of this change on the corresponding column of the partition of *Ma* and, by means of the diagonal matrix *E*, we convert this impact into the number of jobs created. The expression of the *employment multiplier*, *Me*, is the following:

$$Me = E * Ma$$

An element me_{ij}, is the increment in the number of jobs in sector *i* when the sector *j* receives a unitary exogenous injection.[5] If we analyse the sum of the columns, we have the global effect on employment, which results from the input to a sector of an exogenous monetary unit. As far as rows are concerned, they show the increment that the activity sector in question experiences in its employment if the rest of the sectors receive the exogenous monetary unit.

2.3 A tool to analyse SAMs and IOTs: SIMSIPSAM

SIMSIPASAM software, which benefited from World Bank support, has been employed to perform the analyses of this report (Parra and Wodon, 2009). SIMSIPSAM is an Excel-based application to analyse SAMs and I-O tables. The tool makes use of MATLAB as the computation engine and no license or knowledge of MATLAB is required. The application is user-friendly and requires only a basic knowledge of Excel. It performs a large number of decompositions and analyses including two algorithms for SAM balancing (RAS and cross-entropy), SAM aggregation, multiplier decompositions, several types of economic linkages, income-redistribution analysis, structural-path analysis, several methods to analyse structural change (fields of influence, direction of change, importance of technical coefficients), supply constraints, price models, price controls, together with poverty and income-distribution analysis by linking the tool to household survey data.

2.4 The AgroSAM database

A comprehensive study of the agri-food and other bio-based industries requires a dataset able to disaggregate all the main economic sectors involved in the agri-food industry. The JRC has

[5] Additional information about the employment multiplier and a comparison with other type of multipliers, is provided in Arango (1979).

developed a set of Social Accounting Matrices (SAM) for the EU-27 with a highly disaggregated agricultural and agri-food sector (AgroSAMs) (Müller et al., 2009) for the year 2000. This dataset has contributed the new I-O tables for all 27 EU member countries to the GTAP database since version 7.1.

National Supply- and Use-Tables (SUT) or symmetric Input-Output tables (IOT) are typically highly aggregated by agricultural sectors and commodities and thus provide little detail for sub-sector-specific analysis. The agricultural sector is often represented as a single account in the national datasets. This coarse representation is an important reason for the limited application of SAM to the analysis of agriculture-related policies.

The AgroSAMs were constructed based on SUT provided by Eurostat. The agricultural sector has been comprehensively covered by integrating the database from the partial equilibrium (PE) agro-economic simulation model 'Common Agricultural Policy Regionalised Impacts analysis modelling system' (CAPRI) (Britz and Witzke, 2008). These two main datasets have been processed to compile a specific dataset for each Member State covering agricultural and non-agricultural activities and commodities. This database was thought to allow modellers to better assess the issue of agricultural policies within each EU Member State, e.g. the analysis of the impacts of 2013 CAP reforms on agricultural and non-agricultural sectors, with tools typical of the I-O or SAM analysis. This dataset permits a level of analysis which is much more detailed than previously existing databases designed for agricultural CGE analysis. For example, the GTAP database — which is by far the most used database for CGE global analysis — distinguishes 12 raw agricultural products and 8 processed food commodities. Currently, the AgroSAM database contains 29 primary agricultural sectors and 11 processed food sectors and an agricultural service for each Member State (see Table 2). The AgroSAMs contain 98 activities and 97 commodities.[6] The non-agricultural sectors are disaggregated according to the NACE 1.1 classification.

[6] The activity SETA — set aside — does not produce any commodity.

Table 2 — Modified Agricultural Classification (MAC) for AgroSAMS

Modified agricultural classification (MAC)			
Code	**Description**	**Code**	**Description**
A/C OWHE	Production of other wheat	**A/C COMI**	Production of raw milk from cattle
A/C DWHE	Production of durum wheat	**A/C LCAT**	Production of cattle, live
A/C BARL	Production of barley	**A/C PIGF**	Production of swine, live
A/C MAIZ	Production of grain maize	**A/C SGMI**	Production of raw milk from sheep and goats
A/C OCER	Production of other cereals (Rye, meslin and oats)	**A/C LSGE**	Production of sheep, goats, horses, asses, mules and hinnies, live
A/C PARI	Production of paddy rice	**A/C EGGS**	Production of eggs
A/C RAPE	Production of rape seed	**A/C PLTR**	Production of poultry, live
A/C SUNF	Production of sunflower seed	**A/C ANHR**	Production of wool and animal hair; silk worn
A/C SOYA	Production of soya seed	**A/C OANM**	Production of other animals, live, and their products
A/C OOIL	Production of other oil plants (Olive and seeds for oil industry)	**A/C RICE**	Processing of rice, milled or husked
A/C STPR	Production of other starch and protein plants (Pulses)	**A/C SUGA**	Processing of sugar
A/C POTA	Production of potatoes	**A/C VOIL**	Production of vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils
A/C SUGB	Production of sugar beet	**A/C DAIR**	Dairy
A/C FIBR	Production of fibre plants	**A/C BFVL**	Production of meat of cattle, fresh, chilled, or frozen
A/C OTCR	Other crop production activities (Industrial crops and straw)	**A/C PORK**	Production of meat of swine, fresh, chilled, or frozen
A/C GRPS	Production of grapes	**A/C SGMT**	Production of meat of sheep, goats, and equines, fresh, chilled, or frozen
A/C FVEG	Production of fresh vegetables, fruit, and nuts	**A/C POUM**	Meat and edible offal of poultry, fresh, chilled, or frozen
A/C LPLT	Production of live plants	**A/C ANFD**	Production of prepared animal feeds
A SETA	Set aside	**A/C OFOD***	Production of other food
A/C FODD	Production of fodder crops	**A/C BEVR**	Production of beverages
		A/C AGSV	Agricultural service activities

*Production of Other Food includes: prepared and preserved fish or vegetables, fruit juices and vegetable juices, prepared and preserved fruit and nuts, all cereal flours, groats, meal and pellets of wheat, cereal groats, meal and pellets not elsewhere classified, other cereal grain products (including corn flakes), other vegetable flours and meals, mixes and doughs for the preparation of bakers' wares, starches and starch products; sugars and sugar syrups not elsewhere classified, preparations used in animal feeding, bakery products, cocoa, chocolate and sugar confectionery, macaroni, noodles, couscous and similar farinaceous products, food products not elsewhere classified.

Source: Müller et al., (2009)

Building AgroSAMs involved the following three main steps. First, consolidated macroeconomic indicators for EU27 were compiled. Second, various Eurostat datasets were combined into a set of SAMs with aggregated agricultural and food-industry sectors. Third, these sectors were disaggregated based on the CAPRI database.

The comparison of the activity accounts compiled as an extension of the CAPRI database and the SUT databases revealed that, despite some relevant differences in coverage and definition, the CAPRI database can be considered a reliable source of information. In particular, the

quantities of agricultural goods produced and traded, activity levels, output and input coefficients and basic prices are the most reliable values. Other sources, as PRODCOM,[7] are utilised to complete the database when full coverage is not available, as in the case of the food industry sectors.

The CAPRI and the SUTs, both expressed as a SAM structure, are merged. This step cannot be done directly because SUT data are expressed as a mixture of basic and purchaser's prices while the CAPRI database records only basic prices. The a-priori SAM has been populated following a compilation procedure that is fully documented in Müller et al. (2009).

At the end of each of these three stages the datasets had to fulfil all the balancing criteria needed by a typical SAM. The method to balance the datasets draws heavily on the concept of Cross Entropy estimation (Golan et al., 1994). The structural deviations between agricultural-sector and economy-wide data created a need to specify in which cases comparatively large deviations from recorded agricultural data could be tolerated, and in which cases not. For this purpose, Cross Entropy procedures proved to be extremely useful. The final matrixes are balanced through a cross-entropy approach, combined with a multiplicative disturbance term. The balancing process is constrained by the SUT totals and the CAPRI totals.

The integration of the CAPRI database with SUT tables represented the most relevant challenge and achievement of the project. The integration of the CAPRI database into a complete and consolidated set of SAMs for the EU27 raised several challenges. The first challenge came from the level of details of the CAPRI database, its format and its division between agricultural and food processing activities. Firstly, CAPRI was too detailed for the scope of the AgroSAM project. CAPRI contains data on manure production and use, fertiliser consumption, set-aside and milk quotas which require a great deal of work to transform into a SAM framework. In addition, the CAPRI database does not use the 'activity to commodity' structure typical of SAMs. Finally, the CAPRI database does not take into account other activities apart from agricultural ones. This makes it difficult to treat sectors such as wine, meat and milk that are regarded as processed food by the European System of National Accounts and as end-of-pipe agricultural products by the CAPRI database.

In order to avoid technical problems linked to the functioning of the software employed for this study, a new version of AgroSAMs has been produced. The original Supply and Use format is transformed into symmetrical Input-Output tables using a product-by-product input

[7] Eurostat Statistics by Product: http://epp.eurostat.ec.europa.eu/portal/page/portal/prodcom/introduction.

— output tables.[8] This change facilitates the interpretation of the results (no differentiation between activities and commodities and consequent reduction in the number of accounts). On the other hand, it does not cause distortions to the results produced within this study.

3 Sectoral analysis for the EU

3.1 Description of the EU AgroSAM

The EU AgroSAM indicates that the value added of the European agri-food and other bio-based sectors amounted to about 1 000 billion euros in 2000, i.e. 12 % of Europe's total value added. The 2007 SUT confirmed that these sectors grew between 2000 and 2007, reaching a valued added of almost 1 200 billion euros in 2007, but decreased as a share of the total value added of the EU economy (10.7 %) (Table 3).

The agricultural and food sectors represent the two largest agri-food and other bio-based sectors in terms of value added. The 2007 SUT shows that both sectors declined, in percentage terms, compared to the 2000 situation. In particular, the food sector value added experienced a relative decrease between 2000 and 2007 from 2.56 % to 1.93 % of European total value added. The disaggregation of these sectors, available for the year 2000, is recorded in Table 4. The food industry (which is made up of a range of sectors such as rice, meat, dairy products, vegetable oils, beverages and tobacco) represents the most important agri-food and other bio-based sector in terms of value added and direct linkages with primary agricultural sectors.

Table 3 — Agri-food and other bio-based sectors and their relevance in the EU Economy, 2000, 2007

Value added	Year 2000 Millions of Euro	Share of Total	Year 2007 Millions of Euro	Share of Total
Agricultural sectors	163 396	2.03 %	171 512	1.55 %
Fish and forestry	22 560	0.28 %	29 666	0.27 %
Food sectors	206 387	2.56 %	213 122	1.93 %
Wood and products of wood and cork	34 508	0.43 %	44 055	0.40 %
Pulp and paper sector	48 935	0.61 %	51 368	0.47 %
Chemical sector	151 397	1.88 %	192 464	1.74 %
Rubber and plastic products	69 564	0.86 %	84.43	0.76 %
Other non-metallic mineral products	69 278	0.86 %	86 371	0.78 %
Furniture	57 036	0.71 %	63 452	0.57 %
Energy	126 313	1.57 %	216 397	1.96 %
Collected and purified water	19 717	0.24 %	25 438	0.23 %
Agri-food and other bio-based sectors	**969 092**	**12.04 %**	**1 178 276**	**10.67 %**
Total value added	**8 047 788**	**100 %**	**11 037 714**	**100 %**

[8] Following Eurostat Manual of Supply, model B: Product-by-product input — output tables based on industry technology assumption. Each industry has its own specific way of production, irrespective of its product mix. .

Source: compiled by the authors from Eurostat data (European Union EU27 Tables 2007).

In terms of value added, the chemical and energy sectors are other important related extended agri-food manufacturing sectors. In addition, the energy sector is the only one that between 2000 and 2007 registered a growth both in absolute and relative terms. All the other sectors, during the same period, produced a lower share of the European value added.

Within the disaggregated agri-food sectors, other food production, beverages, milk and dairies represent the most important sectors for the EU in terms of value added in 2000. Other relevant sectors were the production of oil plants and livestock, as presented in Table 4.

Table 4 — Disaggregated agri-food sectors and their relevance in the EU Economy, 2000

Value added	Millions Euro
Production of other food	98 438.51
Production of beverages	40 529.84
Production of fresh vegetables, fruit, and nuts	27 017.20
Production of raw milk from cattle	24 233.64
Dairy Products	22 776.29
Products of forestry, logging and related services	15 988.39
Production of livestock*	14 118.59
Production of poultry	6 628.57
Fish and other fishing products; services incidental to fishing	6 571.86
Production of barley	5 787.81
Production of other oil plants	5 161.91

*Production of cattle, swine, sheep, goats, horses, asses, mules and hinnies, slaughtered
Source: compiled by the authors.

