Global food consumption patterns of interest to the Irish seafood sector

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6th September 2019

Executive Summary

In this report food consumption patterns in Ireland and in other countries are assessed to identify eating trends occurring here and around the world and to identify important current and future markets for Irish seafood producers. Seafood competes with other food categories therefore it is important to assess overall food consumption to determine the position of seafood within the general diets of countries and regions of interest. The Food and Agriculture Organisation datasets on food supply and population and the World Bank datasets on gross domestic product for all countries and regions are assessed to identify trends. Food consumption is analysed by the categories of animal-based foods, non-milk animal-based foods, non-animal-based foods and all foods.

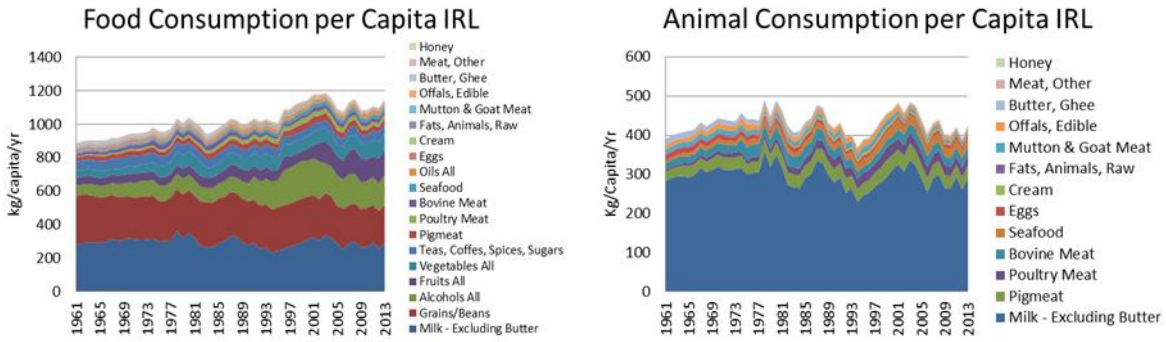

Figure i: per capita total food consumption (a) and animal food consumption (b) for Ireland 1961-2013

The typical diet in Ireland has undergone significant change since the 1960's. Milk and grain foods remain the base of food consumed but consumption of vegetables, fruits and alcohols have all risen significantly on a per capita basis. The consumption rate of animal foods excluding milk is high throughout the last 50 years peaking in the late 1990's. Pigmeat is the main food category here followed by poultry meat, bovine meat and seafood. Pigmeat has been the main non-milk animal food consumed in Ireland at all stages of the last 50 years however the other categories have shifted to a large extent. In the 1960's cheaper proteins were mainly consumed here such as butter/ghee, eggs, offals and mutton. By the 1980's and onwards consumption of poultry grew rapidly to become the second protein consumed in Ireland from the 2000's on.

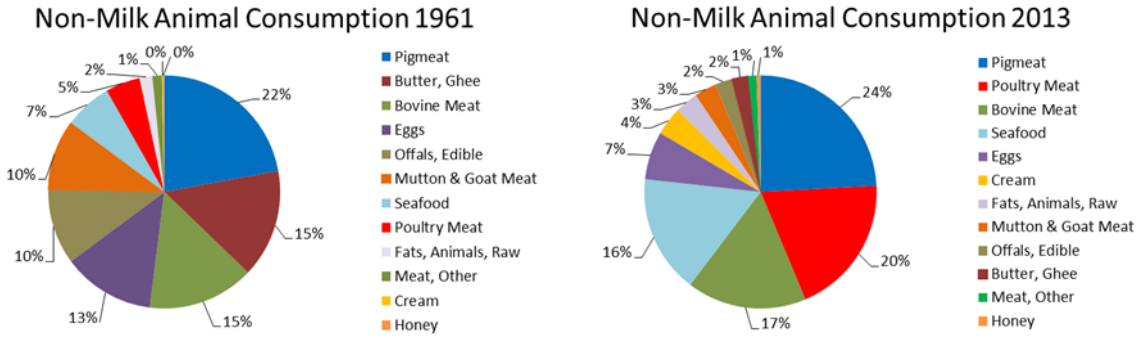

Figure ii: non-milk animal food consumption rates in Ireland for 1961 (a) and 2013 (b)

Consumption of seafood in Ireland has increased from 20,000 tonnes to 100,000 tonnes since 1961. On a per capita basis the average Irish person is estimated to consume 22kg per annum, a tripling since 1961. Seafood grew strongly throughout the Celtic Tiger years to a similar level as bovine meats in 2013 with demersal fish the main category of seafood consumed.

Average world food consumption per capita increased 25% since 1990. Ireland ranks third in the world for the quantity of food consumed per person only surpassed by Montenegro and Luxembourg. Developed countries rank the highest as expected and food consumption in China has now reached 'Western' levels, approaching 1 tonne per person per year. Animal-based food consumption has stabilised around 400kg per capita in Western countries with trends declining slightly. China now consumes around the world average of proteins, circa 200kg per capita. Ireland is in the top ten countries for animal food consumption and non-animal food consumption.

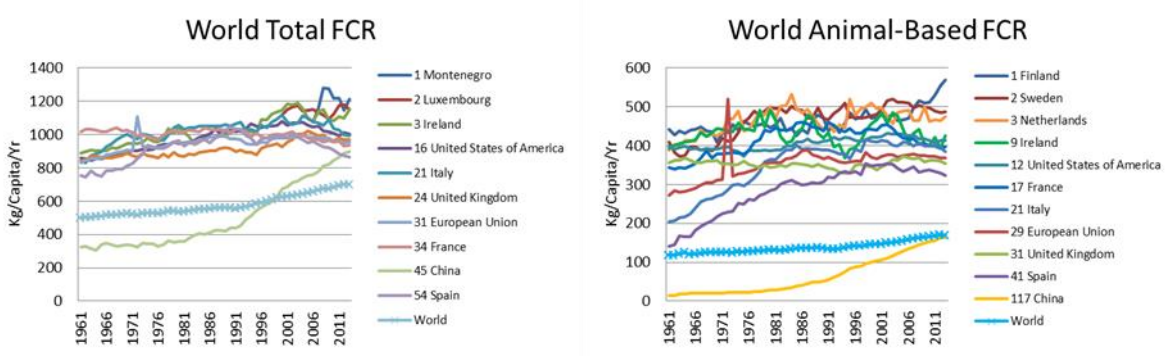

Figure iii: global food consumption rates (FCR) (a) and animal-based consumption rates (b) 1961-2013

In Western countries the main food categories are milk, grains, alcohols, fruits and vegetables. Milk products are the main category in all Western countries except for Spain, Canada and New Zealand where Grains/Beans is the main followed by milk. In East Asia grains were the main category but vegetable consumption has increased significantly. Total food consumption in China continues to grow while in Japan rates are declining and Korean rates have stabilised. In Africa grains form the majority of food consumed in the countries of Nigeria, Ghana and Cameroon.

