The Geographical Spread and the Economic Impact of Food Harvest 2020 – A Regional Perspective

Mary Carey[1], Cathal O'Donoghue[2]

Abstract

Recently the agri-food sector has received increased attention in Ireland. The agri-food sector has been the traditional backbone of Irish exports, and despite the economic downturn Irish exports in this sector grew by an impressive 12 percent in 2011 (CSO 2012). The agri-food sector is regarded as Ireland's largest indigenous industry, the potential of the sector in terms of exports, and its heavy dependence on domestic inputs are the key reasons for the increased attention. The real economic value of the agri-food sector in Ireland is analysed at national, and most importantly for this paper, at regional level. This paper examines the impact of the agri-food sector in addressing regional disparities in Ireland. The estimation of the true value of the agri-food sector is evaluated at regional level by analysing Gross Value Added, employment levels and productivity rates for the sector expressed in percentage of regional values. Gross-Value-Added in absolute terms and as a percentage of regional Gross-Value-Added provides us with a more thorough understanding of the regional importance of certain industries within the sector. In terms of employment, the rural context of the agri-food sector is discussed, including the geographical spread of the sector. A comparison of regional productivity levels is analysed at national and regional level. In addition, this paper geographically distributes the change in output and employment if the four main sector specific Food Harvest 2020 targets are achieved. As a preliminary contour of the agri-food sector in Ireland this research will be useful to all the key players in the sector.

Keywords; *Regional Development Policy, Agri-food sector, Regional Economics*

JEL Codes; Q12 R12 R58

Introduction

The emergence of the agri-food sector as a key driver of economic recovery in post property bubble Ireland and the greater consensus on the positive contribution regional policy could make to the national economy renders regional analysis of the agri-food sector both timely and necessary. The recent surge in interest in the agri-food sector stems from new estimates by Riordan (2008) showing the greater than traditionally thought significance of the sector to the economy in terms of net inflow of funds to the Irish economy. Notwithstanding the recent proliferation of the contribution of the agri-food sector to the national economy, there has been relatively little research conducted on the regional significance of the sector. This paper aims to fill this gap in the literature.

Riordan (2008) highlights that the net foreign earnings of the biosector contributes 32 % of the total net foreign earnings of all primary and manufacturing industries, while the sector's

[1]PhD student in Public Policy, School of Economics, University College Dublin, Ireland
Email: mary.carey@ucdconnect.ie
[2] Rural Economy Research Centre, Teagasc, Athenry, Galway, Ireland

contribution to exports was half the net contribution at 16% in 2005. The main reasons for the sector's disproportionately large net contribution to earnings from exports relate to low import dependence, and low levels of profit repatriation among its processing firms. The agri-food sector is Ireland's largest indigenous industry. It is responsible for approximately 150,000 jobs and has an annual output of around €24 billion with record high exports of €9 billion in 2011 (CSO 2012). The future of the agri-food sector in the national and rural economy has many challenges and opportunities to contend with. Common Agricultural Policy (CAP) post 2013, environmental concerns and World Trade Organisation (WTO) agreements may result in a less favourable policy and market regime. While increased global demand, food security issues, and the high quality reputation offer excellent opportunities for the sector from an Irish perspective.

The importance of the sector for the Irish economy and future opportunities for growth situates the agri-food sector at the centre of the government's strategy for a smart, sustainable economy. Food Harvest 2020 (FH2020) outlines a strategy for the medium-term development of the agri-food sector for the period to 2020. The strategy presents the key actions needed to "ensure that the sector contributes to the maximum possible extent to an export-led economic recovery and the full development of the smart economy"(DAFF 2010; p.2). The targets set out in the report for 2020 at national level include an increase in the value of primary output in the sector of €1.5 billion, a €3 billion increase in value-added of the sector, an export target of €12 billion, and sector specific targets. The four main sector specific targets set in FH 2020 are as follows: (i) 50% increase in the volume of milk production; (ii) 20% increase in cattle output value; (iii) 20% increase in sheep/lamb output value; and (iv) 50% increase in pig output value. Research conducted by Miller *et al* (2012) estimated the economic impact of achieving the four main targets in FH2020 on employment in Ireland. To estimate the impact of such a policy reform and other policy reforms, affecting agriculture, the continued development of economic models is required.

The portfolio of quantitative economic models used to analyse the Irish agricultural sector in the past have focused on Input-Output (I-O) tables. Input-output techniques compute direct impacts, indirect impacts and induced impacts as the main types of assessments on investment for a broad region (not very localised). Quinlan (1961) developed a dynamic econometric model of the Irish economy focusing on the agricultural sector. While O'Connor and Breslin (1968) produced an Input-Output table with a 32 sector transactions matrix based on the agricultural sector and related industrial sectors. Ní Dhubhain et al (1994) developed a regional 16 sector I-O table to investigate the implications of increased afforestation on rural development in specific regions (Western Ireland, rural Scotland, and rural Northern Ireland).