3.2 *Potential* key sectors

For a sector to be considered as key, it should have both its backward and forward linkages greater than 1. This means that the sector can generate more income than the average sector in the economy, and responds more than the average sector to the shocks.

As mentioned in section 2.2, this study uses the concept of *potential* key sectors for each EU Member State. Thus we focus on backward linkages (BL) greater than 0.9. Table 5 summarises Tables A1-A27 presented in the annex with full results by Member States. These data can be used for a pan-EU comparative analysis. It is striking that livestock and related products (including fodder, milk and dairy products) are *potential* key sectors for most of the EU Member States, as well as the energy and water sectors. These results deserve careful analysis in order to draw significant policy conclusions.

Potential key agri-food and other bio-based sectors — twenty-one out of a total of sixty-nine sectors — for at least twenty of the twenty-seven countries are: ‘Other cereals’, ‘Potatoes’,

‘Sugar beet’, ‘Other crop products’, ‘Live plants’, ‘Fodder crops’, ‘Raw milk from cattle’, ‘Cattle, slaughtered’, ‘Swine, slaughtered’, ‘Raw milk from sheep and goats’, ‘Sheep, goats, horses, asses, mules and hinnies, slaughtered’, ‘Eggs’, ‘Poultry, slaughtered’, ‘Other animals, live, and their products’, ‘Products of forestry, logging and related services’, ‘Dairy products’, ‘Meat of cattle, fresh, chilled, or frozen’, ‘Meat of swine, fresh, chilled, or frozen’, ‘Prepared animal feeds’, ‘Electrical energy, gas, steam and hot water’ and ‘Collected and purified water, distribution services of water’.

On the other hand, potential extended agri-food key sectors for three or fewer countries are: ‘Durum wheat’, ‘Rice, milled or husked’, ‘Other food products’ ‘Soya Seed’, ‘Chemical, chemical products and man-mad fibres’. Only one sector, ‘Tobacco products’, is never a potential key sector.

Table 5 — EU *potential* agri-food and other bio-based key sectors: an overview using a backward linkage indicator, 2000

Description	Code	Number of Countries*	Austria	Belgium	Bulgaria
Production of other wheat	C_OWHE	**17**	2.756		
Durum wheat	C_DWHE	**3**			0.915
Barley	C_BARL	**18**	1.186		
Grain maize	C_MAIZ	**8**	1.033		
Other cereals	C_OCER	**20**	1.307		1.416
Paddy rice	C_PARI	**6**			2.398
Rape seed	C_RAPE	**19**	1.225		1.076
Sunflower seed	C_SUNF	**5**			
Soya seed	C_SOYA	**1**			
Other oil plants	C_OOIL	**12**			0.936
Other starch and protein plants	C_STPR	**17**	1.305		0.962
Potatoes	C_POTA	**21**	1.078	1.125	1.091
Sugar beet	C_SUGB	**24**	1.097	1.624	1.164
Fibre plants	C_FIBR	**9**	1.159	1.337	
Other crop products	C_OTCR	**22**	2.081	1.423	0.966
Grapes	C_GRPS	**5**			1.076
Fresh vegetables, fruit, and nuts	C_FVEG	**4**			1.162
Live plants	C_LPLT	**25**	1.194	1.355	1.462
Fodder crops	C_FODD	**27**	1.312	1.288	0.945
Raw milk from cattle	C_COMI	**27**	1.353	1.366	1.370
Cattle, slaughtered	C_LCAT	**26**	1.430	1.274	1.200
Swine, slaughtered	C_PIGF	**26**	1.286	1.207	1.249
Raw milk from sheep and goats	C_SGMI	**21**	1.285	1.534	1.096
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	**24**	1.316	1.094	1.124
eggs	C_EGGS	**26**	1.029	1.203	1.070
Poultry, slaughtered	C_PLTR	**26**	1.277	1.255	1.172
Other animals, live, and their products	C_OANM	**26**		1.442	1.264
Agricultural services	C_AGSV	**2**		1.198	
Products of forestry, logging and related services	C_FORE	**22**	0.949		1.131
Fish and other fishing products	C_FISH	**8**			0.928
Rice, milled or husked	C_RICE	**3**			
Other food products	C_OFOD	**2**			
Processed sugar	C_SUGA	**16**	0.964	0.925	
Vegetable oils and fats	C_VOIL	**5**			0.907
Dairy products	C_DAIR	**24**		1.067	1.518
Meat of cattle, fresh, chilled, or frozen	C_BFVL	**22**	1.220	1.332	1.079
Meat of swine, fresh, chilled, or frozen	C_PORK	**23**	1.104	1.370	1.226
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	**14**	1.083		1.166
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	**18**	1.078		
Beverages	C_BEVR	**14**		1.116	
Prepared animal feeds	C_ANFD	**23**	1.261		1.265
Tobacco products	C_TOBA	**0**			
Textiles	C_TEXT	**4**		0.915	0.943
Wood and products of wood and cork (except furniture)	C_WOOD	**18**	1.002		1.031
Pulp, paper and paper products	C_PULP	**5**	0.910		
Chemicals, chemical products and man-made fibres	C_CHEM	**1**			
Rubber and plastic products	C_PLST	**6**			
Other non-metallic mineral products	C_NMMP	**16**	0.921	0.946	0.923
Furniture; other manufactured goods n.e.c.	C_FURN	**4**			
Electrical energy, gas, steam and hot water	C_EGSW	**25**	1.071	1.117	1.209
Collected and purified water, distribution services of water	C_WATR	**27**	1.297	1.119	1.268

* For each sector, number of countries for which the sector is a *potential* key sector

Source: compiled by the authors

Table 5 [continuation]

Code	Cyprus	Czech Republic	Germany	Denmark	Estonia	Spain	Finland	France
C_OWHE		1.128	1.187	1.255			0.990	1.157
C_DWHE								
C_BARL		1.079	1.236	1.308	1.145	1.148	1.247	0.979
C_MAIZ			0.927					0.917
C_OCER		1.039	1.252	1.152		0.970		1.193
C_PARI						0.933		1.083
C_RAPE		1.059			0.942	2.882	1.123	1.171
C_SUNF								1.131
C_SOYA								
C_OOIL	1.272	0.939				1.125		0.941
C_STPR		1.035	1.167	1.148	1.150		1.422	1.143
C_POTA	1.285	1.064	1.142	1.124	1.049		1.222	0.951
C_SUGB		1.092	1.238	1.285	1.697	1.099	1.156	1.141
C_FIBR				1.203		1.119	1.198	1.124
C_OTCR			1.387	1.455		1.141	1.427	1.223
C_GRPS								
C_FVEG	1.575							
C_LPLT	1.344	1.304	1.197	1.162	1.308	1.117	1.178	1.139
C_FODD	1.489	1.264	1.382	1.431	1.062	1.221	1.193	1.262
C_COMI	1.232	1.268	1.238	1.376	1.427	1.173	2.169	1.293
C_LCAT	1.384	1.274	1.397	1.568	1.420	1.376	2.175	1.690
C_PIGF	1.137	1.395	1.260	1.636	1.584	1.251	1.536	1.348
C_SGMI	1.245	1.156	1.350		1.367	1.324		1.332
C_LSGE	1.139	1.312	1.285	1.531	1.410	1.251	1.687	1.192
C_EGGS	2.072	1.343	0.959	1.038	1.102	1.141	1.432	1.282
C_PLTR	1.238	1.389	1.363	1.552	1.349	1.180	1.557	1.326
C_OANM	4.421	1.229	1.184	1.435	1.316	1.175	1.324	1.368
C_AGSV				1.256				
C_FORE	0.918	1.261	1.106	1.151	1.153	0.937	1.048	1.081
C_FISH		1.151			0.981			
C_RICE						0.972		
C_OFOD								
C_SUGA		0.944	1.019	1.090		0.918		0.910
C_VOIL						0.926		
C_DAIR	1.187	1.212	1.203	1.424	1.265	1.147	1.329	1.194
C_BFVL	1.094	1.240	1.167	1.151	1.509	1.216	1.288	1.211
C_PORK	1.340	1.419	1.074	1.593	1.362	1.318	1.153	1.048
C_SGMT	0.922				1.480	1.328		
C_POUM	1.426	1.293	0.932	1.468		1.233	1.412	1.330
C_BEVR		1.018	0.969	0.956		0.959	0.915	
C_ANFD	1.241	1.196	1.137	0.999	1.349	1.013	1.213	1.176
C_TOBA								
C_TEXT								
C_WOOD		1.107	0.985		1.180	1.010	1.207	0.941
C_PULP							1.152	
C_CHEM								
C_PLST			0.964					0.914
C_NMMP	0.968	0.935	1.016	0.922		0.998	0.939	
C_FURN					0.964			
C_EGSW	1.225	1.114	1.223		1.329	1.003	0.912	1.089
C_WATR	1.378	1.314	1.258	0.974	1.316	1.205	1.127	1.345

Source: Compiled by the authors

Table 5 [continuation]

Code	Greece	Hungary	Ireland	Italy	Lithuania	Luxem-bourg	Latvia	Malta
C_OWHE		1.158	0.911		1.100	0.902	1.073	1.325
C_DWHE	1.028	0.975						
C_BARL		1.152	1.415		1.108	0.945	1.027	
C_MAIZ		1.226		1.110				
C_OCER	0.911	1.201	1.360	0.959	1.063	0.996	1.111	
C_PARI	1.102			1.142				
C_RAPE	1.230	0.999	3.311	1.580	1.071	0.975	0.962	
C_SUNF		1.091		0.985				
C_SOYA								
C_OOIL	1.354		1.127	1.142			1.251	
C_STPR		1.044			1.138	0.936	0.992	
C_POTA	0.939	1.084					1.113	0.981
C_SUGB	1.105	1.073	1.445	1.146	1.471		1.320	
C_FIBR	1.327							
C_OTCR	1.017	1.153	1.298	1.192	0.945	0.986	0.983	
C_GRPS	1.230			1.038				
C_FVEG	0.999							
C_LPLT	1.294	1.188		1.175	1.233	1.078	1.622	
C_FODD	1.396	1.228	1.299	1.122	1.159	1.079	0.952	2.727
C_COMI	0.977	1.389	1.639	1.258	1.564	1.185	1.531	1.554
C_LCAT	1.112	1.181	1.356	1.075	1.148		1.251	1.337
C_PIGF	1.279	1.487	1.522	1.279	1.386		1.329	1.214
C_SGMI	1.419	1.427		1.455	1.236	29.808	0.919	1.185
C_LSGE	1.449		1.731	1.163	6.362			1.076
C_EGGS	1.144	1.243	1.382	1.094	0.971	1.148	1.112	
C_PLTR	1.241	1.392	1.317	1.224	0.910		0.967	1.111
C_OANM	4.413	1.313	1.498	1.209	1.312	2.523	2.822	1.362
C_AGSV								
C_FORE		1.067	1.173		0.936	0.937	0.993	
C_FISH		0.930	1.018				1.070	1.059
C_RICE	1.150			1.294				
C_OFOD							1.065	1.111
C_SUGA	0.967	1.111		0.942	1.208		1.097	
C_VOIL	1.285	1.078						
C_DAIR	1.154	1.235	1.381	1.198	1.215		1.287	
C_BFVL		1.124	1.195		1.167		1.171	
C_PORK		1.396	1.027	0.974	1.177		1.279	1.519
C_SGMT	1.055		1.482				1.102	1.267
C_POUM		1.233	1.083	1.040				1.255
C_BEVR	1.181	1.116	0.969	0.981			1.258	
C_ANFD	1.322	1.243		1.112	1.231	0.946	1.320	
C_TOBA								
C_TEXT				0.984				
C_WOOD				0.931	1.060		1.162	
C_PULP				0.924				
C_CHEM			0.944					
C_PLST				0.982				0.906
C_NMMP			0.915	1.074				
C_FURN								0.910
C_EGSW	1.134	1.035	1.159	0.929	1.223		1.206	1.463
C_WATR	1.315	1.241	1.447	1.374	1.358	1.116	1.395	2.217

Source: compiled by the authors

Table 5 [continuation]