Animal-based consumption is dominated by milk in Western countries, with milk consumption increasing in significance in the Asian and African countries analysed, especially Japan. Pigmeat is the next main category for most Western countries except for the UK, Denmark, USA, Canada, Australia and New Zealand where poultry is more popular and France where seafood is more popular. In the Asian and African countries seafood is the main animal food except for Japan.

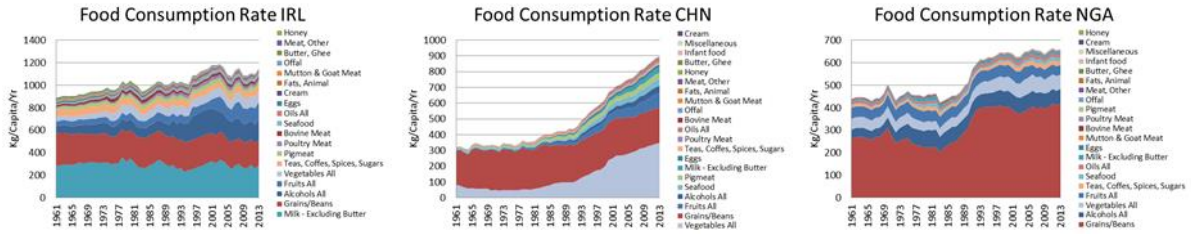

Figure iv: total food consumption rates for Ireland (a), China (b) and Nigeria (c), 1961-2013

While seafood consumption has increased in all countries over the time series growth continues in Korea, Hong Kong and China. Growth is stable or increasing slightly over the latest years in Spain, France, Italy and Ireland. Seafood consumption rates have declined in the latest years in Portugal, Japan and Ghana. Eastern Asia is the top region in the world consuming over 45kg per capita on average. In second place is South-eastern Asia with an FCR of 33kg, followed by Southern Europe (29kg), Australia and New Zealand (26kg) and Northern Europe (26kg). Seafood consumption has been increasing throughout the time series for the EU, North America, Western Europe and Western Africa. The trends for Russia and Eastern Europe are highly correlated with significant growth in both regions up until the late 1980's. Russia and Eastern Europe were the highest seafood consuming regions of the world until the fall of Communism, when consumption declined by over 50% in both regions, reaching their lowest points in 1995. Since then both regions have seen increases in consumption. Western Africa shows promising signs for continued seafood consumption in the future.

Looking to the future population growth and economic development will dictate the destination of Ireland's seafood exports. The top three most populous regions in the world are Asian namely, South Asia, East Asia and South-East Asia. These three regions account for around half of the world's population incorporating India, China and the many populous countries in this continent. Africa is by far the fastest growing continent in the world in population terms with annual growth of 2.5%. World population growth is declining over the time series driven by declining Asian growth rates with growth for Asia, Oceania and the Americas of 1% and European growth averaging 0%.

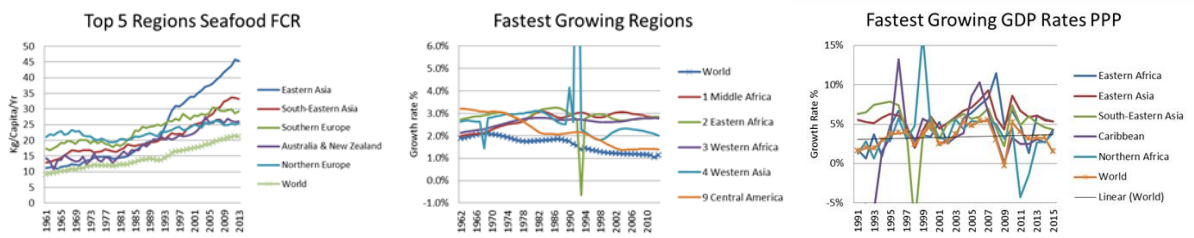

Figure v: highest seafood consumption rates 1961-2013 (a), fastest population growth regions 1962-2013 (b) and fastest growing regional economies 1990-2015 (c) on a purchasing power parity gross domestic product basis

Eastern Africa, Eastern Asia and South-Eastern Asia are highest growing economic regions of the world with GDP growth rates around 5% per annum (PPP). The Middle East regions of Northern Africa and Western Asia also show strong economic growth, albeit from a low GDP base, recovering from recession in 2011 and 2012 throughout the period of the so-called '*Arab Spring*'.

The analysis of population and economic growth by regions indicates that Eastern Asia will remain a priority growth market for the seafood sector in the medium term, with purchasing power increases inevitably leading to higher demand for seafood. South-Eastern Asia, with its current high seafood consumption and its strong economic growth will also grow in importance as an export destination. Northern Africa and Western Africa have strong economic and population growth rates while also having near average seafood consumption rates. Current Irish export markets in these regions include Nigeria, Cameroon, Ghana and Egypt and the trends indicate that these regions will increase their consumption of pelagic species pushing up average prices for the limited supply of these species and opening up opportunities for substitution with alternative pelagic species. The re-opening of the Russian market would accelerate these trends given their demand for pelagic species.

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Global food consumption patterns of interest to the Irish seafood sector

Introduction

In this report food consumption patterns in Ireland and in other countries are assessed to identify eating trends occurring here and around the world and to identify important current and future markets for Irish seafood producers. The Food and Agriculture Organisation datasets on food supply for all countries are assessed to identify these trends. The consumption of seafood in Ireland and in Ireland's main export markets will be analysed to assess the accuracy of BIM estimates of the seafood supply chain in Ireland and also to highlight growing markets to target for the Irish seafood sector. To begin this exercise food consumption in Ireland will be investigated throughout time showing overall eating trends with a detailed look at animal-based food consumption and finally seafood consumption. In the next section Ireland's global position in the overall food consumption statistics will be assessed. This will be detailed in the terms of all food and the two broad categories of animal-based food and non-animal-based food. In the following section a sample of countries of relevance to the Irish seafood sector will be analysed at a more in-depth level exploring the composite categories within the animal and non-animal based food sectors. The final section will then assess global seafood trends for selected countries.

Methods and materials

The Food and Agriculture Organisation (FAO) of the United Nations collect and analyse data and statistics on all varieties of food and agriculture production and consumption. Data is collected in three domains namely 'Commodities Balances', 'Food Balance Sheets' and finally 'Consumption'. **Commodity Balances** covers all countries, the timespan 1961-2013, the main food and seafood categories, (bovine meats, poultry meats, pelagic fish, butter, etc. but also silk, wool etc.) and the elements of production, import, exports, feed, seeds etc. **Food Balance Sheets** has the same countries, years, and elements as Commodity Balance but the items include grains, alcohols, spices as well as meats. **Consumption** shows livestock and fish products like in the Commodity Balances domain.

Data from the FAO have been analysed to assess the patterns of consumption of meats throughout time in Ireland. All data is from the **Consumption** domain and has been downloaded from FAOSTAT[1][2]. The methodology used by the FAO to calculate the food supply is summarised in Appendix A. Further details on the sources of data and the methodologies used can be found on the FAOSTAT website. The categorisation of foods is shown in Appendix B.