In the past decade or so major models have been developed to analyse the wider agricultural sector. O'Connor and Matthews (2000) disaggregated the 1993 I-O tables to develop a detailed table of the agri-food sector. Disaggregation of the I-O table allows the economy-wide effects of agricultural sector developments to be estimated. Matthews *et al* (2003) went on to construct a general equilibrium model of Irish agriculture. The Irish Model of Agriculture, General Equilibrium (IMAGE) had the ability to estimate the impacts of major agricultural policy reforms and other policy reforms affecting agriculture, and the food industry at a macro level. Whereas the Simulation Model for the Irish Local Economy (SMILE) focuses on a micro level impact and analysis. SMILE is a spatial analytical structure developed by Teagasc's Rural Economy Research Centre in collaboration with researchers in the National University of Ireland, Galway and University of Leeds. The objective of the research programme is to develop a modelling and data infrastructure to aid

in the analysis of Rural, Agricultural and Environmental Policies in Ireland. Spatial Microsimulation has been conducted in Ireland using the SMILE model to examine a variety of policy questions including; The Spatial Distribution of Family Farm Income (O'Donoghue et al. 2009), Higher Education Participation in Rural Ireland (Flannery et al. 2009), Recreational Pursuits in Rural Areas (Hynes et al. 2009), and Habitat Conservation (Cullinan et al. 2008). Much of the research conducted under SMILE has focused on individuals and farms to date. Firm level is the next step in completing the simulation model.

Within the models mentioned the regional element of the analysis has been inadequate or underutilised. Regional analysis was not incorporated into any model with the exception of Ní Dhubhain et al (1994). Regional disaggregation was mentioned as part of the IMAGE model but unfortunately was not conducted. Several challenges exist with performing analysis at regional level. As MacFeely *et al* (2011; p.6) highlight there has been insufficient regional analysis stemming from the "sub-standard and dysfunctional" infrastructure supporting the production of regional statistics in Ireland. However, acknowledgement of the problem is a step in the right direction.

In recent years there has been a resurgence in regional analysis in Ireland. MacFeely et al (2011) makes a significant impact on the ability to perform regional analysis using a comprehensive Supply and Use Tables (SUT) and domestic I-O tables which they compiled for the NUTS[3] 2 regions (the Border, Midlands, & Western region (BMW) and the Southern & Eastern region (S&E)). The regional SUT and I-O tables' purpose is to "contribute to the understanding of the complex relationships that exist between the regions in Ireland". Inter-regional trade flow data for products and industries (Agricultural, Forestry, & Fishing is one such industry) are estimated at NUTS 2 level (MacFeely et al 2011; p.1). Unfortunately, the significant failure of such rigorous analysis was the level of disaggregation. NUTS 3 level analysis, despite the difficulty in estimation, would have contributed much greater understanding to the relationships between the regions.

Walsh (2006) made another significant contribution to regional analysis in Ireland by examining the evolution of key labour market characteristics by region. However, specific sectors and their respective impact were not considered. Morgenrath (2008) also analysed the economic geography of Ireland by identifying the spatial distribution of sectoral employment. An analysis of job density in the agricultural, forestry and the food and drinks sectors is conducted with varying results for each. Unsurprisingly the job density associated with agriculture and forestry appears very widely dispersed. The food and drink sector job density is heavily affected by the location of certain manufacturing plants. Morgenrath (2008) provides a thorough analysis of job density by sector but fails to take any measure of output into account. O'Leary (1999 and 2002) on the other hand performed some interesting analysis on regional GNP divergence (and the causes) during the Celtic Tiger years based on three sectors; agriculture, manufacturing, and services. Estimating the scale of the divergence was the focus of O'Leary's GVA analysis as opposed to the significance of a particular sector's GVA to the respective region.

Despite the difficulties in estimating the impact of the agri-food sector at regional level it is imperative that such analysis is conducted. In addition to the agri-food sector's economic impact, the sector contributes enormously to the development of rural Ireland. The geographical spread of the agri-food sector should be highly significant in any assessment of

[3] The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU.

the sector's future potential, as it plays a particularly important role in the future development of an economically viable, socially inclusive and environmentally sustainable rural Ireland. Impact at national level has been estimated, trade flows at NUTS 2 level have been analysed, spatial distribution based on employment by sector have been conducted. However, Gross Value Added data by region have not been analysed, nor have employment figures been analysed in particular at NUTS 3 level for the agri-food sector. This paper aims to fill this gap in the research. This paper will also show the significance of the agri-food sector to each of the perspective regions and thus national spatial distribution. In addition, following from Miller et al (2012) analysis, the regional distribution of the economic impact of achieving the four main FH2020 targets can be estimated.

This paper is structured as follows; Section 2 provides an introduction to regional policy in Ireland and an overview of divergence between the regions. Section 3 provides an outline of the data used in this paper and the methodology adopted to estimate the regional distribution. Section 4 provides an analysis of Gross Value Added, employment, and productivity to give an understanding of the economic impact of the sector from a regional perspective. Section 5 estimates a spatial multiplier analysis based on applying the regional distribution to the national FH2020 multiplier results. Finally, section 6 contains concluding remarks focusing on the current policy dilemma facing policy makers.