Code	Nether-lands	Poland	Portugal	Romania	Sweden	Slovenia	Slovak	United Kingdom
C_OWHE		1.023		1.285	1.292		1.133	1.148
C_DWHE								
C_BARL		1.022		1.063	1.367		1.032	1.204
C_MAIZ		0.905		1.121			1.052	
C_OCER		1.044	1.317	1.144	1.693		1.280	1.221
C_PARI			1.056					
C_RAPE		1.026		1.061	0.922		1.166	1.163
C_SUNF				1.259			1.172	
C_SOYA							0.944	
C_OOIL			1.053	1.035		1.162		
C_STPR		1.143		1.137	1.281		0.990	1.154
C_POTA	1.137		1.024	1.110	0.938	1.177	0.994	0.989
C_SUGB	1.310	1.123	1.127	1.196	1.244	1.182	1.147	1.265
C_FIBR	1.314							1.221
C_OTCR	1.100	1.016	1.221	1.175	1.419		1.094	1.542
C_GRPS			0.916	1.034				
C_FVEG				1.028				
C_LPLT	1.484	1.445	1.263	1.184	1.205	1.491	1.486	1.259
C_FODD	1.511	1.094	1.587	1.239	1.575	1.331	1.315	1.041
C_COMI	1.352	1.294	1.218	1.231	1.353	1.559	1.781	1.330
C_LCAT	1.385	1.371	1.270	1.349	1.424	1.105	1.624	1.851
C_PIGF	1.431	1.358	1.185	1.271	1.441	1.189	1.818	1.386
C_SGMI		1.419	1.321	1.354		1.486	1.193	
C_LSGE	1.053	1.299	1.260	1.325	1.459	1.490	1.274	1.471
C_EGGS	1.181	1.108	1.068	1.267	1.125	1.279	1.309	1.284
C_PLTR	1.201	1.268	1.276	1.292	1.467	1.362	1.372	1.384
C_OANM	1.412	1.298	1.251	1.323	1.352	1.388	1.304	1.198
C_AGSV								
C_FORE		1.127	0.939	1.317	1.073	1.017	1.384	1.093
C_FISH								0.901
C_RICE								
C_OFOD								
C_SUGA	1.074	1.288			1.010		0.975	
C_VOIL				1.047				
C_DAIR	1.377	1.221	1.138	1.341	1.278	1.111	1.274	1.176
C_BFVL	1.123	1.432		1.323	1.049	1.001	1.393	1.177
C_PORK	1.486	1.464	0.993	1.172	1.186		1.617	
C_SGMT		1.448	1.069	1.186			1.410	1.207
C_POUM	1.050	0.908	1.350		1.295	1.200		1.243
C_BEVR	1.069		1.081		0.944			
C_ANFD	0.920	1.219		1.088	1.132	1.175	1.208	1.040
C_TOBA								
C_TEXT			0.909					
C_WOOD		1.069	1.144	1.046	1.253	0.971	0.999	0.937
C_PULP			0.913		1.130			
C_CHEM								
C_PLST						0.998		0.982
C_NMMP		0.914	1.110	0.939			0.978	0.938
C_FURN				0.919		1.028		
C_EGSW	1.173	1.309	1.333	1.217	0.966	1.233	1.376	1.368
C_WATR	1.247	1.343	1.381	1.314	1.173	1.370	1.384	1.333

Source: compiled by the authors.

4 Sectoral analysis for Spain

4.1 Description of the Spanish AgroSAM

The value added of the Spanish agri-food and other bio-based sectors amounted about 83 billion euros in 2000, i.e. 15 % of Spain's total value added (calculation based on AgroSAM). The 2007 SUT confirmed that these sectors grew between 2000 and 2007, reaching a value added of almost 110 billion euros in 2007 but decreased as a share of Spain's total value added (11.6 %) (Table 6).

The agricultural and food sectors represent the two largest agri-food and other bio-based sectors in terms of value added. The 2007 SUT shows that both sectors declined, in percentage terms, compared to the 2000 situation. In particular, the food sector value added experienced a relative decrease between 2000 and 2007, from 2.85 % to 2.06 % of Europe's total value added. The disaggregation of these sectors, available for the year 2000, is recorded in Table 7.

Table 6 — Agri-food and other bio-based sector relevance in the Spanish economy, 2000, 2007

Value added	Year 2000 Millions of Euro	Share of Total	Year 2007 Millions of Euro	Share of Total
Agricultural sectors	21 435	3.77 %	23 867	2.53 %
Fish and forestry	2 677	0.47 %	3 334	0.35 %
Food sectors	16 200	2.85 %	19 488	2.06 %
Wood and products of wood and cork	2 550	0.45 %	3 235	0.34 %
Pulp and paper sector	2 915	0.51 %	3 519	0.37 %
Chemical sector	9 340	1.64 %	13 172	1.39 %
Rubber and plastic products	4 527	0.80 %	5 711	0.60 %
Other non-metallic mineral products	7 724	1.36 %	11 604	1.23 %
Furniture	5 021	0.88 %	5 799	0.61 %
Energy	9 053	1.59 %	16 994	1.80 %
Collected and purified water	1 745	0.31 %	2 793	0.30 %
Agri-food and other bio-based sectors	**83 188**	**14.64 %**	**109 516**	**11.59 %**
Total value added	**568 041**	**100 %**	**944 824**	**100 %**

Source: compiled by the authors from Eurostat data (European Union EU27 Tables 2007).

In terms of value added, the chemical and energy sectors are other important extended agri-food manufacturing sectors. The energy sector is the only one that between 2000 and 2007 registered growth in both absolute and relative terms. All the other sectors produced a similar, or in some cases decreasing, share of Spain's value added during the same period,.

Table 7 — Disaggregated agri-food sectors and their relevance in the Spanish economy, 2000

Value added	Million euros
Production of other food	8 387.73
Production of fresh vegetables, fruit, and nuts	6 097.95
Production of beverages	4 061.79
Production of livestock*	3 017.87
Production of other oil plants	1 719.79
Dairy Products	1 433.28
Products of forestry, logging and related services	1 399.58
Fish and other fishing products; services incidental of fishing	1 277.82
Production of barley	1 053.38
Production of raw milk from cattle	1 045.88
Production of poultry	1 012.81

*Production of cattle, swine, sheep, goats, horses, assses, mules and hinnies, slaughtered
Source: compiled by the authors.

Within the disaggregated agri-food sectors, the production of other food, fresh vegetable, fruits, and beverages represent the most important sectors for Spain in terms of value added in 2000.

4.2 Key sectors and employment

A sector is defined as 'key' when its backward and forward linkages are greater than 1. This means that this sector can generate more income than the average sector in the economy and responds more to shocks than the average sector. Table 8, 11 and 12 relax the key-sector criteria by considering both linkages greater than 0.9.

The backward linkage (BL) of sector j quantifies the change in economy wide income, relative to the average change in the economy, caused by a unitary injection in the final demand of sector j. In other words, the BL represents a diffusion effect since it quantifies the changes in the economy wide activity generated by increasing the final demand of sector j by 1 euro.

Table 8 records the agri-food and other bio-based sectors with a BL greater than 0.9. There are two main observations from Table 8. Firstly, rapeseed production is the sector with the highest backward linkage; i.e. a change of 1 euro in the final demand of this sector generates an increase in the activity of the other sectors of almost 3 Euros. However, rapeseed production in Spain is low (only 31 000 ha) thus, this result may be considered as not relevant.

Table 8 — Positive extended agri-food backward linkages, Spain, 2000

SAM #	Code	BL	Description
7	C_RAPE	2.882	Rape seed*
21	C_LCAT	1.376	Cattle, slaughtered
42	C_SGMT	1.328	Meat of sheep, goats, and equines, fresh, chilled, or frozen
23	C_SGMI	1.324	Raw milk from sheep and goats
41	C_PORK	1.318	Meat of swine, fresh, chilled, or frozen
22	C_PIGF	1.251	Swine, slaughtered
24	C_LSGE	1.251	Sheep, goats, horses, asses, mules and hinnies, slaughtered
43	C_POUM	1.233	Meat and edible offal of poultry, fresh, chilled, or frozen
19	C_FODD	1.221	Fodder crops
40	C_BFVL	1.216	Meat of cattle, fresh, chilled, or frozen
69	C_WATR	1.205	Collected and purified water, distribution services of water
26	C_PLTR	1.180	Poultry, slaughtered
27	C_OANM	1.175	Other animals, live, and their products
20	C_COMI	1.173	Raw milk from cattle
3	C_BARL	1.148	Barley
39	C_DAIR	1.147	Dairy products
15	C_OTCR	1.141	Other crop products
25	C_EGGS	1.141	Eggs
10	C_OOIL	1.125	Other oil plants
14	C_FIBR	1.119	Fibre plants
18	C_LPLT	1.117	Live plants
13	C_SUGB	1.099	Sugar beet
45	C_ANFD	1.013	Prepared animal feeds
50	C_WOOD	1.010	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials
68	C_EGSW	1.003	Electrical energy, gas, steam and hot water
56	C_NMMP	0.998	Other non-metallic mineral products
35	C_RICE	0.972	Rice, milled or husked
5	C_OCER	0.970	Other cereals
44	C_BEVR	0.959	Beverages
29	C_FORE	0.937	Products of forestry, logging and related services
6	C_PARI	0.933	Paddy rice
38	C_VOIL	0.926	Vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils
37	C_SUGA	0.918	Processed sugar

* Data not relevant: Rap seed covered 31 000 ha in Spain in 2000

Source: compiled by the authors.

Secondly, livestock and related products (including fodder, milk and dairy products) are the sector with the greatest capacity to diffuse income within the Spanish economy. Tables 9 and 10 provide some basic information on the livestock sector in 2000 and 2007. The livestock sector (e.g. pigs and cattle) grew in the last decade in terms of the number of animals (the number of pigs in particularly grew by 17% between 2000 and 2007) and of the value of production. The value of production increased for all livestock (cattle 35%, pigs 20%, and poultry 49%) except for sheep and goats, for which (mainly due to the decrease in subsidies after 2006) the value of production fell between 2000 and 2007. An interesting case is represented by the milk sector. In this sector, the number of dairy cows fell by more than 20%

while the production increased by 0.7% and the value of production by more than 27%. These data seems to indicate the capacity of milk farmers to raise their productivity in order to react to market incentives.

Table 9– Number of animals, Spain, thousands, 2000, 2007

	2000	2007	% change
Pigs	22 149.3	26 061.2	17.7
Sheep	24 927.4	22 194.3	-11.0
Goats	2 875.7	2 891.6	0.6
Cattle	6 163.9	6 585.0	6.8
of which dairy cows	*1 880.0*	*2 070.5*	*10.1*
*Cows' milk**	*6 289.7**	*6 335.3**	*0.7**

* Cow's milk in thousand tonnes

Source: Eurostat

Table 10 — Production value at producer price*, Spain, million euros, 2000, 2007

	2000	2007	% change
Cattle	1 813.7	2 462.5	35.8
Pigs	3 794.3	4 571.5	20.5
Equines	68.8	83.1	20.8
Sheep and goats	1 356.1	1 302.0	-4.0
Poultry	1 227.7	1 833.4	49.3
Other animals	320.1	197.6	-38.3
Milk	2 163.6	2 760.4	27.6
Eggs	794.6	1 012.9	27.5

* Product subsidies are included

Source: Eurostat

The forward linkage (FL) of sector j quantifies the change in income for sector j, relative to the average change in the economy, caused by a unitary injection in the final demand of all sectors. In other words the FL represents an absorption effect since it quantifies the changes in sector j generated by a 1 euro increase in the final demand of all sectors.

Table 11 — Positive extended agri-foo forward linkages, Spain, 2000

SAM #	Code	FL	Description
54	C_CHEM	2.182	Chemicals, chemical products and man-made fibres
36	C_OFOD	1.563	Other food products
68	C_EGSW	1.098	Electrical energy, gas, steam and hot water
44	C_BEVR	0.934	Beverages

Source: Compiled by the authors.

Table 11 lists the agri-food and other bio-based sectors with a forward linkage greater than 0.9. There are two main findings from Table 9. Firstly, the sector 'other food products'[9] has a significant forward linkage or absorption effect, i.e. a change of one unit in the final demand

[9] This sector contains the following subsectors: processing and preserving of fish and fish products, processing and preserving of fruit and vegetables, manufacture of grain-mill products, starches and starch products and manufacture of other food products.

of all sectors produces an increase in other food product production of more than 56% above the average. It is 'almost' a key sector (cf. below). Secondly, chemicals, chemical products and man-made fibres present a high absorption effect, i.e. they are affected by the rest of the sectors of the economy to a larger extent than the average response.