In this study the methodologies utilised by the FAO will not be scrutinised. Here it is assumed that these are valid and accurate for each individual country taking into account that their purpose is to provide a standard means of comparing countries to assess global trends. Future work may analyse these methodologies and their applicability to the Irish seafood supply chain in detail.

[1] http://www.fao.org/fishery/statistics/global-consumption/en;
[2] http://www.fao.org/faostat/en/#data/CL

Results

Food consumption in Ireland

The overall food supply and food consumption rate (FCR) in Ireland from 1961 to 2013 is shown in figure 1 by category. On the left the overall supply of food is shown to be increasing over time. This can be attributed to a growing population in Ireland. On the right it can be seen that the consumption of milk has historically formed the basis of food consumption in Ireland since the 1960's and has remained remarkably constant on a per capita basis over the time series. Grains/Beans have seen a decrease in the rate of consumption. Alcohols and vegetables have seen the biggest increases in consumption rates over the time series.

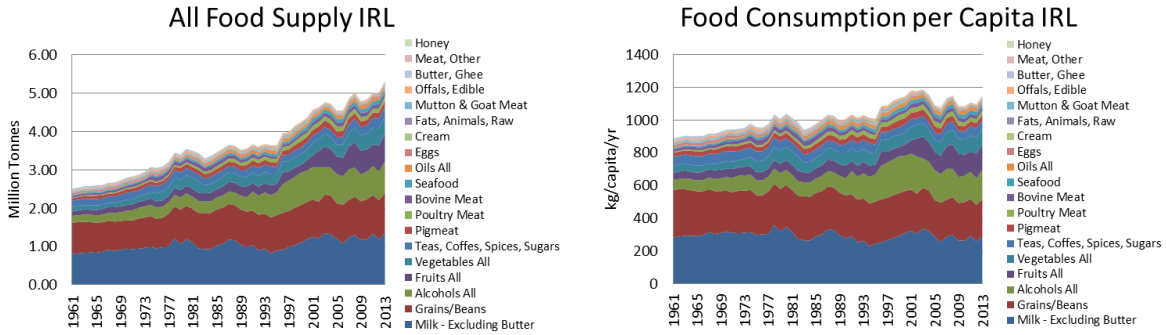


Figure 1: total food supply (a) and food consumption rate (b) in Ireland 1961-2013

Total food consumption rates can be categorised broadly as animal-based foods and non-animal based foods. Animal based foods include the following sub-categories; Bovine Meat; Butter, Ghee; Cream; Eggs; Fats, Animal; Honey; Meat, Other; Milk - Excluding Butter; Mutton & Goat Meat; Offal; Pigmeat; Poultry Meat and Seafood. Of these animal based sub-categories 'seafood' can be broken down further i.e. demersal, pelagic, freshwater fish etc. Splitting total food supply by animal-based foods shows the profile of animal product consumption in Ireland changing considerable over the last 50 years. '*Milk – Excluding Butter*' remains by far the largest animal food consumed and the share of this is stable as can be seen in figure 2. This product is composed of 34 products varying from milk to ice-cream and whey.

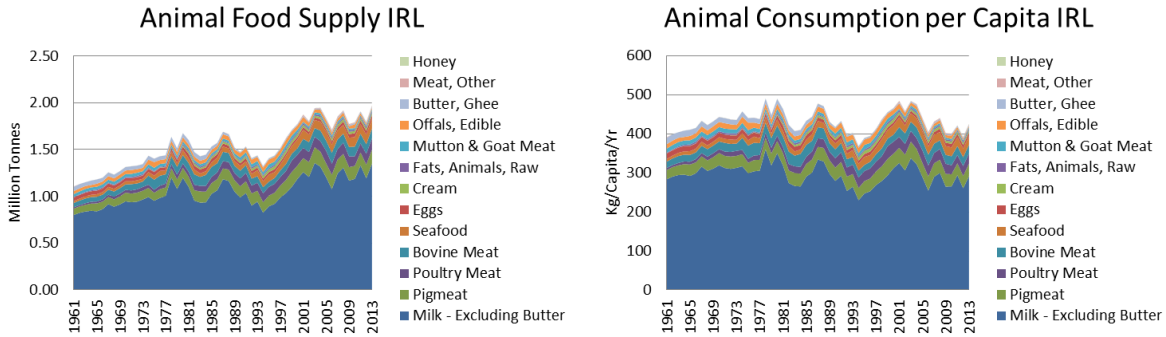


Figure 2: total animal food supply (a) and animal food consumption rate (b) in Ireland 1961-2013

To assess other animal food trends the milk category is removed from the following figures. In figure 3 the consumption of non-milk animal products is shown over the time series. It is clear that *pigmeat* has been the main source of animal meat in Ireland since the 1960's. *Poultry meat* is now

the second most popular type of animal meat with this category growing phenomenally over time. Consumption in the 60's was only around 5kg/capita but this grew strongly until the late 1990's and stabilised around 25kg/capita. *Bovine meat* consumption grew in the 1970's however fell throughout the late 1980's and mid 1990's before recovering to above 20kg/capita. Increases during the 1970's were potentially related to the UK importing beef from South America periodically in this period which led to significant price drops for Irish and UK meats. *Seafood* is another strong performer over the time series with growth occurring in the 1960's and early 1970's and again with the Celtic Tiger economic growth from the early 1990's on. Average consumption of seafood is 22kg/capita in 2013, up from 7kg in 1961. Over the last 10 years growth rates for most of the main animal categories have been in decline. *Pigmeat*, *poultry meat* and *bovine meat* all saw considerable declines in consumption over these years with consumption of cream falling to a lesser extent also. E*ggs* have increased over these years while seafood consumption has remained stable.

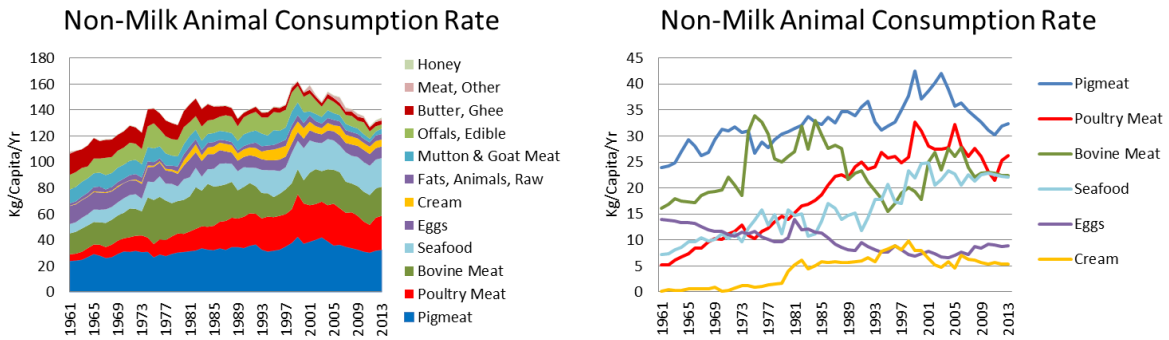


Figure 3: non-milk animal food consumption rates in Ireland 1961-2013 (a) and rates for top 7 categories (b)

In figure 4 the non-milk animal food categories consumed by Irish people are shown to have changed significantly throughout the years.