Regional Policy in Ireland

The origins of regional economic policy in Ireland date back to 1952 with the Underdeveloped Areas Act which provided for employment grants for manufacturing industries in designated counties of the west of Ireland. The Act was introduced to attempt to halt mass emigration from these areas (O'Farrell, 1970; NESC Report No. 4, 1975). In the late 1950's two key regional developments occurred; the establishment of Gaeltarrá Éireann[4] by the Gaeltacht Industries Act 1957 and the establishment of the Shannon Free Zone by the Shannon Free Airport Development Company Limited Act 1959[5]. Both ÚnaG and Shannon Development have played a key role in demonstrating regional autonomy and transferring resources to less prosperous regions in Ireland. The Buchanan Report of 1968 was a crucial step in the development of regionalisation in Ireland. The mention of growth centres in this report led to the establishment of the Regional Development Organisations (RDOs) in 1968/69. The RDOs were given a co-ordination, and advisory role in relation to regional planning, development and investment priorities. Unfortunately, the RDOs existence was short lived and they were abolished in 1987 due budgetary constraints (cited by McAleer (2007) in Moylan (2011)). The Industrial Development Authority (IDA) also developed Regional Industrial Plans from 1973-1977 as a response to the formal statutory regional remit it received in 1969. Leading from the developments of the 1960s the Government formally issued a statement on regional policy in May 1972 (Stone 1999).
Despite the fact that the 1972 statement set out a regional strategy for the subsequent 20 years, the majority of the priorities made were abandoned in the 1980s due to high unemployment, budget constraints, and political instability. The regionalisation debate returned in the late 1980s with the reform of the European Structural and Cohesion Funds. As

[4] Gaeltarra Éireann (1957-1979) is the predecessor of Údarás na Gaeltachta. ÚnaG was established in 1980 under the Údarás na Gaeltachta Act 1979. ÚnaG is the regional development authority funded by the Government to promote the economic, social and cultural development of the Gaeltacht with the overall objective of maintaining Irish as the main communal language of the region.
[5] The regional development body with responsibility for the Shannon Free Zone is known as Shannon Development. In recent years the enterprise support remit has been transferred to national agencies and a separate development strategy is being developed focusing on the Aviation Sector.

a consequence of such reforms and the associated Irish National Development Plans (NDPs) a permanent regional structure of administration and planning was established in Ireland. The Barrington Report (Advisory Expert Committee 1991) recommended a new three-tier system of local governance (regional, county, sub-county). Eight regional authorities were established in January 1994, with responsibility for strategic planning and co-ordination of public services for the regions, and most importantly a role in monitoring and evaluation of E.U. Structural and Cohesion funded programmes (Laffan 2004). The authorities were based on counties in the Border, West, Midland, Dublin, Mid-East, Mid-West, South-East, and South-West regions and were assigned NUTS 3 level status.

Map 1: Republic of Ireland at NUTS 3 level

As a result of the impressive growth and the development of the Irish Economy throughout the 1990s, by 1999 Ireland as a whole no longer qualified for Objective 1 EU funding. In response to this, the division of the country into two regions in the same year – Border, Midland, West (BMW) region and the Southern and Eastern (SE) region – allowed the BMW region to retain the financial advantage of objective 1 status (Moylan 2011). A regional assembly was established for each of the two regions in order to execute Regional Operational Programmes. The regional assembles have exerted limited influence due to lack of devolution of responsibility and power from central government (Morgenroth 2000). The regional assemblies and the regional authorities most active role was in public policy formation through submissions on investment priorities and development needs for each region as part of the National Development Plan (NDP) 2000-2006 (O'Leary 2003b).

In addition to the NDP 2000-2006 another strategic framework was in operation at the time; the National Spatial Strategy (NSS) 2002-2020. The blueprint for balanced regional development was drawn up by the Department of Environment and Local Government and states "Balanced regional development requires that the full potential of each region to

contribute to the overall performance of the state be developed" (DEHLG 2002:10). Enhancing the "potential" of regions as opposed to reducing disparities was a key purpose of the blueprint. Several challenges and criticisms have been associated with the NDP 2000-2006, and the NSS 2002-2020 from the outset; difficulties in evaluating (Fitzgerald et al 2003), absence of understanding in underlying economic principles (Morgenroth 2003a), inaccurate projections, lack of coherence, inadequate political will and institutional commitment (Moylan 2011) in particular. Furthermore the NDP as a basis for investment priorities determination for E.U. funds was segregated in 2007. This separation renders any evaluation of the NDP in terms of regional policy objectives more difficult due to the lack of measurable targets (Moylan 2011).

The effective implementation of regional policy and the impact of regional policy in terms of achieving regional convergence are often discussed in terms of key indicators. Morrissey (2011) updated a number of key characteristics used by O'Leary (2002) and Walsh (2006) focusing on the size and associated economic development of the respective regions. Table 1 below provides an updated version of similar key indicators of regional performance. According to Morrissey (2011) there was a significant gap of 75.4% between the region with the highest GVA, Dublin, and the region with the lowest GVA, Midlands. This gap has not only persisted but according to an index of per capita GVA the gap has increased to 79.4%. The substantial GVA per capita gap alone does not point to regional disparities; commuting patterns by households, and transfer pricing by multinational firms often create biased estimates of output variables (Morgenroth 2008). Such analysis should also consider demographic, labour market, and income statistics in order to get a broader understanding of the indicators associated with regional disparities. Table 1 examines disparities using income per capita as an indicator. According to Morrissey (2011) the income per capita gap between the most prosperous region, Dublin, and the least prosperous region, the Midlands, was 20.5%[6] in 2007. The gap between the richest region, again Dublin, and the poorest region, the Border, increased to 28.7%. A considerable jump as a result of Dublin's income per capita rising while the income per capita in the Border and in the Midland regions declined. In terms of demographics, an imbalance is also evident with almost one-third of the population living in the Dublin region. When the Mid-East region is included the percentage increases to almost 40%. For a geographically small area this is a significant proportion of the population. Based on this we would expect labour statistics to follow the same trend. Statistics related to persons at work are broadly in line with the percentage of population in each respective region.