Following the definition of the backward and forward linkages in Spain's economy in the year 2000, only one agri-food and other bio-based sector, 'electrical energy, gas, steam and hot water', fulfils the criteria to be defined as a 'key sector' (Table 12).

Table 12 — Key agri-food and other bio-based sectors, Spain, 2000

SAM #	Code	BL	FL	Description
36	C_OFOD	**0 835**	1.563	Other food products
68	C_EGSW	1.003	1.098	Electrical energy, gas, steam and hot water
44	C_BEVR	**0.959**	**0.934**	Beverages

Source: Compiled by the authors.

There are three main observations from Table 10. Firstly, no key sector includes primary production. Secondly, energy is a key sector and it represents a very important sector for the agri-food and other bio-based economy as it uses natural and renewable resources in the production process. Box 2 presents the range of contribution of the food and agricultural sector to energy markets.

Thirdly, production of beverages and other food products are 'almost' key sectors. Other food products include processing and preserving of fruit and vegetables, and processing and preserving of fish and fish products. Tables 10 and 11 provide the full backward and forward linkage dataset for Spain.

The analysis of the Spanish agri-food and other bio-based sectors (year 2000) is visualised in Figures 1 and 2. It clearly shows that half of the sectors can be classified as weak sectors, whereas the other half has positive backward linkages. However, only one of the sectors can be categorised as key.

Finally, Table 15 presents the employment content of each agri-food and other bio-based sector in Spain, i.e. the number of jobs on a full time basis generated by a one million euro increase in the respective output sector.

Box 2. Contribution of agri-food sector to energy markets

'The food and agriculture sector can contribute renewable energy to final energy markets in the following ways:

- Production of conventional agricultural crops (grains, sugar beet and sugar cane, oilseeds) which are then transformed into biofuels, or into biogas (via anaerobic digestion).

- Production of dedicated (non-food) energy crops (any ligno-cellulosic crop). This route leads to the production of second-generation biofuels, biogas and the energies derived from primary solid biomass.

- Agricultural wastes and residues, whether of crop or animal origin, and forest residues. This is currently severely under-exploited as a source of renewable energy relative to the enormous potential.

- Wind and solar energy used for electricity generation. Although these outputs do not rely on any biological transformation process, they can fall within the decisionmaking sphere of the farmer, contribute to farm income and may have implications for the farm's fixed resources.

- Organic waste produced in the agrifood chain downstream from farming can also be a source of renewable energy, including first- and second-generation biofuels, heat and electricity from primary solid biomass conversion, and biogas'.

Source: OECD, 2011.

Table 13 — Extended agri-food backward linkages — full results, Spain, 2000

SAM #	Description	Code	BL
9	Soya seed	C_SOYA	0.260
28	Agricultural services	C_AGSV	0.306
46	Tobacco products	C_TOBA	0.415
30	Fish and other fishing products; services incidental of fishing	C_FISH	0.694
54	Chemicals, chemical products and man-made fibres	C_CHEM	0.696
17	Fresh vegetables, fruit, and nuts	C_FVEG	0.697
1	Other wheat	C_OWHE	0.747
11	Other starch and protein plants	C_STPR	0.750
4	Grain maize	C_MAIZ	0.753
51	Pulp, paper and paper products	C_PULP	0.823
36	Other food products	C_OFOD	0.835
8	Sunflower seed	C_SUNF	0.845
12	Potatoes	C_POTA	0.855
2	Durum wheat	C_DWHE	0.856
55	Rubber and plastic products	C_PLST	0.868
16	Grapes	C_GRPS	0.875
37	Processed sugar	C_SUGA	0.918
38	Vegetable oils and fats	C_VOIL	0.926
6	Paddy rice	C_PARI	0.933
29	Products of forestry, logging and related services	C_FORE	0.937
44	Beverages	C_BEVR	0.959
5	Other cereals	C_OCER	0.970
35	Rice, milled or husked	C_RICE	0.972
56	Other non-metallic mineral products	C_NMMP	0.998
68	Electrical energy, gas, steam and hot water	C_EGSW	1.003
50	Wood and products of wood and cork (except furniture); straw and plaiting materials	C_WOOD	1.010
45	Prepared animal feeds	C_ANFD	1.013
13	Sugar beet	C_SUGB	1.099
18	Live plants	C_LPLT	1.117
14	Fibre plants	C_FIBR	1.119
10	Other oil plants	C_OOIL	1.125
25	Eggs	C_EGGS	1.141
15	Other crop products	C_OTCR	1.141
39	Dairy products	C_DAIR	1.147
3	Barley	C_BARL	1.148
20	Raw milk from cattle	C_COMI	1.173
27	Other animals, live, and their products	C_OANM	1.175
26	Poultry, slaughtered	C_PLTR	1.180
69	Collected and purified water, distribution services of water	C_WATR	1.205
40	Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.216
19	Fodder crops	C_FODD	1.221
43	Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.233
24	Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.251
22	Swine, slaughtered	C_PIGF	1.251
41	Meat of swine, fresh, chilled, or frozen	C_PORK	1.318
23	Raw milk from sheep and goats	C_SGMI	1.324
42	Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.328
21	Cattle, slaughtered	C_LCAT	1.376
7	Rape seed	C_RAPE	2.882

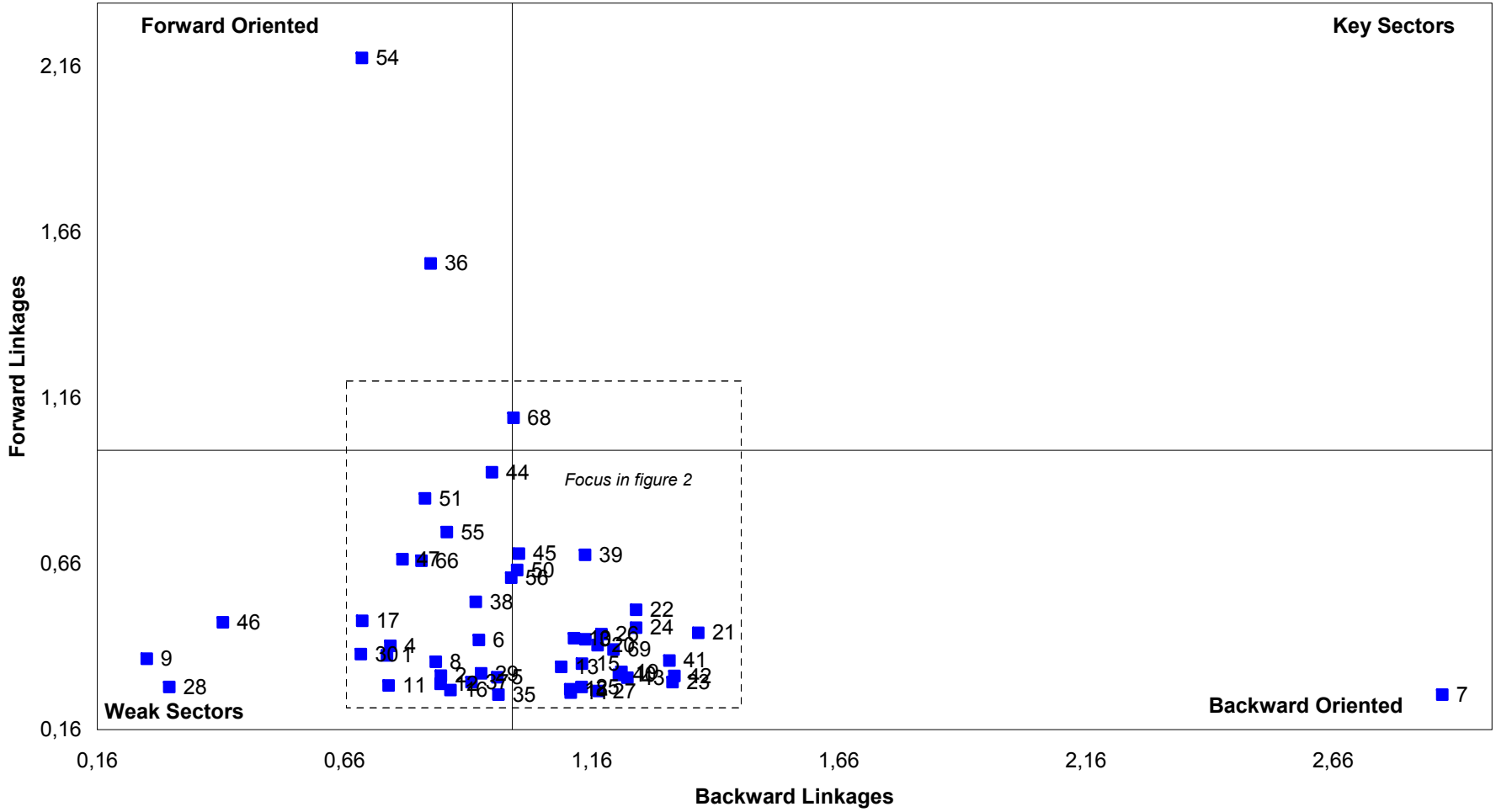
Source: Compiled by the authors.

Table 14 — Extended agri-food forward linkages — full results, Spain, 2000

SAM #	Description	Code	FL
7	Rape seed	C_RAPE	0.263
35	Rice, milled or husked	C_RICE	0.263
14	Fibre plants	C_FIBR	0.269
27	Other animals, live, and their products	C_OANM	0.274
16	Grapes	C_GRPS	0.278
18	Live plants	C_LPLT	0.280
25	Eggs	C_EGGS	0.286
28	Agricultural services	C_AGSV	0.287
11	Other starch and protein plants	C_STPR	0.291
12	Potatoes	C_POTA	0.296
37	Processed sugar	C_SUGA	0.301
23	Raw milk from sheep and goats	C_SGMI	0.301
43	Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	0.314
5	Other cereals	C_OCER	0.316
42	Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	0.320
2	Durum wheat	C_DWHE	0.320
40	Meat of cattle, fresh, chilled, or frozen	C_BFVL	0.323
29	Products of forestry, logging and related services	C_FORE	0.328
19	Fodder crops	C_FODD	0.332
13	Sugar beet	C_SUGB	0.346
15	Other crop products	C_OTCR	0.357
8	Sunflower seed	C_SUNF	0.363
41	Meat of swine, fresh, chilled, or frozen	C_PORK	0.366
9	Soya seed	C_SOYA	0.372
1	Other wheat	C_OWHE	0.382
30	Fish and other fishing products; services incidental of fishing	C_FISH	0.386
69	Collected and purified water, distribution services of water	C_WATR	0.400
4	Grain maize	C_MAIZ	0.410
20	Raw milk from cattle	C_COMI	0.413
6	Paddy rice	C_PARI	0.428
3	Barley	C_BARL	0.431
10	Other oil plants	C_OOIL	0.433
26	Poultry, slaughtered	C_PLTR	0.445
21	Cattle, slaughtered	C_LCAT	0.450
24	Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	0.465
46	Tobacco products	C_TOBA	0.481
17	Fresh vegetables, fruit, and nuts	C_FVEG	0.486
22	Swine, slaughtered	C_PIGF	0.519
38	Vegetable oils and fats	C_VOIL	0.543
56	Other non-metallic mineral products	C_NMMP	0.616
50	Wood and products of wood and cork (except furniture); straw and plaiting materials	C_WOOD	0.639
39	Dairy products	C_DAIR	0.685
45	Prepared animal feeds	C_ANFD	0.689
55	Rubber and plastic products	C_PLST	0.754
51	Pulp, paper and paper products	C_PULP	0.855
44	Beverages	C_BEVR	0.934
68	Electrical energy, gas, steam and hot water	C_EGSW	1.098
36	Other food products	C_OFOD	1.563
54	Chemicals, chemical products and man-made fibres	C_CHEM	2.182