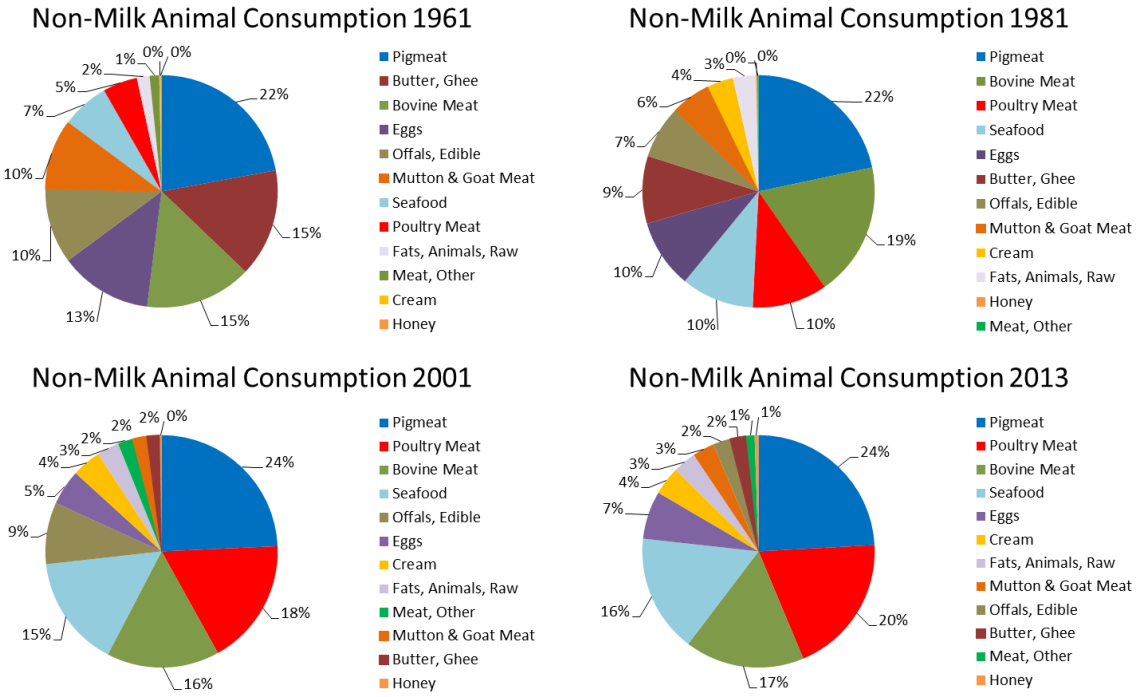


Figure 4: non-milk animal food consumption in 1961 (a), 1981 (b), 2001 (c) and 2013 (d)

Consumption is shown at 20 year intervals for the years 1961, 1981, 2001 and finally the latest year of data, 2013. In 1961 the main categories of non-milk animal foods consumed were *pigmeat*, *butter/ghee*, *bovine meats*, *eggs* and *offals*. These five categories composed three quarters of average consumption in Ireland in that year. Twenty years later the consumption of *butter/ghee*, *eggs*, *offal* and *mutton & goat meat* had all fallen significantly while consumption of *bovine meat*, *poultry meat* and *seafood* had all risen.

By 2001 consumption of *poultry meat* and *seafood* continued to grow while consumption of *eggs*, *butter/ghee* and *mutton* continued to decline. Finally in the latest data for 2013 the top four categories of *pigmeat*, *poultry meat*, *bovine meat* and *seafood* continue to be the main meats consumed as in 2001 and 1981. Consumption of cheese has continued to consistently increase while *eggs* have returned to growth after consistent declines in consumption from 1961 to 2001.

Consumption of seafood in Ireland has increased over the years to the latest/current 22kg per capita in 2013. This is an increase of 200% over the time series representing a tripling of seafood consumption per capita since 1961. According to the estimates of FAO 102,000 tonnes were consumed in 2013 (FAO). Consumption is estimated to have increased five-fold in Ireland since 1961. *Demersal* species are the main category consumed in Ireland followed by *pelagics* and *crustaceans*.

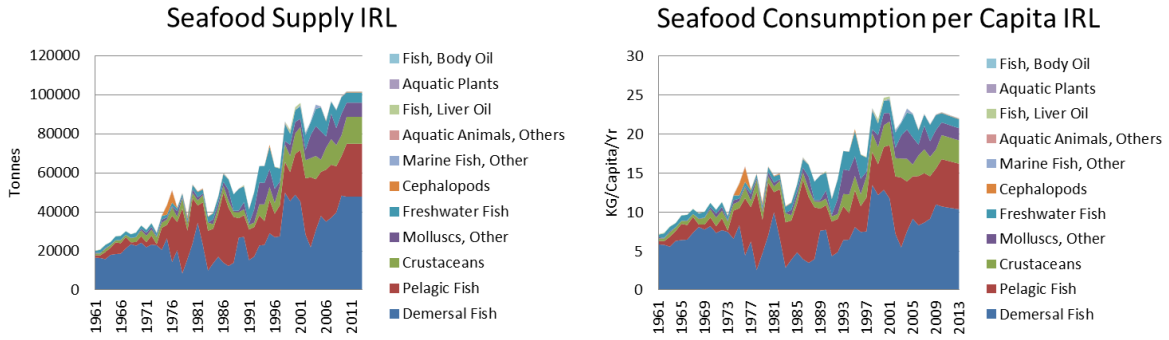


Figure 5: seafood supply and seafood consumption rate in Ireland 1961-2013

Over the time series seafood consumption in Ireland has shifted from near total *demersal* at the beginning to significant growth in *pelagic* consumption in the 1970's and 1980's. Shellfish (*crustaceans* and *molluscs*) consumption increased from the 1990's on.

In the following section food consumption rates globally will be analysed to comparatively assess Irish eating patterns.

Global food consumption statistics overview

In figure 6 consumption rates of all food products are shown for the time series 1961-2013 for selected countries and in 2013 for all countries. These figures show the average quantity (in weight) of food consumed per person in each year. Clear positive trends can be seen in the selected countries FCRs over time while the average world FCR is increasing consistently over the years, particularly since 1991. Ireland has the third highest FCR in the world in 2013, only surpassed by Luxembourg and Montenegro. In 2013 the average Irish person consumed 1.15 tonnes of food. Irish food consumption peaked in 2003 at 1.19 tonnes before falling throughout the economic crisis to a recent trough of 1.09 tonnes in 2009. At the beginning of the time series, in 1961, the FCR for Ireland was 0.88 tonnes, which was the 7th highest in the world at the time. Therefore, consumption of food

has historically been very high in Ireland. In 1961 Belgium, Switzerland, France and Czechoslovakia all consumed over 1 tonnes of food per capita per annum. Since then the FCR of France and Switzerland have fallen while those of Ireland and Luxembourg have continued to increase. In comparison to Irelands current FCR of 1.15 tonnes are the FCRs of the USA (1.00), Italy (0.99), the UK (0.97), the EU (0.95), France (0.94), China (0.90), Spain (0.86) and the World (0.70).