It is interesting to consider that on all counts the Dublin region appears as the most prosperous region, while the Midland regions appears as the poorest region with the exception of income per capita where the Border region is marginally lower by less than 1%. Although the gap between the richest and the poorest regions varies depending on the indicator used, the Dublin and South-East region continually outperform the Border, Midland, and West region. The results presented are closely related to the findings of Morrissey (2011), O'Leary (2003), and Walsh (2006). Table 1 above demonstrates that regional inequalities exist in the Irish economy. The limited impact of regional policy in Ireland is evident in the considerable divergence in the national economy. However, the following analysis will examine the impact of the agri-food sector at the regional level and consider the role the sector plays in reducing regional disparities.

[6] The figure estimated by Morrissey (2011) was 10.5%. However, further analysis of the associated table this figure is an error with 20.5% being the correct figure.

Table 1: Key characteristics of the NUTS 3 regions

	Population	Persons at work (000)	GVA (%)	Population (%)	Persons at work (%)	Indices of GVA per capita 2008	Indices of Income per person 2008
Border	481	221	7.7	11.1	10.5	70.4	87.3
Midland	260	123	3.9	6	5.8	65.9	88.1
West	419	201	6.8	9.7	9.5	72	90.6
BMW	1,616	545	18.5	26.8	25.8	69.9	88.7
Dublin	1,210	616	39.7	27.9	29.1	145.3	116
Mid-East	497	251	9	11.4	11.9	76.8	103.1
Mid-West	365	174	7.2	8.4	8.2	83.8	96.4
South-East	474	223	8.2	10.9	10.6	74.6	93.5
South West	632	305	17.4	14.6	14.4	116.8	95
Southern and Eastern	3,178	1,569	81.5	73.2	74.2	111	104.1
State	**4,339**	**2,114**	**100**	**100**	**100**	**100**	**100**

Source: Quarterly National Household Survey, 2008, National Accounts, 2008, CSO

Methodology

Access to the data for this analysis was obtained with help from the Central Statistics Office.[7] The scope of the analysis will be on industries depicting the broadly defined agri-food sector. The data is aggregated into industry groups defined by the NACE[8] classification system which is used throughout Europe. The NACE code groupings of significance for this analysis include;

NACE code Industry Grouping

A1	Agriculture (Crop and animal production, hunting and related service activities)
A2	Forestry and logging
A3	Fishing
C10	Food (Manufacture of food products)
C11	Beverages (Manufacture of beverages)

Data sources used include the Census of Industrial Production (CIP), County Incomes and Regional Accounts, the Quarterly National Household Survey, and the national accounts (NIE). Gross Value Added at basis prices data was obtained from the Regional and County Accounts. The data was available for the three broad sectors of activity, agriculture, forestry, and fishing. Gross Value Added for food and beverages was obtained by focusing on processed food data (manufacturing of food and beverages). The employment data was

[7] The authors would like to acknowledge the assistance provided by Brian McCann, Sabrina Bowen, and Kevin Phelan from the CSO. All findings are those of the authors only and do not reflect the views of the Central Statistics Office, or any other institution. Any errors found are solely those of my own.

[8] Nomenclature générale des activités économiques dans les communautés européennes (NACE) represents the General Industrial Classification of Economic Activity within the European Community.

sourced from the Quarterly National Household Survey was straight forward in the sense the groupings were based on NACE coding. The main issue with the employment data by region was reliability of the estimates established by the CSO. When estimates for number of persons or averages were less than 30,000 persons in a specific sector estimates were not produced as estimates are too small to be considered reliable. Where 30,000 to 49,000 persons were estimated to work in a specific region, estimates are considered to have a wider margin of error and should be treated with caution.

In terms of the methodology adopted to estimate the impact of the agri-food sector by region a distributional analysis was conducted. The distributional analysis includes the estimated disaggregated percentage data in terms of national agri-food and regional significance. In addition, a spatial multiplier was estimated based on Miller et al (2011; 2012) findings by applying the disaggregated regional percentage data results to the overall impact of FH2020 (output and employment figures). The national output figures were derived from Miller et al (2011), while the possible national employment figures were derived from Miller et al (2012). The following paragraphs will offer a summary of the methodological approach and results estimated in Miller et al (2011; 2012).

Miller et al (2011) uses a 2005 Agri-Food Social Accounting Matrix (SAM) for Ireland and a multiplier analysis to estimate the total final demand shock across all sectors.[9] The AgriFood SAM has 12 primary agricultural sectors and 10 food processing sectors, along with an additional 53 sectors across manufacturing and services. In such a SAM multiplier model the exogenous (shock) variable is the final demand. The change in output is translated via the final demand in the relevant processing sector based on the assumption that all additional primary production is processed. The below table summarizes the results for each of the FH2020 targets. For example, a 9% increase in cattle output (€250m in value) requires a final demand shock of €442 million in beef processing, which in turn leads to a €1,239 million increase in output across all sectors in the economy.