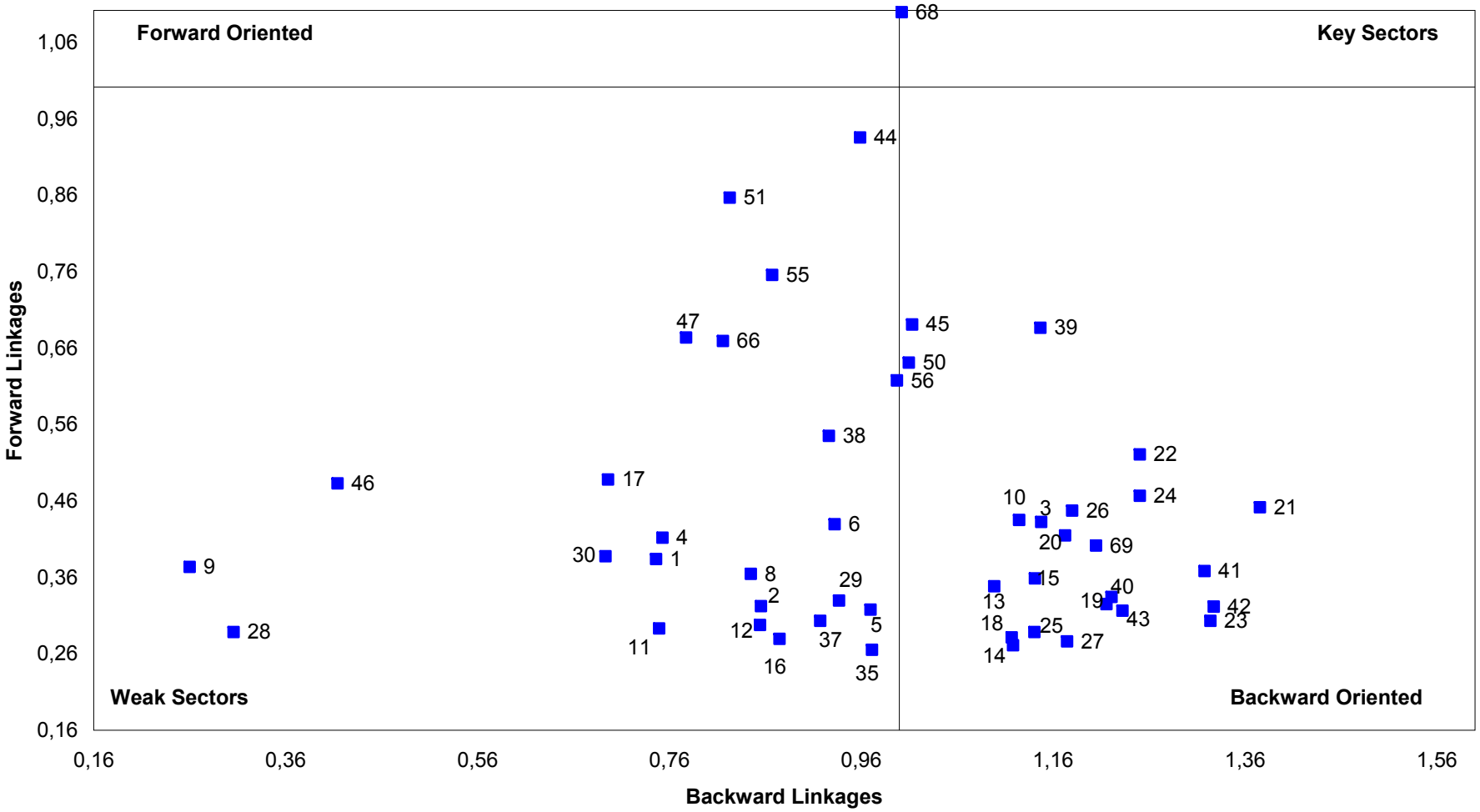
Source: Compiled by the authors.

Figure 1.
Structural overview of the agri-food and other bio-based sectors, Spain, 2000



Note: For data specification, see Tables 13 and 14.
Source: Compiled by the authors.

Figure 2.
Structural overview of the agri-food and other bio-based sectors (focus), Spain, 2000



Note: For data specification, see Tables 13 and 14.
Source: Compiled by the authors.

Table 15 — Extended agri-food employment multiplier, Spain, 2000.

SAM#	Code	Description	Employment multiplier
1	C_OWHE	Other wheat	6.57
2	C_DWHE	Durum wheat	5.35
3	C_BARL	Barley	8.07
4	C_MAIZ	Grain maize	7.44
5	C_OCER	Other cereals	7.68
6	C_PARI	Paddy rice	4.31
7	C_RAPE	Rape seed	4.88
8	C_SUNF	Sunflower seed	7.19
9	C_SOYA	Soya seed	4.97
10	C_OOIL	Other oil plants	5.07
11	C_STPR	Other starch and protein plants	14.67
12	C_POTA	Potatoes	6.87
13	C_SUGB	Sugar beet	10.28
14	C_FIBR	Fibre plants	7.91
16	C_GRPS	Grapes	3.34
17	C_FVEG	Fresh vegetables, fruit, and nuts	5.04
18	C_LPLT	Live plants	6.99
19	C_FODD	Fodder crops	8.65
20	C_COMI	Raw milk from cattle	22.36
21	C_LCAT	Cattle, slaughtered	0.83
22	C_PIGF	Swine, slaughtered	0.98
23	C_SGMI	Raw milk from sheep and goats	18.78
24	C_LSGE	Sheep, goats, horses, asses, mules and hinnies, slaughtered	0.96
25	C_EGGS	Eggs	0.41
26	C_PLTR	Poultry, slaughtered	1.00
28	C_AGSV	Agricultural services	14.84
29	C_FORE	Products of forestry, logging and related services	13.94
30	C_FISH	Fish and other fishing products; services incidental of fishing	10.45
35	C_RICE	Rice, milled or husked	26.31
36	C_OFOD	Other food products	5.30
37	C_SUGA	Processed sugar	15.93
38	C_VOIL	Vegetable oils and fats	1.28
39	C_DAIR	Dairy products	1.22
40	C_BFVL	Meat of cattle, fresh, chilled, or frozen	1.37
41	C_PORK	Meat of swine, fresh, chilled, or frozen	1.43
42	C_SGMT	Meat of sheep, goats, and equines, fresh, chilled, or frozen	2.33
43	C_POUM	Meat and edible offal of poultry, fresh, chilled, or frozen	2.33
44	C_BEVR	Beverages	0.57
45	C_ANFD	Prepared animal feeds	12.37
46	C_TOBA	Tobacco products	0.80
47	C_TEXT	Textiles	6.39
50	C_WOOD	Wood and products of wood and cork (except furniture); straw and plaiting materials	8.47
51	C_PULP	Pulp, paper and paper products	3.24
54	C_CHEM	Chemicals, chemical products and man-made fibres	2.27
55	C_PLST	Rubber and plastic products	5.48
56	C_NMMP	Other non-metallic mineral products	6.36
66	C_FURN	Furniture; other manufactured goods n.e.c.	8.87
68	C_EGSW	Electrical energy, gas, steam and hot water	1.64
69	C_WATR	Collected and purified water, distribution services of water	11.42
		TOTAL	**335.21**

Note: Employment multiplier of '(15) other crops products' and '(27) other animals, live, and their products' are excluded from the analysis for consistency reason (employment residual).

Source: Compiled by the authors

5 Concluding remarks

This study stresses the capacity of a Social Accounting Matrix (SAM) with a highly disaggregated agricultural sector (AgroSAM) to provide descriptive analysis of the agri-food and other bio-based sectors in 2000.[10] The software SIMSIPSAM is used to detect backward and forward structural linkages as well as key sectors with the aim of revealing likely growth, a key element in the design of public and private policies. Finally, it presents the Spanish employment multiplier to show the most significant sectors in term of job creation. The methodology used in this study allows automatated and enhanced reviews of the agri-food and other bio-based sectors for each of the 27 EU Member States, making possible pan-EU mapping.

A first insight from the pan-EU analysis sheds some light on the European key feature of disaggregated agri-food and other bio-based sectors. On the one hand, livestock and related products (including fodder, milk and dairy products) present the highest backward linkages within these sectors at the European level. Energy and water sectors are also important potential key sectors.

On the other hand, some primary sectors — durum wheat, soya and sunflower seeds, grapes, fresh and vegetables, fruits and nuts — cannot be considered as key agri-food and other bio-based sectors at the European level, although they may be key for some Members States. The same observation applies to chemicals, rubber and plastic products. Further research may use the methodology presented here on an updated database for a detailed pan-EU diagnosis.

The key sector analysis for Spain leads to three remarks. Firstly, it highlights that no primary agricultural sectors emerges as key for the Spanish economy. The production of energy appears as the only key sector related to an extended agri-food sector, given a potential high and mixed consumption of intermediate inputs. In particular, energy uses natural and renewable resources in the production process — such as conventional agricultural or energy crops, agricultural or agri-food chain wastes and residues, wind, solar, etc. — thus it should be critical in any attempt to foster a bio-based economy in Spain.[11] These results for Spain are

[10] AgroSAMs are currently in a process of updating to the year 2007. Currently, the dataset is for the year 2000. Thus macroeconomic adjustments and policy changes that occurred between these dates, notably the 2003-2004-2008 CAP reforms, are not taken into account.

[11] One may highlight that electricity from natural and renewable resources increased by over 40% between 1999 and 2009 in Spain. It accounted for about 25% of Spain's gross electricity production in 2009 (Data from Spain's national renewable energy action plan 2011-2020 released in June 2010 by the Spanish Ministry of industry, tourism and trade).

consistent with other studies using more aggregated SAMs in Cardenete (2008) and Cardenete et al (2008).

Secondly, the 'other food products' sector has a forward linkage or an absorption effect greater than the average, i.e. an increase in the final demand of all sectors produces a higher increase in other food product activities relative to the average change in the economy. In addition, the sector 'chemicals, chemical products and man-made fibres' presents a high absorption effect i.e. is affected by the rest of the sectors of the economy to a larger extent than the average response. As for the energy sector, the chemical sector is related to the agri-food and other bio-based sectors, given the amount of natural and renewable resources used in its production process.

Finally, livestock and related products (including fodder, milk and dairy products) present the highest backward linkages within the extended agri-food sectors or diffusion effects; i.e. a change of 1 euro in the finale demand of these sectors generates an increase in the activity of the other sectors higher than 1 euro. This result is relevant for most of EU Member States in 2000.

This original key-sector snapshot may contribute to a better understanding of agri-food and other bio-based sectors' economic linkages. Targeting public intervention to those sectors that generate more income than the average sector should be a priority to make the EU a smart, sustainable and inclusive economy.

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Annex. Dataset on potential agri-food and other bio-based key sectors by EU Member States

A key sector has both backward and forward linkages greater than 1. This means that the sector can generate more income than the average sector in the economy, and responds more to shocks than the average sector.

The tables below show potential agri-food and other bio-based sectors, i.e. sectors which have a backward linkage (BL) greater than 0.9 and a forward linkage less than 0.9. Thus an increase in the forward linkage would make the sector a key sector.

Table A1 — Potential agri-food and other bio-based key sectors, EU27, Austria, 2000

Description	Code	BL
Production of other wheat	C_OWHE	2.756
Other crop products	C_OTCR	2.081
Cattle, slaughtered	C_LCAT	1.430
Raw milk from cattle	C_COMI	1.353
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.316
Fodder crops	C_FODD	1.312
Other cereals	C_OCER	1.307
Other starch and protein plants	C_STPR	1.305
Collected and purified water, distribution services of water	C_WATR	1.297
Swine, slaughtered	C_PIGF	1.286
Raw milk from sheep and goats	C_SGMI	1.285
Poultry, slaughtered	C_PLTR	1.277
Prepared animal feeds	C_ANFD	1.261
Rape seed	C_RAPE	1.225
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.220
Live plants	C_LPLT	1.194
Barley	C_BARL	1.186
Fibre plants	C_FIBR	1.159
Meat of swine, fresh, chilled, or frozen	C_PORK	1.104
Sugar beet	C_SUGB	1.097
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.083
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.078
Potatoes	C_POTA	1.078
Electrical energy, gas, steam and hot water	C_EGSW	1.071
Grain maize	C_MAIZ	1.033
eggs	C_EGGS	1.029
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.002
Processed sugar	C_SUGA	0.964
Products of forestry, logging and related services	C_FORE	0.949
Other non-metallic mineral products	C_NMMP	0.921
Pulp, paper and paper products	C_PULP	0.910

Source: Compiled by the authors

Table A2 — Potential agri-food and other bio-based key sectors, EU27, Belgium, 2000