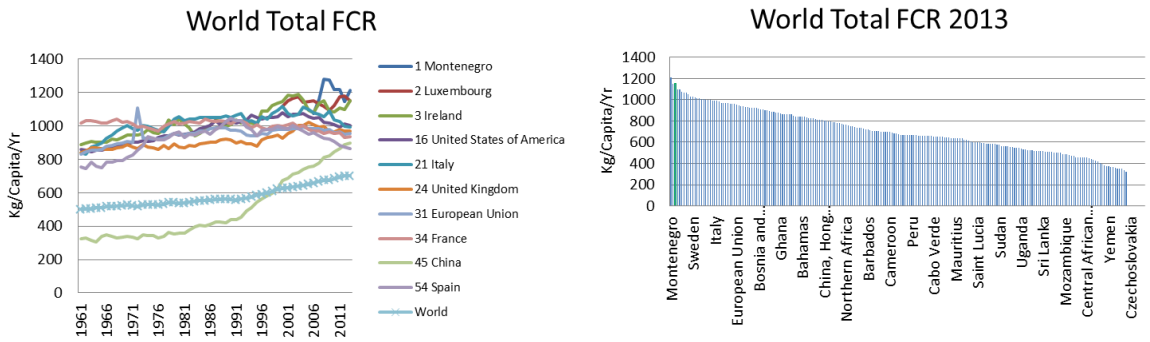


Figure 6: global food consumption rates for selected countries from 1961 to 2013 (a) and for all countries in 2013 (b)

In terms of animal-based FCRs Finland, Sweden and the Netherlands are the top three countries in 2013. Finland is the only country to consume over half a tonne of animal-based foods per year at 568kg per capita per annum with Sweden and the Netherlands consuming 488kg and 474kg respectively. The top 10 countries are all European with Ireland placed in ninth position with an FCR of 426kg. The animal based FCR of other countries of interest are as follows; USA (412kg); France (396kg); Italy (384kg); EU (368kg); UK (354kg); Spain (323kg); China (164kg) and the World (169kg). Animal based food consumption rates have levelled off for developed nations since the 1980's. World rates have nearly doubled over the time period with growth in China increasing strongly since the 1980's. This growth is continuing and as China develops will surely continue to grow strongly. Irish consumption of animal based food has always been high with Ireland placing 10th in 1961 at 392kg. Rates have fluctuated over the time series peaking in 1978 at 491kg (possibly due to UK imports of South American beef leading to price crashes in the Irish and UK beef market during this period) with troughs in the mid-1980's and mid-1990's.

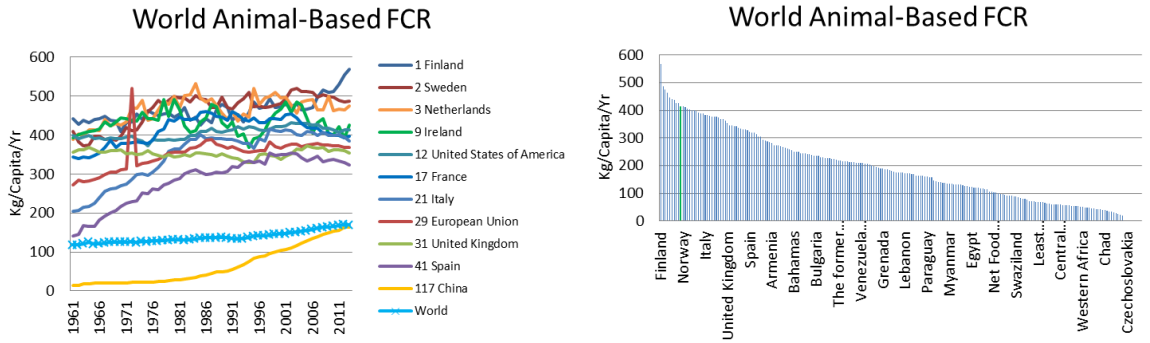


Figure 7: animal based FCRs for selected countries from 1961-2013 (a) and for all countries in 2013 (b)

Non-animal food categories include the sub-categories of *Alcohols All*; *Fruits All*; *Grains/Beans*; *Oils All*; *Teas, Coffees, Spices, Sugars*; and *Vegetables All*. All these sub-categories can be broken down in to more detailed foodstuffs as can be seen in Appendix B.

The top three countries for non-animal based FCRs in 2013 were Ghana, Dominica and Rwanda with FCRs of 817kg, 798kg and 767kg respectively. Ireland is placed 8th in the world at 705kg. Other FCRs of interest are as follows; China (733kg); Italy (610kg); USA (590kg); EU (585kg); France (541kg); Spain (540kg); and the World (532kg). Non-animal FCRs are relatively stable for mature economies in the EU and US over the time series. These rates are growing for developing countries with China growing strongly since the 1990's. Non-animal FCR for Ireland has grown strongly over the time series. The composition of food consumption is assessed in more detail in the next section.

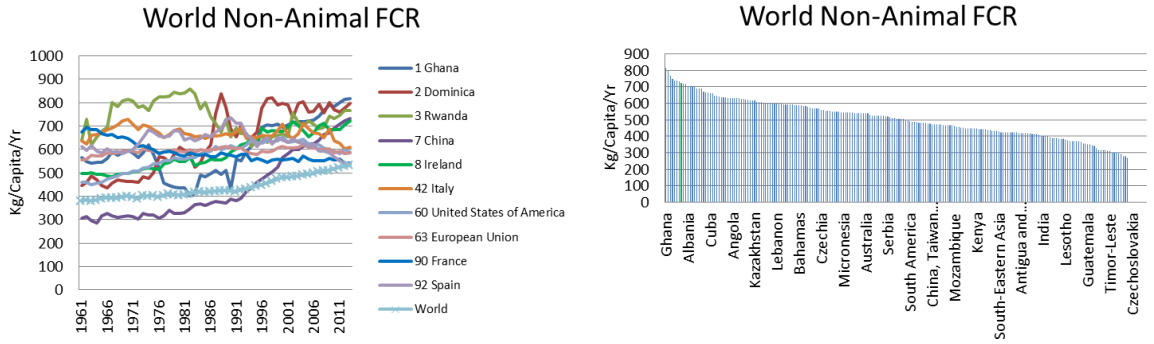
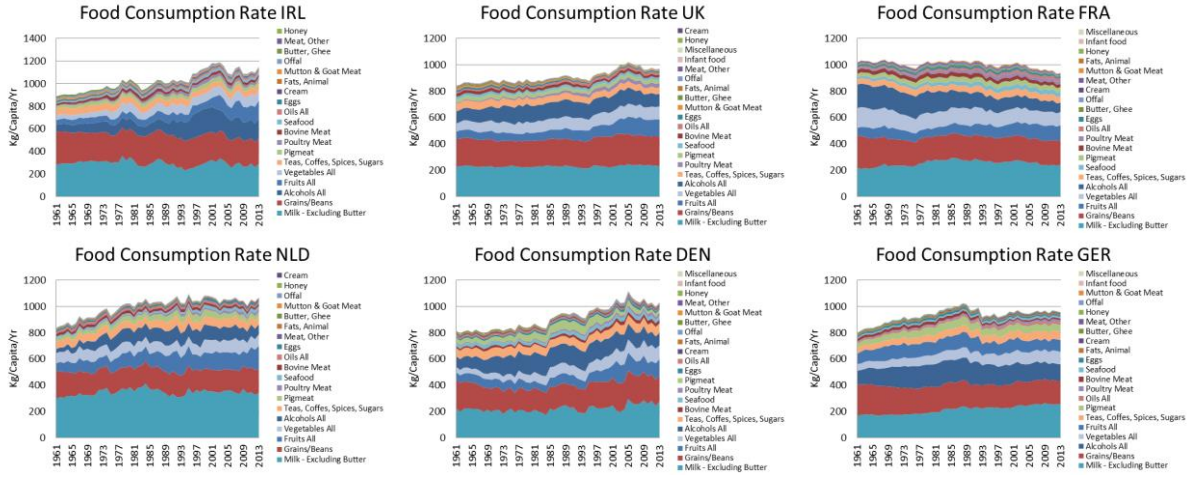