Table 2: Final Demand Shock and multiplier analysis implemented in Miller et al (2012)

FH2020 Target	Final Demand Shock	Resulting change in total demand across all sectors
50% increase in milk output	€1,369m in dairy processing	€2,506m
9% increase in cattle output	€442m in beef processing	€1,239m
7% decrease in sheep output	- €39m in sheep processing	- €71m
30% increase in pig output	€374m in pigs processing	€630m

Miller et al (2012) estimated the employment multiplier, as a result of the change in output, based on scenario analysis. Three scenarios were simulated. The first scenario used employment intensities for 2008 for all 22 agri-food sectors, and 2005 employment intensities for the remaining sectors; the second scenario assumed no employment increase in agriculture in response to increased farm output; and the third scenario as an intermediate scenario between the first two. For example, using the three different employment intensity scenarios it was found that a minimum of 18,989 jobs, a maximum of 38,430 jobs and an intermediate numbers of 24,719 jobs will be created in the economy as a result of achieving the four main volume targets in the FH2020. This paper offers, in addition to the descriptive analysis, a better understanding as to how the increased output and the resulting employment figures of FH2020 might be geographically distributed. The purpose of the paper is to

[9] The limitations of SAM multiplier analysis are outlined in Miller et al (2011).

measure the impact of the agri-food sector in the respective regions representing the structure of the economy in a way that is consistent with the National Accounts.

Regional Distribution

This paper examines the role that the agri-food plays in regional economic activity in terms of Gross Value Added (GVA), employment, and productivity. Considering the current policy focus of the sector and the evolving role of the sector in the economic recovery (DAFF 2010) this analysis provides an initial step in developing an inter-regional economic analysis of the agri-food sector in Ireland. As indicated in Section 1, regional analysis of the agri-food sector has been inadequate stemming from the difficulties in measuring such a diverse sector at such a disaggregated level. However, combining data from several surveys undertaken by the CSO has overcome these empirical difficulties. The base year used in the analysis is 2008, unless otherwise stated. 2008 is chosen given data availability issues, and the accuracy of unbiased data in terms of regional significance prior to the drastic fall in agricultural prices and output in 2009, and the unprecedented growth levels experienced in the past number of years.

4.1 Gross Value Added

Gross Value added (GVA) is the value created by any unit engaged in an economic activity involving production. GVA refers to a sector's turnover (basic prices) minus intermediate consumption; the sector's output less the inputs used in production. GVA at basic prices is a measure of the value of the goods and services produced in a region priced at the value which the producers received excluding taxes and subsidies receivable on the products. GVA is preferable to other measures of output, such as Gross Domestic Product (GDP), at the regional level because it removes the danger of double counting as GVA excludes taxes or subsidies on products that are difficult to attribute at local level. The significance of transfer pricing and profit repatriation of foreign multinationals in Ireland is often cited as a cause for concern when dealing with GVA (O'Leary 2002). However, for this analysis the potential bias is reduced due to the largely indigenous basis for the agri-food sector.

Table 3: Regional Gross Value Added Analysis

	GVA (€m)	GVA (%)	Regional Agri-Food GVA as a % of Total Agri-Food GVA	Regional Agri-Food GVA as a % of Regional GVA
Border	12886	7.7	20.4	13.7
Midlands	6491	3.9	4.3	5.8
West	11413	6.8	12.3	9.3
BMW	30790	18.5	37.0	10.4
Dublin	64095	39.7	19.0	2.6
Mid-East	14495	9	8.5	5.1
Mid-West	11415	7.2	4.3	3.3
South-East	13250	8.2	11.6	7.6
South-West	26237	17.4	19.5	6.4
SE	129492	81.5	63.0	4.2
State	**160282**	**100**	**100.0**	**5.4**

This section investigates the contribution of the agri-food sector to each region in terms of GVA. Table 3 above presents the relevant data of interest. It is possible to see from Table 3 the regions that derive the largest proportion of agri-food based GVA; Border (20.4%),

Dublin (19%), and the South-West (19.5%), respectively. Dublin and the South-West also have the largest share of national GVA. However, the significance of the agri-food sector can be seen in the considerably lower ranking for the Border region in terms of national GVA. The significance of the agri-food sector in the Border region is reinforced when the relative share of agri-food GVA as a percentage of regional GVA is examined, with the highest percentage (13.7%). The Midlands and the Mid-West jointly have the lowest percentage of national GVA, €374 million (4.3%). However, when the percentage of agri-food GVA as a percentage of regional GVA is examined the geographical significance is evident. From Table 3, the Border (13.7%), as stated, and the West (9.3%) derive the greatest relative share of regional agri-food GVA as a percentage of regional GVA, while Dublin derives the lowest. Further disaggregation of the data will allow a better understanding of this relationship.

GVA data can be segregated into processed food (manufacturing of food and beverages) and unprocessed food (Agriculture, Forestry, & Fishing). The data findings are presented in Table 4. Firstly, looking at the regions with the largest proportion of agri-food based GVA it is interesting to see these regions also boast the highest GVA for processed food; the Border (€1,428m), Dublin (€1,564m), and the South-West (€1,086m). As one can see, in most regions GVA for processed foods exceeds GVA for unprocessed food, which is in line with the national figures. The significant exception to the rule appears in the Mid-West region. Explanations for such a considerable low GVA for processed foods may stem from the limited impact of associated food processing plants in the Mid-West region in comparison to other regions. It is interesting to note that GVA in the Border region is dominated by GVA for processed foods. Possible explanations include the activity of significant fishing ports and the location of influential plants in the Border region. As expected, given the urban setting, the Dublin region has the lowest GVA for unprocessed agricultural produce, while the South-West and South-East receives the highest proportion of unprocessed GVA. The geographical profile of Ireland dictates the better quality agricultural land has a considerable impact in this regard. Thus, the gap in agri-food GVA between regions is attributable to the impact of food processing plants in the Border, Dublin, and South-West compared to other regions in Ireland.