Description	Code	BL
Sugar beet	C_SUGB	1.624
Raw milk from sheep and goats	C_SGMI	1.534
Other animals, live, and their products	C_OANM	1.442
Other crop products	C_OTCR	1.423
Meat of swine, fresh, chilled, or frozen	C_PORK	1.370
Raw milk from cattle	C_COMI	1.366
Live plants	C_LPLT	1.355
Fibre plants	C_FIBR	1.337
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.332
Fodder crops	C_FODD	1.288
Cattle, slaughtered	C_LCAT	1.274
Poultry, slaughtered	C_PLTR	1.255
Swine, slaughtered	C_PIGF	1.207
eggs	C_EGGS	1.203
Agricultural services	C_AGSV	1.198
Potatoes	C_POTA	1.125
Collected and purified water, distribution services of water	C_WATR	1.119
Electrical energy, gas, steam and hot water	C_EGSW	1.117
Beverages	C_BEVR	1.116
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.094
Dairy products	C_DAIR	1.067
Other non-metallic mineral products	C_NMMP	0.946
Processed sugar	C_SUGA	0.925
Textiles	C_TEXT	0.915

Source: Compiled by the authors

Table A3– Potential agri-food and other bio-based key sectors, EU27, Bulgaria, 2000

Description	Code	BL
Paddy rice	C_PARI	2.398
Dairy products	C_DAIR	1.518
Live plants	C_LPLT	1.462
Other cereals	C_OCER	1.416
Raw milk from cattle	C_COMI	1.370
Collected and purified water, distribution services of water	C_WATR	1.268
Prepared animal feeds	C_ANFD	1.265
Other animals, live, and their products	C_OANM	1.264
Swine, slaughtered	C_PIGF	1.249
Meat of swine, fresh, chilled, or frozen	C_PORK	1.226
Electrical energy, gas, steam and hot water	C_EGSW	1.209
Cattle, slaughtered	C_LCAT	1.200
Poultry, slaughtered	C_PLTR	1.172
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.166
Sugar beet	C_SUGB	1.164
Fresh vegetables, fruit, and nuts	C_FVEG	1.162
Products of forestry, logging and related services	C_FORE	1.131
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.124
Raw milk from sheep and goats	C_SGMI	1.096
Potatoes	C_POTA	1.091
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.079
Grapes	C_GRPS	1.076
eggs	C_EGGS	1.070
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.031
Other crop products	C_OTCR	0.966
Other starch and protein plants	C_STPR	0.962
Rape seed	C_RAPE	0.960
Fodder crops	C_FODD	0.945
Textiles	C_TEXT	0.943
Other oil plants	C_OOIL	0.936
Fish and other fishing products; services incidental of fishing	C_FISH	0.928
Other non-metallic mineral products	C_NMMP	0.923
Durum wheat	C_DWHE	0.915
Vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils	C_VOIL	0.907

Source: Compiled by the authors

Table A4 — Potential agri-food key sectors, EU27, Cyprus, 2000

Description	Code	BL
Other animals, live, and their products	C_OANM	4.421
eggs	C_EGGS	2.072
Fresh vegetables, fruit, and nuts	C_FVEG	1.575
Fodder crops	C_FODD	1.489
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.426
Cattle, slaughtered	C_LCAT	1.384
Collected and purified water, distribution services of water	C_WATR	1.378
Live plants	C_LPLT	1.344
Meat of swine, fresh, chilled, or frozen	C_PORK	1.340
Potatoes	C_POTA	1.285
Other oil plants	C_OOIL	1.272
Other service activities	C_OTSV	1.256
Raw milk from sheep and goats	C_SGMI	1.245
Prepared animal feeds	C_ANFD	1.241
Poultry, slaughtered	C_PLTR	1.238
Raw milk from cattle	C_COMI	1.232
Electrical energy, gas, steam and hot water	C_EGSW	1.225
Dairy products	C_DAIR	1.187
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.139
Swine, slaughtered	C_PIGF	1.137
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.094
Other non-metallic mineral products	C_NMMP	0.968
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	0.922
Products of forestry, logging and related services	C_FORE	0.918

Source: Compiled by the authors

Table A5 — Potential agri-food and other bio-based key sectors, EU27, Czech Republic, 2000

Description	Code	BL
Meat of swine, fresh, chilled, or frozen	C_PORK	1.419
Swine, slaughtered	C_PIGF	1.395
Poultry, slaughtered	C_PLTR	1.389
eggs	C_EGGS	1.343
Collected and purified water, distribution services of water	C_WATR	1.314
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.312
Live plants	C_LPLT	1.304
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.293
Cattle, slaughtered	C_LCAT	1.274
Raw milk from cattle	C_COMI	1.268
Fodder crops	C_FODD	1.264
Products of forestry, logging and related services	C_FORE	1.261
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.240
Other animals, live, and their products	C_OANM	1.229
Dairy products	C_DAIR	1.212
Prepared animal feeds	C_ANFD	1.196
Raw milk from sheep and goats	C_SGMI	1.156
Fish and other fishing products; services incidental of fishing	C_FISH	1.151
Production of other wheat	C_OWHE	1.128
Electrical energy, gas, steam and hot water	C_EGSW	1.114
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.107
Sugar beet	C_SUGB	1.092
Barley	C_BARL	1.079
Potatoes	C_POTA	1.064
Rape seed	C_RAPE	1.059
Other cereals	C_OCER	1.039
Other starch and protein plants	C_STPR	1.035
Beverages	C_BEVR	1.018
Processed sugar	C_SUGA	0.944
Other oil plants	C_OOIL	0.939
Other non-metallic mineral products	C_NMMP	0.935

Source: Compiled by the authors

Table A6– Potential agri-food and other bio-based key sectors, EU27, Germany, 2000

Description	Code	BL
Cattle, slaughtered	C_LCAT	1.397
Other crop products	C_OTCR	1.387
Fodder crops	C_FODD	1.382
Poultry, slaughtered	C_PLTR	1.363
Raw milk from sheep and goats	C_SGMI	1.350
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.285
Swine, slaughtered	C_PIGF	1.260
Collected and purified water, distribution services of water	C_WATR	1.258
Other cereals	C_OCER	1.252
Raw milk from cattle	C_COMI	1.238
Sugar beet	C_SUGB	1.238
Barley	C_BARL	1.236
Electrical energy, gas, steam and hot water	C_EGSW	1.223
Dairy products	C_DAIR	1.203
Live plants	C_LPLT	1.197
Production of other wheat	C_OWHE	1.187
Other animals, live, and their products	C_OANM	1.184
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.167
Other starch and protein plants	C_STPR	1.167
Potatoes	C_POTA	1.142
Prepared animal feeds	C_ANFD	1.137
Products of forestry, logging and related services	C_FORE	1.106
Meat of swine, fresh, chilled, or frozen	C_PORK	1.074
Processed sugar	C_SUGA	1.019
Other non-metallic mineral products	C_NMMP	1.016
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.985
Beverages	C_BEVR	0.969
Rubber and plastic products	C_PLST	0.964
eggs	C_EGGS	0.959
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	0.932
Grain maize	C_MAIZ	0.927

Source: Compiled by the authors

Table A7– Potential agri-food and other bio-based key sectors, EU27, Denmark, 2000

Description	Code	BL
Swine, slaughtered	C_PIGF	1.636
Meat of swine, fresh, chilled, or frozen	C_PORK	1.593
Cattle, slaughtered	C_LCAT	1.568
Poultry, slaughtered	C_PLTR	1.552
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.531
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.468
Other crop products	C_OTCR	1.455
Other animals, live, and their products	C_OANM	1.435
Fodder crops	C_FODD	1.431
Dairy products	C_DAIR	1.424
Raw milk from cattle	C_COMI	1.376
Barley	C_BARL	1.308
Sugar beet	C_SUGB	1.285
Agricultural service activities	C_AGSV	1.256
Production of other wheat	C_OWHE	1.255
Fibre plants	C_FIBR	1.203
Live plants	C_LPLT	1.162
Other cereals	C_OCER	1.152
Products of forestry, logging and related services	C_FORE	1.151
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.151
Other starch and protein plants	C_STPR	1.148
Potatoes	C_POTA	1.124
Processed sugar	C_SUGA	1.090
eggs	C_EGGS	1.038
Prepared animal feeds	C_ANFD	0.999
Collected and purified water, distribution services of water	C_WATR	0.974
Beverages	C_BEVR	0.956
Other non-metallic mineral products	C_NMMP	0.922

Source: Compiled by the authors

Table A8– Potential agri-food and other bio-based key sectors, EU27, Estonia, 2000

Description	Code	BL
Sugar beet	C_SUGB	1.697
Swine, slaughtered	C_PIGF	1.584
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.509
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.480
Raw milk from cattle	C_COMI	1.427
Cattle, slaughtered	C_LCAT	1.420
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.410
Raw milk from sheep and goats	C_SGMI	1.367
Meat of swine, fresh, chilled, or frozen	C_PORK	1.362
Prepared animal feeds	C_ANFD	1.349
Poultry, slaughtered	C_PLTR	1.349
Electrical energy, gas, steam and hot water	C_EGSW	1.329
Collected and purified water, distribution services of water	C_WATR	1.316
Other animals, live, and their products	C_OANM	1.316
Live plants	C_LPLT	1.308
Dairy products	C_DAIR	1.265
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.180
Products of forestry, logging and related services	C_FORE	1.153
Other starch and protein plants	C_STPR	1.150
Barley	C_BARL	1.145
eggs	C_EGGS	1.102
Fodder crops	C_FODD	1.062
Potatoes	C_POTA	1.049
Fish and other fishing products; services incidental of fishing	C_FISH	0.981
Furniture; other manufactured goods n.e.c.	C_FURN	0.964
Rape seed	C_RAPE	0.942

Source: Compiled by the authors

Table A9– Potential agri-food and other bio-based key sectors, EU27, Spain, 2000

Description	Code	BL
Rape seed*	C_RAPE	2.882
Cattle, slaughtered	C_LCAT	1.376
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.328
Raw milk from sheep and goats	C_SGMI	1.324
Meat of swine, fresh, chilled, or frozen	C_PORK	1.318
Swine, slaughtered	C_PIGF	1.251
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.251
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.233
Fodder crops	C_FODD	1.221
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.216
Collected and purified water, distribution services of water	C_WATR	1.205
Poultry, slaughtered	C_PLTR	1.180
Other animals, live, and their products	C_OANM	1.175
Raw milk from cattle	C_COMI	1.173
Barley	C_BARL	1.148
Dairy products	C_DAIR	1.147
Other crop products	C_OTCR	1.141
eggs	C_EGGS	1.141
Other oil plants	C_OOIL	1.125
Fibre plants	C_FIBR	1.119
Live plants	C_LPLT	1.117
Sugar beet	C_SUGB	1.099
Prepared animal feeds	C_ANFD	1.013
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.010
Electrical energy, gas, steam and hot water	C_EGSW	1.003
Other non-metallic mineral products	C_NMMP	0.998
Rice, milled or husked	C_RICE	0.972
Other cereals	C_OCER	0.970
Beverages	C_BEVR	0.959
Products of forestry, logging and related services	C_FORE	0.937
Paddy rice	C_PARI	0.933
Vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils	C_VOIL	0.926
Processed sugar	C_SUGA	0.918

* Inconsistent data: Rap seed covered 31 000 ha in Spain in 2000

Source: Compiled by the authors

Table A10– Potential agri-food and other bio-based key sectors, EU27, France, 2000

Description	Code	BL
Cattle, slaughtered	C_LCAT	1.690
Other animals, live, and their products	C_OANM	1.368
Swine, slaughtered	C_PIGF	1.348
Collected and purified water, distribution services of water	C_WATR	1.345
Raw milk from sheep and goats	C_SGMI	1.332
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.330
Poultry, slaughtered	C_PLTR	1.326
Raw milk from cattle	C_COMI	1.293
eggs	C_EGGS	1.282
Fodder crops	C_FODD	1.262
Other crop products	C_OTCR	1.223
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.211
Dairy products	C_DAIR	1.194
Other cereals	C_OCER	1.193
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.192
Prepared animal feeds	C_ANFD	1.176
Rape seed	C_RAPE	1.171
Production of other wheat	C_OWHE	1.157
Other starch and protein plants	C_STPR	1.143
Sugar beet	C_SUGB	1.141
Live plants	C_LPLT	1.139
Sunflower seed	C_SUNF	1.131
Fibre plants	C_FIBR	1.124
Electrical energy, gas, steam and hot water	C_EGSW	1.089
Paddy rice	C_PARI	1.083
Products of forestry, logging and related services	C_FORE	1.081
Meat of swine, fresh, chilled, or frozen	C_PORK	1.048
Barley	C_BARL	0.979
Potatoes	C_POTA	0.951
Other oil plants	C_OOIL	0.941
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.941
Grain maize	C_MAIZ	0.917
Rubber and plastic products	C_PLST	0.914
Processed sugar	C_SUGA	0.910