Figure 8: non-animal based FCRs for selected countries from 1961-2013 (a) and for all countries in 2013 (b)

Composition of food consumption for selected countries

In Ireland '*Milk – Excluding Butter*' is the main food source consumed in 2013 as it was in 1961. This sub-category is composed of 34 products ranging from whole fresh milk to whey and ice-cream and includes milk from all animals. '*Grains/Beans*' is the next main sub-category followed by '*Alcohols All*', '*Fruits All*' and '*Vegetables All*'. These top five sub-categories are similar across the Western world and '*Milk – Excluding Butter*' is the most consumed category in most of these countries except for Spain, Canada and New Zealand where *Grains/Beans* is the main followed by milk.



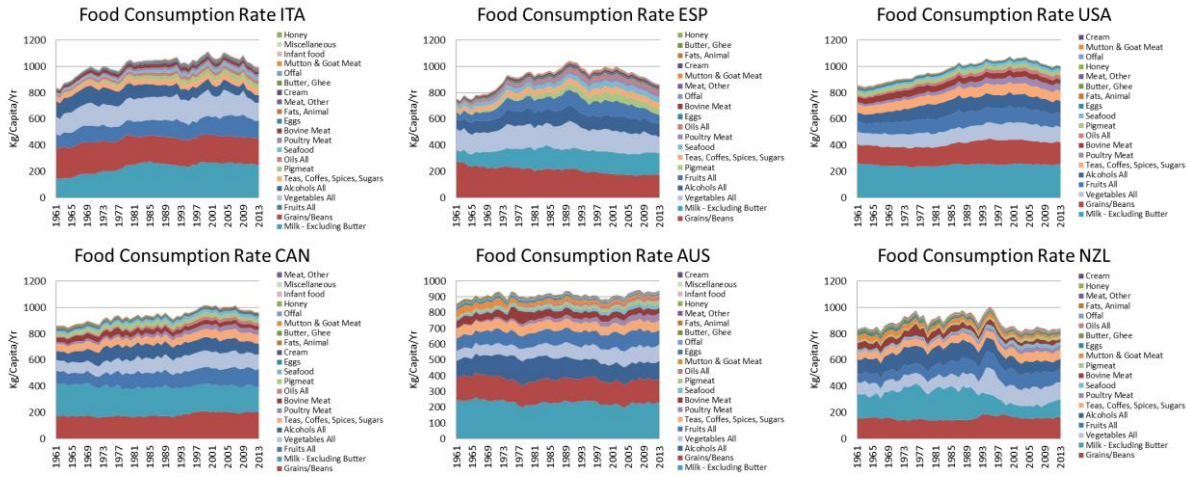


Figure 9: breakdown of total food consumption rates for Western countries

Other markets of interest for the Irish seafood sector are the East Asian markets of China, Japan and Korea and African markets such as Nigeria, Cameroon and Ghana. Of the East Asian countries Japan began the time series as a relatively mature economy with higher FCRs than other Asian countries. *Grains/Beans* and *Vegetables All* are the main sub-categories but these have declined over time. Overall consumption of food in Japan has declined after peaking in early 1990's. Consumption of *milk* products has increased the most of all sub-categories. *Seafood* consumption is high but declining. Korea and China have seen rapid growth in food consumption mirroring their economic growth rates. *Vegetables* are the main food category in 2013 with rates increasing considerably over time, overtaking *grains/beans* as the main food category consumed in both countries. *Alcohols*, *seafood* and *fruits* are the other three main growth areas in both countries throughout the time series. Of these three East Asian countries overall food consumption rates are decreasing for Japan, stable for Korea and increasing for China, which already surpasses the per capita consumption of the other two. In the African countries of Nigeria, Cameroon and Ghana *Grains/Beans* dominate food consumption followed by *vegetables* and *fruits*. *Alcohols* are a main category consumed in Nigeria and Cameroon. Consumption of animal-based foods is low in these countries with *seafood* being a major component of total animal-based food consumption in all three countries.

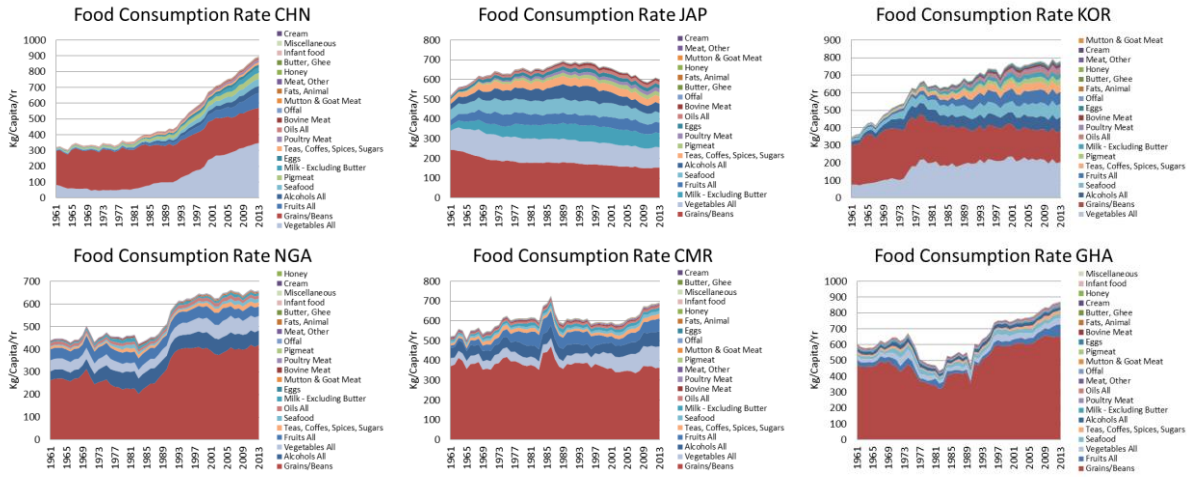


Figure 10: breakdown of total food consumption rates for East Asian and African countries of interest

Globally, it is clear that *Grains/Beans* are a vital food component across the developed and developing world. In Western countries *Milk – Excluding Butter* is, in most countries, the number one food category consumed. This is much less the case in developing countries however in fast growing countries such as China growth rates are increasing strongly. It is clear that as economies develop the diet of the Western countries will be adopted in many cases therefore it can be expected that animal-based food consumption will increase globally.