Table 4: Breakdown of Agri-Food GVA

	Regional GVA Agri, Forestry, Fishing (€m)	Regional GVA Manufacturing of Food & Beverages (€m)	Regional GVA Agri-Food (€m)
Border	332	1,428	1,760
Midland	172	202	374
West	274	786	1,060
BMW	777	2416	3,193
Dublin	80	1564	1,644
Mid-East	241	497	738
Mid-West	274	99	373
South-East	516	486	1,002
South-West	602	1086	1,688
SE	1713	3732	5,445
State	**2490**	**6148**	**8,638**

4.2 Employment data

This section examines the significance of the agri-food sector in terms of regional labour market share. The analysis includes the use of data from the Quarterly National Household

Survey based on the NACE code groupings. The data findings are presented in table 5 below. According to the data in Table 5 the South-East (17.5%), South-West (17%), and the Border (15.2%) have the highest regional share of national employment in the sector. The lowest share on the other hand is Dublin (5.8%) and the Midlands (8.3%). The figures for Dublin would appear surprising given the significance of Dublin from the output indicator presented in Table 3. However, the low relative share of Dublin based agri-food employment is impacted by the size of Dublin's employment market. Analysing the regional employment levels for the sector as a percentage of regional employment, this relationship continues with Dublin receiving the lowest percentage (1.5%). The South-East (12.4%) and the Border (11.2%) rank high in terms of regional employment. However, the geographical significance of the sector is evident when regional employment levels are examined. This indicator demonstrates the significance of agri-food based employment for the Border, Midland, and West regions, with over 10% for each of the respective regions.

To understand the geographical spread of agri-food based employment further analysis is presented below in Table 6. Agriculture (NACE 01 Crop and animal production, hunting and related service activities) and by the Manufacture of Food Products (NACE 10) dominate employment in the agri-food sector. In seven regions agriculture employment is higher than employment in the manufacture of food products. The significant exception is the Dublin region where employment in the agri-food sector almost entirely stems from the manufacture of food products (94%). Employment in the West region on the other hand is dominated by the agricultural based employment (89%). Of the other six regions, agricultural based employment almost doubles employment in the manufacture of food products. Regional disparities appear much less as the employment figures for the six respective regions are broadly in line with the other regions in this six. Regional disparities do not seem as significant for the employment levels, as they did for the output indicator considered in Table 3. It is interesting to consider the analysis from a NUTS 2 perspective; the less well-off Border, Midlands, & West (BMW), (in terms of qualifying for European Union funds) is dominated by the agriculture as opposed to manufacture food products' employment. This relationship is not as strong in the Southern & Eastern (S&E). Urbanisation and the location of food producing plants appear to have an impact here.

Table 5: Regional Employment Analysis

	Total Employment ('000s)	Employment %	Regional Agri-Food Employment as a % of National Agri-Food Employment	Regional Agri-Food Employment as a % of Regional Employment
Border	216	10.3	15.2	11.2
Midland	120	5.7	8.3	10.9
West	202	9.6	13.3	10.4
BMW	538	25.6	36.8	10.8
Dublin	612	29.1	5.8	1.5
Mid-East	252	12.0	12.6	7.9
Mid-West	170	8.1	10.3	9.6
South-East	224	10.7	17.5	12.4
South-West	304	14.5	17.0	8.8
SE	1561	74.4	63.2	6.4
State	2100	100.0	100.0	8.0

Table 6: Breakdown of Agri-Food Employment by Region

NACE Economic Sector	01 Agriculture ('000)	01 Agriculture based employment as a % of regional agri-food employment	10 Manufacture of Food Products ('000)	10 Manufacture of Food Products employment as a % of regional agri-food employment
Border	16.0	66.2	8.2	33.8
Midland	9.4	72.1	3.7	27.9
West	18.7	89.1	2.3	10.9
BMW	44.1	75.8	14.1	24.2
Dublin	0.5	6.1	8.1	93.9
Mid East	14.5	72.7	5.4	27.3
Mid West	12.1	74.6	4.1	25.4
South East	19.9	71.6	7.9	28.4
South West	19.5	72.6	7.4	27.4
SE	66.4	66.9	32.9	33.1
Total	110.5	70.2	47.0	29.8

4.3 Productivity

Productivity can be defined as 'a ratio of a volume measure of output to a volume measure of input use' (OECD 2001). Labour productivity will be used to measure productivity at regional and sectoral level. Labour productivity provides a better indicator than GVA per capita due to the elimination of potential regional demographic differences or cross-regional commuting (significant for Dublin and the Mid-East). GVA per person employed is not without problems; the breakdown by sector may differ between regions, different working patterns (i.e mix of part-time and full-time workers) are not considered. Nor is the issue of regional deflators for GVA considered, rendering growth rate calculation impossible. The relation of sectoral GVA to employment is first analysed at national and then regional level. Regional data is analysed to capture the levels of productivity in the agri-food sector at regional level. The last section of the productivity analysis takes a look at how the sector compares to overall regional productivity levels.