Source: Compiled by the authors

Table A11– Potential agri-food and other bio-based key sectors, EU27, Finland, 2000

Description	Code	BL
Cattle, slaughtered	C_LCAT	2.175
Raw milk from cattle	C_COMI	2.169
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.687
Poultry, slaughtered	C_PLTR	1.557
Swine, slaughtered	C_PIGF	1.536
eggs	C_EGGS	1.432
Other crop products	C_OTCR	1.427
Other starch and protein plants	C_STPR	1.422
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.412
Dairy products	C_DAIR	1.329
Other animals, live, and their products	C_OANM	1.324
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.288
Barley	C_BARL	1.247
Potatoes	C_POTA	1.222
Prepared animal feeds	C_ANFD	1.213
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.207
Fibre plants	C_FIBR	1.198
Fodder crops	C_FODD	1.193
Live plants	C_LPLT	1.178
Sugar beet	C_SUGB	1.156
Meat of swine, fresh, chilled, or frozen	C_PORK	1.153
Pulp, paper and paper products	C_PULP	1.152
Collected and purified water, distribution services of water	C_WATR	1.127
Rape seed	C_RAPE	1.123
Products of forestry, logging and related services	C_FORE	1.048
Production of other wheat	C_OWHE	0.990
Other non-metallic mineral products	C_NMMP	0.939
Beverages	C_BEVR	0.915
Electrical energy, gas, steam and hot water	C_EGSW	0.912

Source: Compiled by the authors

Table A12– Potential agri-food and other bio-based key sectors, EU27, Greece, 2000

Description	Code	BL
Other animals, live, and their products	C_OANM	4.413
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.449
Raw milk from sheep and goats	C_SGMI	1.419
Fodder crops	C_FODD	1.396
Other oil plants	C_OOIL	1.354
Fibre plants	C_FIBR	1.327
Prepared animal feeds	C_ANFD	1.322
Collected and purified water, distribution services of water	C_WATR	1.315
Live plants	C_LPLT	1.294
Production of vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils	C_VOIL	1.285
Swine, slaughtered	C_PIGF	1.279
Poultry, slaughtered	C_PLTR	1.241
Grapes	C_GRPS	1.230
Beverages	C_BEVR	1.181
Dairy products	C_DAIR	1.154
Processing of rice, milled or husked	C_RICE	1.150
eggs	C_EGGS	1.144
Electrical energy, gas, steam and hot water	C_EGSW	1.134
Cattle, slaughtered	C_LCAT	1.112
Sugar beet	C_SUGB	1.105
Paddy rice	C_PARI	1.102
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.055
Durum wheat	C_DWHE	1.028
Other crop products	C_OTCR	1.017
Fresh vegetables, fruit, and nuts	C_FVEG	0.999
Raw milk from cattle	C_COMI	0.977
Processed sugar	C_SUGA	0.967
Potatoes	C_POTA	0.939
Other cereals	C_OCER	0.911

Source: Compiled by the authors

Table A13– Potential agri-food and other bio-based key sectors, EU27, Hungary, 2000

Description	Code	BL
Swine, slaughtered	C_PIGF	1.487
Raw milk from sheep and goats	C_SGMI	1.427
Meat of swine, fresh, chilled, or frozen	C_PORK	1.396
Poultry, slaughtered	C_PLTR	1.392
Raw milk from cattle	C_COMI	1.389
Other animals, live, and their products	C_OANM	1.313
eggs	C_EGGS	1.243
Prepared animal feeds	C_ANFD	1.243
Collected and purified water, distribution services of water	C_WATR	1.241
Dairy products	C_DAIR	1.235
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.233
Fodder crops	C_FODD	1.228
Grain maize	C_MAIZ	1.226
Other cereals	C_OCER	1.201
Live plants	C_LPLT	1.188
Cattle, slaughtered	C_LCAT	1.181
Production of other wheat	C_OWHE	1.158
Other crop products	C_OTCR	1.153
Barley	C_BARL	1.152
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.124
Beverages	C_BEVR	1.116
Processed sugar	C_SUGA	1.111
Sunflower seed	C_SUNF	1.091
Potatoes	C_POTA	1.084
Vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils	C_VOIL	1.078
Sugar beet	C_SUGB	1.073
Products of forestry, logging and related services	C_FORE	1.067
Other starch and protein plants	C_STPR	1.044
Electrical energy, gas, steam and hot water	C_EGSW	1.035
Rape seed	C_RAPE	0.999
Durum wheat	C_DWHE	0.975
Fish and other fishing products; services incidental of fishing	C_FISH	0.930

Source: Compiled by the authors

Table A14– Potential agri-food and other bio-based key sectors, EU27, Ireland, 2000

Description	Code	BL
Rape seed	C_RAPE	3.311
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.731
Raw milk from cattle	C_COMI	1.639
Swine, slaughtered	C_PIGF	1.522
Other animals, live, and their products	C_OANM	1.498
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.482
Collected and purified water, distribution services of water	C_WATR	1.447
Sugar beet	C_SUGB	1.445
Barley	C_BARL	1.415
eggs	C_EGGS	1.382
Dairy products	C_DAIR	1.381
Other cereals	C_OCER	1.360
Cattle, slaughtered	C_LCAT	1.356
Poultry, slaughtered	C_PLTR	1.317
Fodder crops	C_FODD	1.299
Other crop products	C_OTCR	1.298
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.195
Products of forestry, logging and related services	C_FORE	1.173
Electrical energy, gas, steam and hot water	C_EGSW	1.159
Other oil plants	C_OOIL	1.127
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.083
Meat of swine, fresh, chilled, or frozen	C_PORK	1.027
Fish and other fishing products; services incidental of fishing	C_FISH	1.018
Beverages	C_BEVR	0.969
Chemicals, chemical products and man-made fibres	C_CHEM	0.944
Other non-metallic mineral products	C_NMMP	0.915
Production of other wheat	C_OWHE	0.911

Source: Compiled by the authors

Table A15– Potential agri-food and other bio-based key sectors, EU27, Italy, 2000

Description	Code	BL
Rape seed	C_RAPE	1.580
Raw milk from sheep and goats	C_SGMI	1.455
Collected and purified water, distribution services of water	C_WATR	1.374
Processing of rice, milled or husked	C_RICE	1.294
Swine, slaughtered	C_PIGF	1.279
Raw milk from cattle	C_COMI	1.258
Poultry, slaughtered	C_PLTR	1.224
Other animals, live, and their products	C_OANM	1.209
Dairy products	C_DAIR	1.198
Other crop products	C_OTCR	1.192
Live plants	C_LPLT	1.175
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.163
Sugar beet	C_SUGB	1.146
Other oil plants	C_OOIL	1.142
Paddy rice	C_PARI	1.142
Fodder crops	C_FODD	1.122
Prepared animal feeds	C_ANFD	1.112
Grain maize	C_MAIZ	1.110
eggs	C_EGGS	1.094
Cattle, slaughtered	C_LCAT	1.075
Other non-metallic mineral products	C_NMMP	1.074
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.040
Grapes	C_GRPS	1.038
Sunflower seed	C_SUNF	0.985
Textiles	C_TEXT	0.984
Rubber and plastic products	C_PLST	0.982
Beverages	C_BEVR	0.981
Meat of swine, fresh, chilled, or frozen	C_PORK	0.974
Other cereals	C_OCER	0.959
Processed sugar	C_SUGA	0.942
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.931
Electrical energy, gas, steam and hot water	C_EGSW	0.929
Pulp, paper and paper products	C_PULP	0.924

Source: Compiled by the authors

Table A16– Potential agri-food and other bio-based key sectors, EU27, Lithuania, 2000

Description	Code	BL
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	6.362
Raw milk from cattle	C_COMI	1.564
Sugar beet	C_SUGB	1.471
Swine, slaughtered	C_PIGF	1.386
Collected and purified water, distribution services of water	C_WATR	1.358
Other animals, live, and their products	C_OANM	1.312
Raw milk from sheep and goats	C_SGMI	1.236
Live plants	C_LPLT	1.233
Prepared animal feeds	C_ANFD	1.231
Electrical energy, gas, steam and hot water	C_EGSW	1.223
Dairy products	C_DAIR	1.215
Processed sugar	C_SUGA	1.208
Meat of swine, fresh, chilled, or frozen	C_PORK	1.177
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.167
Fodder crops	C_FODD	1.159
Cattle, slaughtered	C_LCAT	1.148
Other starch and protein plants	C_STPR	1.138
Barley	C_BARL	1.108
Production of other wheat	C_OWHE	1.100
Rape seed	C_RAPE	1.071
Other cereals	C_OCER	1.063
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.060
eggs	C_EGGS	0.971
Other crop products	C_OTCR	0.945
Products of forestry, logging and related services	C_FORE	0.936
Poultry, slaughtered	C_PLTR	0.910

Source: Compiled by the authors

Table A17– Potential agri-food and other bio-based key sectors, EU27, Luxembourg, 2000

Description	Code	BL
Raw milk from sheep and goats	C_SGMI	29.808
Other animals, live, and their products	C_OANM	2.523
Raw milk from cattle	C_COMI	1.185
eggs	C_EGGS	1.148
Collected and purified water, distribution services of water	C_WATR	1.116
Fodder crops	C_FODD	1.079
Live plants	C_LPLT	1.078
Other cereals	C_OCER	0.996
Other crop products	C_OTCR	0.986
Rape seed	C_RAPE	0.975
Prepared animal feeds	C_ANFD	0.946
Barley	C_BARL	0.945
Products of forestry, logging and related services	C_FORE	0.937
Other starch and protein plants	C_STPR	0.936
Production of other wheat	C_OWHE	0.902

Source: Compiled by the authors

Table A18– Potential agri-food and other bio-based key sectors, EU27, Latvia, 2000

Description	Code	BL
Other animals, live, and their products	C_OANM	2.822
Live plants	C_LPLT	1.622
Raw milk from cattle	C_COMI	1.531
Collected and purified water, distribution services of water	C_WATR	1.395
Swine, slaughtered	C_PIGF	1.329
Sugar beet	C_SUGB	1.320
Prepared animal feeds	C_ANFD	1.320
Dairy products	C_DAIR	1.287
Meat of swine, fresh, chilled, or frozen	C_PORK	1.279
Beverages	C_BEVR	1.258
Other oil plants	C_OOIL	1.251
Cattle, slaughtered	C_LCAT	1.251
Electrical energy, gas, steam and hot water	C_EGSW	1.206
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.171
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.162
Potatoes	C_POTA	1.113
eggs	C_EGGS	1.112
Other cereals	C_OCER	1.111
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.102
Processed sugar	C_SUGA	1.097
Production of other wheat	C_OWHE	1.073
Fish and other fishing products; services incidental of fishing	C_FISH	1.070
Other food products	C_OFOD	1.065
Barley	C_BARL	1.027
Products of forestry, logging and related services	C_FORE	0.993
Other starch and protein plants	C_STPR	0.992
Other crop products	C_OTCR	0.983
Poultry, slaughtered	C_PLTR	0.967
Rape seed	C_RAPE	0.962
Fodder crops	C_FODD	0.952
Raw milk from sheep and goats	C_SGMI	0.919

Source: Compiled by the authors

Table A19– Potential agri-food and other bio-based key sectors, EU27, Malta, 2000

Description	Code	BL
Fodder crops	C_FODD	2.727
Collected and purified water, distribution services of water	C_WATR	2.217
Raw milk from cattle	C_COMI	1.554
Meat of swine, fresh, chilled, or frozen	C_PORK	1.519
Electrical energy, gas, steam and hot water	C_EGSW	1.463
Other animals, live, and their products	C_OANM	1.362
Cattle, slaughtered	C_LCAT	1.337
Production of other wheat	C_OWHE	1.325
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.267
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.255
Swine, slaughtered	C_PIGF	1.214
Raw milk from sheep and goats	C_SGMI	1.185
Poultry, slaughtered	C_PLTR	1.111
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.076
Fish and other fishing products; services incidental of fishing	C_FISH	1.059
Potatoes	C_POTA	0.981
Furniture; other manufactured goods n.e.c.	C_FURN	0.910
Rubber and plastic products	C_PLST	0.906

Source: Compiled by the authors

Table A20– Potential agri-food and other bio-based key sectors, EU27, Netherlands, 2000