Ireland's animal-based FCR oscillates historically around 400kg peaking in the late 1970's (with mini peaks in the late 1980's and early 2000's) before declining in most recent years. Milk dominates here as it does in most other Western countries accounting for ~70% of total animal-based food consumption. In figure 11 a number of interesting trends can be seen in Western countries. Milk consumption has increased or remained stable in all countries throughout the time series except in Canada and New Zealand. In Canada consumption has decreased by over 20% over the time series while in New Zealand consumption of milk has halved (this is surprising as NZ is a major milk producing nation). Poultry meat has increased considerably in every Western country over the years at the expense of bovine meat. Pig meat consumption is stable in most countries falling only in Denmark and rising in Germany, Netherlands, Italy and Spain. Consumption of seafood has remained stable or grown with increases seen in Ireland, France, Netherlands, Italy, Spain, Australia and New Zealand.

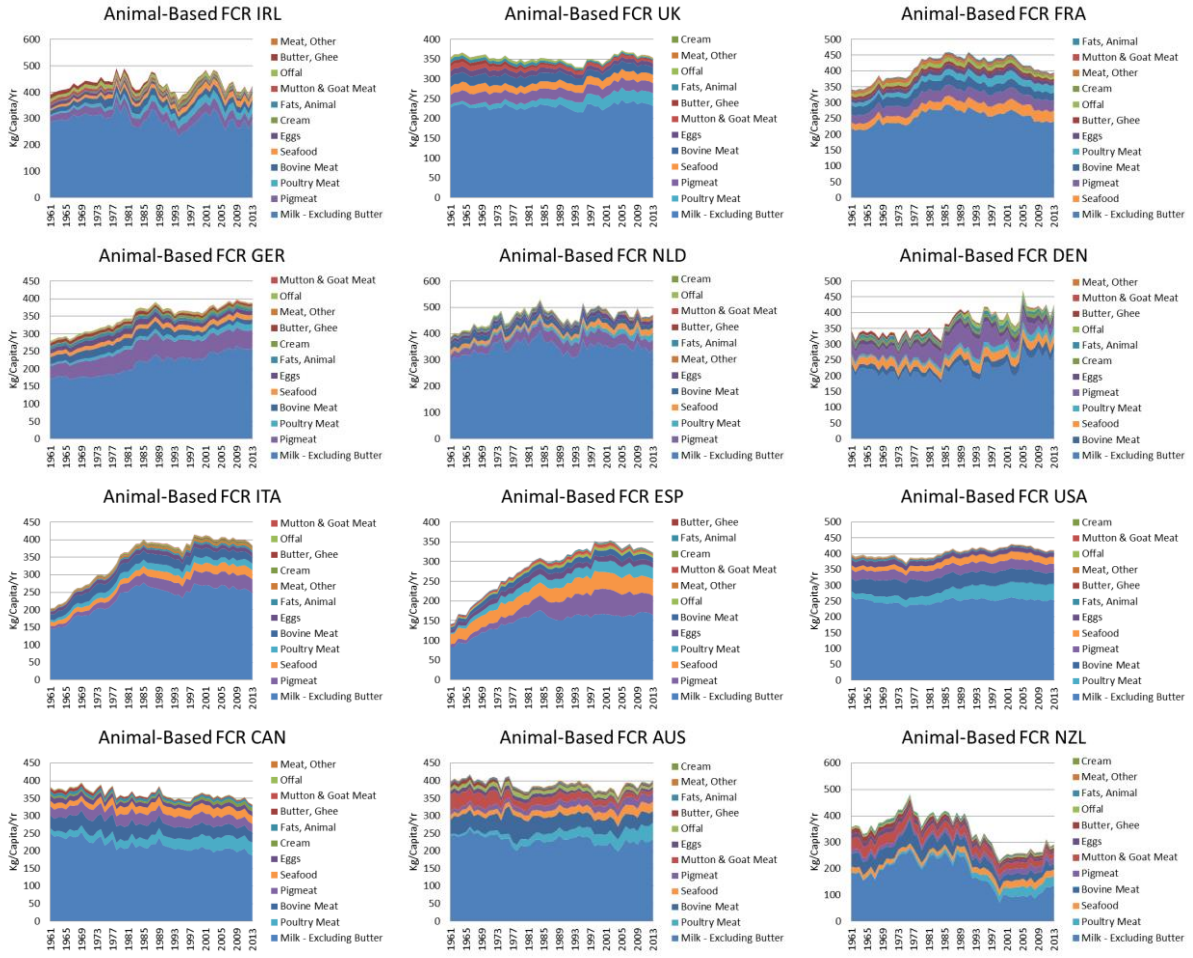


Figure 11: breakdown of animal-based food consumption rates for Western countries

In East Asia Japan has had the highest animal-based FCRs throughout the time series with *seafood* historically the main food category consumed. However, *milk* has been the most consumed category since the 1980's. While *seafood* consumption has fallen, rates for *pigmeat*, *poultry meat* and *eggs* have all risen significantly. Korea and China had very low levels of animal-based food consumption in 1961 (~20kg per person per year – one twentieth of the 1961 rate for Ireland) but experienced rapid growth in consumption from the 1970's on for Korea and from the 1980's on for China. *Seafood* is the main animal-based food category in China and Korea in 2013 and continues to show high growth.

In Africa all three selected countries show *seafood* as the main animal-based food category showing strong growth rates in Nigeria in particular. Milk is the second category in all three countries also however Cameroon shows the highest consumption rate followed by moderate levels in Nigeria and lower levels in Ghana.