Table 7: Regional Productivity Analysis

	Regional Productivity (€)	Regional Agri-Food Productivity (€)	Difference (€)
Border	59713	73029	-13316
Midland	54047	28604	25442
West	56409	50416	5993
BMW	57207	54863	2344
Dublin	104752	178211	-73460
Mid-East	57434	37085	20349
Mid-West	67236	22989	44247
South-East	59244	36141	23104
South-West	86370	62926	23443
SE	82931	54505	28426
State	76337	54636	21701

Table 8: Breakdown of Agri-Food Productivity by region

	Regional Agricultural Productivity	Regional Manufacture of Food Products Productivity	Regional Agri-Food Productivity
Border	20750	174146	73029
Midland	18298	54595	28604
West	14652	341739	50416
BMW	17619	171348	54863
Dublin	160000	193086	178211
Mid East	16621	92037	37085
Mid West	22645	24146	22989
South East	25930	61519	36141
South West	30872	146757	62926
SE	25798	113435	54505
Total	22534	130809	54636

Labour productivity is estimated by dividing GVA data by employment data for each respective region. Table 7 above, provides the relevant data. At national level, the productivity rate in the agri-food sector (€54,636) is less than the overall national rate (€76,337). In addition, the difference between the national and agri-food rate of productivity (+€21,701) is broadly in line with the differential observed across several of the regions. Table 6 also contains the data for a comparison of regional agri-food productivity to overall regional productivity. Productivity in the regional agri-food based sector is higher than overall regional productivity in six of the regions; Midlands (+€25,442), West (+€5,993), Mid-East (+€20,349), Mid-West (+€44,247), South-East (+€23,104), South-West (+€23,443). The West and the Mid-West regions sway the furthest from the national differential. One can see that there were two regions with higher regional agri-food productivity than the overall regional rate; Border (-€13,316) and Dublin (-€73,460). Dublin also has the highest levels of agri-food productivity, as well as the highest overall regional productivity.

Table 8 presents a breakdown of the regional productivity rate into agriculture (unprocessed) and the manufacture of food products (processed) to further the understanding of agri-food productivity rates. Examining the breakdown, it is possible to see that productivity is highest in the manufacture of food products across all regions. The West, Border, and Dublin regions have considerably significant productivity rates for manufacturing of food products. The poor productivity levels associated with the agricultural (unprocessed) sector are consistent with national level analysis conducted in the past, for example Matthews *et al* (2007). In addition, the low productivity rates associated with the primary agricultural sector is heavily impacted by the labour intensive nature of the sector and the low value added in agriculture.

The regional distribution, estimated above for output (GVA) and employment, can be applied to the national multiplier figures for changes in output (Miller et al 2011) and the resulting impact of employment figures (Miller et al 2012) resulting in a preliminary spatial multiplier analysis of FH2020 targets.

Regional Distribution of Food Harvest 2020 impacts

5.1 Output Multiplier Analysis

Estimating the preliminary spatial output multiplier as a result of FH2020 targets being met can be achieved by applying the regional distribution of agri-food based GVA estimated as a percentage of overall GVA in the sector, outlined in table 3, to the national output figures. Miller et al (2011) estimated the final demand shock for each of the four main targets. Taking the sum total of each respective target allows the change in output resulting from each target to be spatially distributed by region. For example, as stated, a 9% increase in cattle output (€250m in value) requires a final demand shock of €442 million in beef processing, which in turn leads to a €1,239 million increase in output across all sectors in the economy. The spatial distribution estimates the border region stands to see a substantial increase in output across all sectors of €252 million. It is interesting to consider the geographical spread of the increased output as a result of achieving FH2020 targets from a regional policy perspective. The Border, Dublin, and South-West regions, the regions geographically furthest apart, receive the largest proportion of increased output (in excess of €800m). However, the Midlands, and the Mid-West are a cause of concern receiving a relatively low increase in output. Should FH2020 targets be redirected to promote rural areas?

Table 9: Output effect of the FH2020 targets by region

		Change in Output (€m) by region				
	Regional Agri-Food GVA as a % of Total Agri-Food GVA	50% increase in milk output volume	9% increase in cattle output volume	7% decrease in sheep output volume	30% increase in pigs output volume	FH2020 by region
Border	20.4	511	252	-14	128	877
Midland	4.3	109	54	-3	27	186
West	12.3	308	152	-9	77	528
Border, Midland and Western	37.0	926	458	-26	233	1591
Dublin	19.0	477	236	-14	120	819
Mid-East	8.5	214	106	-6	54	368
Mid-West	4.3	108	54	-3	27	186
South-East	11.6	291	144	-8	73	499
South-West	19.5	490	242	-14	123	841
Southern and Eastern	63.0	1580	781	-45	397	2713
State	100.0	2506	1239	-71	630	4304

From a NUTS 2 perspective, access to EU structural and cohesion is initiated at NUTS 2 level, the Southern and Eastern regions stands to benefit from two-thirds of the increased output. The dominance of the SE region, in terms of the output indicator, is a cause for concern given the traditional view of agriculture being predominantly rural and west of Ireland based.