Description	Code	BL
Fodder crops	C_FODD	1.511
Meat of swine, fresh, chilled, or frozen	C_PORK	1.486
Live plants	C_LPLT	1.484
Swine, slaughtered	C_PIGF	1.431
Other animals, live, and their products	C_OANM	1.412
Cattle, slaughtered	C_LCAT	1.385
Dairy products	C_DAIR	1.377
Raw milk from cattle	C_COMI	1.352
Fibre plants	C_FIBR	1.314
Sugar beet	C_SUGB	1.310
Collected and purified water, distribution services of water	C_WATR	1.247
Poultry, slaughtered	C_PLTR	1.201
eggs	C_EGGS	1.181
Electrical energy, gas, steam and hot water	C_EGSW	1.173
Potatoes	C_POTA	1.137
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.123
Other crop products	C_OTCR	1.100
Processed sugar	C_SUGA	1.074
Beverages	C_BEVR	1.069
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.053
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.050
Prepared animal feeds	C_ANFD	0.920

Source: Compiled by the authors

Table A21– Potential agri-food and other bio-based key sectors, EU27, Poland, 2000

Description	Code	BL
Meat of swine, fresh, chilled, or frozen	C_PORK	1.464
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.448
Live plants	C_LPLT	1.445
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.432
Raw milk from sheep and goats	C_SGMI	1.419
Cattle, slaughtered	C_LCAT	1.371
Swine, slaughtered	C_PIGF	1.358
Collected and purified water, distribution services of water	C_WATR	1.343
Electrical energy, gas, steam and hot water	C_EGSW	1.309
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.299
Other animals, live, and their products	C_OANM	1.298
Raw milk from cattle	C_COMI	1.294
Processed sugar	C_SUGA	1.288
Poultry, slaughtered	C_PLTR	1.268
Dairy products	C_DAIR	1.221
Prepared animal feeds	C_ANFD	1.219
Other starch and protein plants	C_STPR	1.143
Products of forestry, logging and related services	C_FORE	1.127
Sugar beet	C_SUGB	1.123
eggs	C_EGGS	1.108
Fodder crops	C_FODD	1.094
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.069
Other cereals	C_OCER	1.044
Rape seed	C_RAPE	1.026
Production of other wheat	C_OWHE	1.023
Barley	C_BARL	1.022
Other crop products	C_OTCR	1.016
Other non-metallic mineral products	C_NMMP	0.914
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	0.908
Grain maize	C_MAIZ	0.905

Source: Compiled by the authors

Table A22– Potential agri-food and other bio-based key sectors, EU27, Portugal, 2000

Description	Code	BL
Fodder crops	C_FODD	1.587
Collected and purified water, distribution services of water	C_WATR	1.381
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.350
Electrical energy, gas, steam and hot water	C_EGSW	1.333
Raw milk from sheep and goats	C_SGMI	1.321
Other cereals	C_OCER	1.317
Poultry, slaughtered	C_PLTR	1.276
Cattle, slaughtered	C_LCAT	1.270
Live plants	C_LPLT	1.263
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.260
Other animals, live, and their products	C_OANM	1.251
Other crop products	C_OTCR	1.221
Raw milk from cattle	C_COMI	1.218
Swine, slaughtered	C_PIGF	1.185
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.144
Dairy products	C_DAIR	1.138
Sugar beet	C_SUGB	1.127
Other non-metallic mineral products	C_NMMP	1.110
Other mining and quarrying products	C_OMIN	1.090
Beverages	C_BEVR	1.081
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.069
eggs	C_EGGS	1.068
Paddy rice	C_PARI	1.056
Other oil plants	C_OOIL	1.053
Potatoes	C_POTA	1.024
Meat of swine, fresh, chilled, or frozen	C_PORK	0.993
Products of forestry, logging and related services	C_FORE	0.939
Grapes	C_GRPS	0.916
Pulp, paper and paper products	C_PULP	0.913
Textiles	C_TEXT	0.909

Source: Compiled by the authors

Table A23– Potential agri-food and other bio-based key sectors, EU27, Romania, 2000

Description	Code	BL
Raw milk from sheep and goats	C_SGMI	1.354
Cattle, slaughtered	C_LCAT	1.349
Dairy products	C_DAIR	1.341
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.325
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.323
Other animals, live, and their products	C_OANM	1.323
Products of forestry, logging and related services	C_FORE	1.317
Collected and purified water, distribution services of water	C_WATR	1.314
Poultry, slaughtered	C_PLTR	1.292
Production of other wheat	C_OWHE	1.285
Swine, slaughtered	C_PIGF	1.271
eggs	C_EGGS	1.267
Sunflower seed	C_SUNF	1.259
Fodder crops	C_FODD	1.239
Raw milk from cattle	C_COMI	1.231
Electrical energy, gas, steam and hot water	C_EGSW	1.217
Sugar beet	C_SUGB	1.196
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.186
Live plants	C_LPLT	1.184
Other crop products	C_OTCR	1.175
Meat of swine, fresh, chilled, or frozen	C_PORK	1.172
Other cereals	C_OCER	1.144
Other starch and protein plants	C_STPR	1.137
Grain maize	C_MAIZ	1.121
Potatoes	C_POTA	1.110
Prepared animal feeds	C_ANFD	1.088
Barley	C_BARL	1.063
Rape seed	C_RAPE	1.061
Vegetable oils and fats, crude and refined; oil-cake and other solid residues, of vegetable fats or oils	C_VOIL	1.047
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.046
Other oil plants	C_OOIL	1.035
Grapes	C_GRPS	1.034
Fresh vegetables, fruit, and nuts	C_FVEG	1.028
Other non-metallic mineral products	C_NMMP	0.939
Furniture; other manufactured goods n.e.c.	C_FURN	0.919

Source: Compiled by the authors

Table A24– Potential agri-food and other bio-based key sectors, EU27, Sweden, 2000

Description	Code	BL
Other cereals	C_OCER	1.693
Fodder crops	C_FODD	1.575
Poultry, slaughtered	C_PLTR	1.467
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.459
Swine, slaughtered	C_PIGF	1.441
Cattle, slaughtered	C_LCAT	1.424
Other crop production activities	C_OTCR	1.419
Barley	C_BARL	1.367
Raw milk from cattle	C_COMI	1.353
Other animals, live, and their products	C_OANM	1.352
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.295
Production of other wheat	C_OWHE	1.292
Other starch and protein plants	C_STPR	1.281
Dairy products	C_DAIR	1.278
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	1.253
Sugar beet	C_SUGB	1.244
Live plants	C_LPLT	1.205
Meat of swine, fresh, chilled, or frozen	C_PORK	1.186
Collected and purified water, distribution services of water	C_WATR	1.173
Prepared animal feeds	C_ANFD	1.132
Pulp, paper and paper products	C_PULP	1.130
eggs	C_EGGS	1.125
Products of forestry, logging and related services	C_FORE	1.073
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.049
Processed sugar	C_SUGA	1.010
Electrical energy, gas, steam and hot water	C_EGSW	0.966
Beverages	C_BEVR	0.944
Potatoes	C_POTA	0.938
Rape seed	C_RAPE	0.922

Source: Compiled by the authors

Table A25– Potential agri-food and other bio-based key sectors, EU27, Slovenia, 2000

Description	Code	BL
Raw milk from cattle	C_COMI	1.559
Live plants	C_LPLT	1.491
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.490
Raw milk from sheep and goats	C_SGMI	1.486
Other animals, live, and their products	C_OANM	1.388
Collected and purified water, distribution services of water	C_WATR	1.370
Poultry, slaughtered	C_PLTR	1.362
Fodder crops	C_FODD	1.331
eggs	C_EGGS	1.279
Electrical energy, gas, steam and hot water	C_EGSW	1.233
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.200
Swine, slaughtered	C_PIGF	1.189
Sugar beet	C_SUGB	1.182
Potatoes	C_POTA	1.177
Prepared animal feeds	C_ANFD	1.175
Other oil plants	C_OOIL	1.162
Dairy products	C_DAIR	1.111
Cattle, slaughtered	C_LCAT	1.105
Other mining and quarrying products	C_OMIN	1.054
Furniture; other manufactured goods n.e.c.	C_FURN	1.028
Products of forestry, logging and related services	C_FORE	1.017
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.001
Rubber and plastic products	C_PLST	0.998
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.971

Source: Compiled by the authors

Table A26-Potential agri-food and other bio-based key sectors, EU27, Slovakia, 2000

Description	Code	BL
Swine, slaughtered	C_PIGF	1.818
Raw milk from cattle	C_COMI	1.781
Cattle, slaughtered	C_LCAT	1.624
Meat of swine, fresh, chilled, or frozen	C_PORK	1.617
Live plants	C_LPLT	1.486
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.410
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.393
Products of forestry, logging and related services	C_FORE	1.384
Collected and purified water, distribution services of water	C_WATR	1.384
Electrical energy, gas, steam and hot water	C_EGSW	1.376
Poultry, slaughtered	C_PLTR	1.372
Fodder crops	C_FODD	1.315
eggs	C_EGGS	1.309
Other animals, live, and their products	C_OANM	1.304
Other cereals	C_OCER	1.280
Dairy products	C_DAIR	1.274
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.274
Prepared animal feeds	C_ANFD	1.208
Raw milk from sheep and goats	C_SGMI	1.193
Sunflower seed	C_SUNF	1.172
Rape seed	C_RAPE	1.166
Sugar beet	C_SUGB	1.147
Production of other wheat	C_OWHE	1.133
Other crop products	C_OTCR	1.094
Grain maize	C_MAIZ	1.052
Barley	C_BARL	1.032
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.999
Potatoes	C_POTA	0.994
Other starch and protein plants	C_STPR	0.990
Other non-metallic mineral products	C_NMMP	0.978
Processed sugar	C_SUGA	0.975
Soya seed	C_SOYA	0.944

Source: Compiled by the authors

Table A27– Potential agri-food and other bio-based key sectors, EU27, United Kingdom, 2000

Description	Code	BL
Cattle, slaughtered	C_LCAT	1.851
Other crop production activities	C_OTCR	1.542
Sheep, goats, horses, asses, mules and hinnies, slaughtered	C_LSGE	1.471
Swine, slaughtered	C_PIGF	1.386
Poultry, slaughtered	C_PLTR	1.384
Electrical energy, gas, steam and hot water	C_EGSW	1.368
Collected and purified water, distribution services of water	C_WATR	1.333
Raw milk from cattle	C_COMI	1.330
eggs	C_EGGS	1.284
Sugar beet	C_SUGB	1.265
Live plants	C_LPLT	1.259
Meat and edible offal of poultry, fresh, chilled, or frozen	C_POUM	1.243
Fibre plants	C_FIBR	1.221
Other cereals	C_OCER	1.221
Meat of sheep, goats, and equines, fresh, chilled, or frozen	C_SGMT	1.207
Barley	C_BARL	1.204
Other animals, live, and their products	C_OANM	1.198
Meat of cattle, fresh, chilled, or frozen	C_BFVL	1.177
Dairy products	C_DAIR	1.176
Rape seed	C_RAPE	1.163
Other starch and protein plants	C_STPR	1.154
Production of other wheat	C_OWHE	1.148
Products of forestry, logging and related services	C_FORE	1.093
Fodder crops	C_FODD	1.041
Prepared animal feeds	C_ANFD	1.040
Potatoes	C_POTA	0.989
Rubber and plastic products	C_PLST	0.982
Other non-metallic mineral products	C_NMMP	0.938
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	C_WOOD	0.937
Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	C_FISH	0.901

Source: Compiled by the authors

European Commission
EUR 25468 – Joint Research Centre – Institute for Prospective Technological Studies

Title: An approach to describe the agri-food and other bio-based sectors in the European Union. Focus on Spain.

Authors: M. A. Cardenete, Pierre Boulanger, M. C. Delgado, Emanuele Ferrari, Robert M'Barek.

Luxembourg: Publications Office of the European Union

2012 – 64 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series –ISSN 1831-9424

ISBN 978-92-79-25927-2

doi: 10.2791/95751

Abstract

This study stresses the capacity of a Social Accounting Matrix (SAM) with a highly disaggregated agricultural sector (AgroSAM) to provide a descriptive analysis of the agri-food and other bio-based sectors. It focuses on Spain but also performs a review for every European Union Member State to detect potential agri-food and other bio-based key sectors. It uses the software SIMSIPSAM to detect backward and forward structural linkages as well as key sectors with the aim of revealing potential growth, a key element in the design of public and private policies. Finally, it presents the Spanish employment multiplier, in order to stress which sectors are the most significant in term of job creation.

LF-NA-25468-EN-N

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Publications Office

ISBN 978-92-79-25927-2

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