5.2 Employment Multiplier Analysis by region

Miller et al (2012) estimated the national job creation potential of FH2020 from the final demand shock for each of the four main targets by analysing three alternative scenarios. The total employment change for each respective scenario gives the national employment figures possible due to the achievement of the four main FH2020 targets. A spatial distribution of the change in employment can be estimated by applying the regional distribution of agri-food based employment estimated as a percentage of overall employment in the sector, outlined in table 5, to the national employment figures. Scenario 3 can be expressed as the most realistic scenario, as an intermediate scenario between the other two scenarios, with a total employment change of almost 25,000 jobs.

Table 10: Employment effect of the FH2020 targets by region

		Total Employment Change by region		
	Regional Agri-Food Employment as a % of Total Agri-Food Employment	Scenario 1	Scenario 2	Scenario 3
Border	15.2	5859	2895	3769
Midland	8.3	3178	1570	2045
West	13.3	5111	2525	3288
BMW	36.8	14148	6991	9101
Dublin	5.8	2243	1108	1443
Mid-East	12.6	4838	2390	3112
Mid-West	10.3	3944	1949	2537
South-East	17.5	6740	3330	4335
South-West	17.0	6521	3222	4195
SE	63.2	24285	11999	15621
Total Persons	100.0	38433	18990	24722

As can be seen from table 10 the spatial distribution estimates the South-East region stands to experience a substantial increase in agri-food based employment as a consequence of achieving FH2020 targets. Using the three different employment intensity scenarios it is found that a minimum of 3,330 jobs, a maximum of 6,740 jobs and an intermediate of number of 4,335 jobs will be created in the South-East economy as a result of achieving the four main FH2020 targets. From a regional perspective, the spatial distribution of employment suggests the more rural regions stand to do marginally better from FH2020 than estimated by the output indicator. The Border, Midlands, and West all see substantial increases in employment. While the Dublin region stands to experience a relatively small increase. The geographical spread of the increased employment as a result of achieving FH2020 targets suggests such a policy initiative in the agri-food sector could have a significant impact on rural Ireland while simultaneously adding to the national economy.

Conclusion – Implications for Regional Development

Promoting balanced regional development has been a long-term policy objective at least since the Underdeveloped Areas Act of 1952. However, the past sixty years have seen varying debates on regional policy in Ireland. The 1980s were seen as a decade with subdued regional policy debate due to national performance receiving the majority of attention. With the

current crisis, and return of high unemployment rates, has the balanced growth target been lost to national performance once again?

Addressing the problem of regional imbalance without compromising national growth and competitiveness has often been the dilemma for policy-makers. In the past redistributional measures were used to correct regional imbalances, thus undermining regional and national competiveness. The agri-food sector was no exception to this tradition. In fact the agricultural sector in particular has been a significant beneficiary of subsidies, in particular at EU level. Ireland has benefited via the Common Agricultural Policy (CAP) receiving nearly €44 billion between 1973 and 2008 (Europa 2009). CAP has enhanced farmers' incomes, and transformed the living standards of small farmers in rural communities. Investment from the EU Structural Funds has allowed farmers to diversify, increase productivity, and facilitate environmental and safety measures. The CAP post 2013 will experience a period of significant reform including changes to; the single farm payment, milk quotas, budget allocation. While these reforms offer challenges for Irish agriculture and food industries, they also offer significant opportunities if the potential of the sector in Ireland can be realised.

The recent resurgence in interest in the agri-food sector in Ireland stemmed from positive market performance of agricultural commodities since 2010. Despite an economic recession gripping the world economy, agri-food sector export output increased by 12% in 2011, and the performance for 2012 have also been positive to date. This demonstrates the sector is market driven and has the ability to compete on a global scale. When we take the contribution of the sector in terms of net foreign earnings into consideration the potential for the sector to lead Ireland's economic recovery becomes even more pronounced. The agri-food sector has the potential to significantly contribute to the revival of the Irish economy and in doing so can help to support and enhance national finances.

The implementation of regional policy in a financial constrained state needs to be effective. However, the role of the agri-food sector as a geographically spread sector with a recent pronounced role in national growth levels offers a significant contribution option to the traditional regional policy dilemma. This analysis contributes to the understanding of the impact of the agri-food sector in Ireland at regional level. Policy can be developed to focus on enhancing the GVA potential in the significant regions, the Border (13.7%), and the West (9.3%). The employment indicator provides similar results to regional output, with agri-food based employment showing a considerable significance in the BMW regions. In terms of productivity, only two of the NUTS 3 regions had higher agri-food productivity than the overall regional rate. In addition, the spatial multiplier analysis provides a preliminary estimate of the spatial location of employment and output impact resulting from FH2020.

This paper demonstrates the impact the sector makes on the regional economy, while it also directs policy makers to regions of significance and to regions with future growth potential. The significance or otherwise of certain regions, in particular the border region, appears to be heavily impacted by the location of food processing plants. Unfortunately, enterprise analysis was not possible due to data constraints. In addition, further analysis is required to enhance the understanding of Gross Value Added, and the inter-linkages between agri-food businesses in Ireland at the local level. Further analysis of the agri-food sector at the more local level would provide a compelling contribution to the quantitative economic models available in Ireland to analyse the Irish agri-food sector.

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