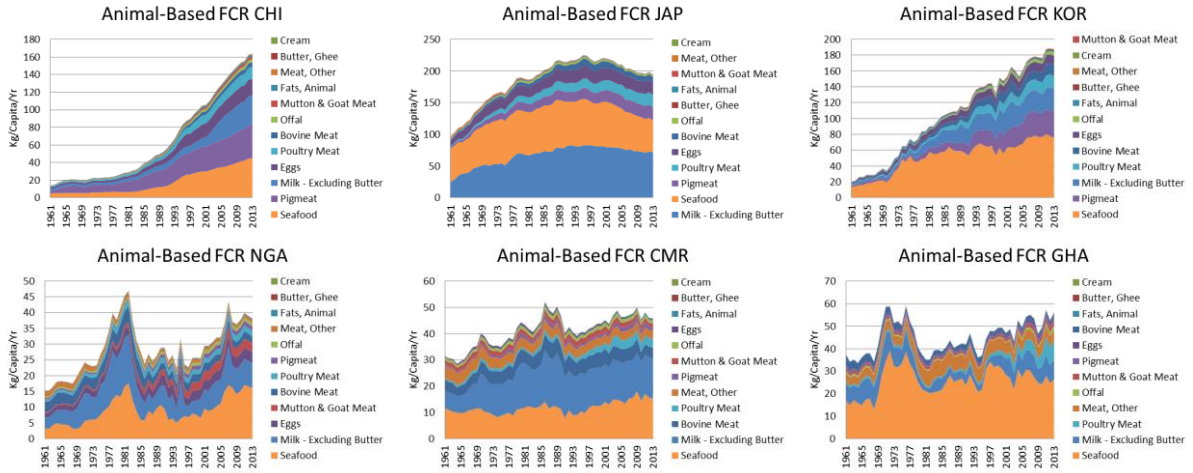


Figure 12: breakdown of animal-based food consumption rates for East Asian and African countries of interest

Focussing on animal-based consumption rates shows clear differences between Western diets and Asian and African consumption patterns. In Western countries animal-based FCRs are levelling at around 400kg with rates declining in some countries such as France, Spain and Italy. Milk dominates Western diets throughout the time series and shows no sign of changing in the near to medium term. Poultry consumption has seen the main increase in these countries while seafood has also seen growth. In East Asia seafood is the main animal-based food with strong growth in China and Korea. Milk is now the main animal-based food category in Japan but rates are declining while milk is growing in China and Korea. *Pigmeat* is growing in all three countries. In Africa *seafood* is the main animal-based food category for Nigeria, Cameroon and Ghana with milk growing in popularity. Focus will now be turned to the consumption of seafood globally.

Seafood consumption trends

Seafood FCRs are shown in figure 13 for the top ten consumers per capita/year globally (a) and for selected countries of interest (b). The Maldives have by far the highest seafood FCR reaching towards 200kg/capita. Iceland are the second highest consumers at 92kg while the next four highest consumers, South Korea, Kiribati, Micronesia and Hong Kong have FCRs of above 70kg. Assessing the selected countries of interest to the Irish seafood sector shows some contrasting trends. Seafood consumption has increased in most countries over the time series. Growth continues in Korea, Hong

Kong and China. Growth is stable or increasing slightly over the latest years in Spain, France, Italy and Ireland while consumption rates have declined in the latest years in Portugal, Japan and Ghana.

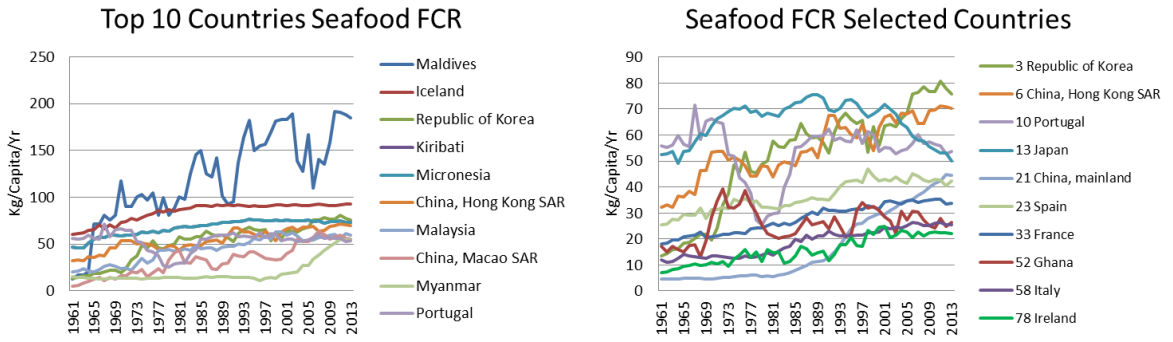


Figure 13: top ten consumption rates of seafood (a) and seafood FCRs of selected countries 1961-2013 (b)

Seafood FCRs are shown for the main regions of the world in figure 14 by high, middle and lower consumption levels. In part (a) the top 5 seafood consuming regions are shown. For most of these regions consumption dropped through the 1970's before increasing from the 1980's on. Eastern Asia is the top region in the world consuming over 45kg per capita/year on average. In second place is South-eastern Asia with an FCR of 33kg, followed by Southern Europe (29kg), Australia and New Zealand (26kg) and Northern Europe (26kg). Over the last ten years FCRs in Europe and Australia/NZ have stabilised while growth continues in Eastern and South-eastern Asia.

For the Middle six regions seafood FCR has been increasing throughout the time series for the EU, North America, Western Europe and Western Africa. The trends for Russia and Eastern Europe are highly correlated, with significant growth in both regions up until the late 1980's. Up until this point Russia and Eastern Europe were the highest seafood consuming regions in the world. Seafood consumption declined by over 50% in both regions after the fall of Communism, reaching their lowest points in 1995. Since then both regions have seen increases in consumption. In 2013 Russia, the EU and North America all show seafood FCRs of around the global average of 23kg. Western Africa shows promising signs for continued seafood consumption in the future.

The lowest 6 regions, composed of mainly American and African regions, all show below average consumption rates except for North Africa which shows a similar growth rate to the World average.

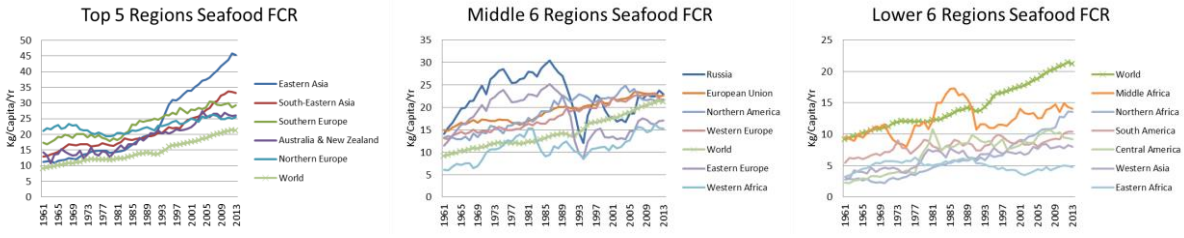


Figure 14: regional seafood consumption rates 1961-2013

Population growth and economic development in the future will dictate the destination of Ireland's seafood exports. Africa is by far the fastest growing continent in the world in population terms with annual growth of 2.5%. World population growth is declining over the time series, being led by

declining Asian growth rates. Surprisingly population growth in the Americas is matching Asian levels. European growth rates are, as expected, the lowest, converging around 0%.

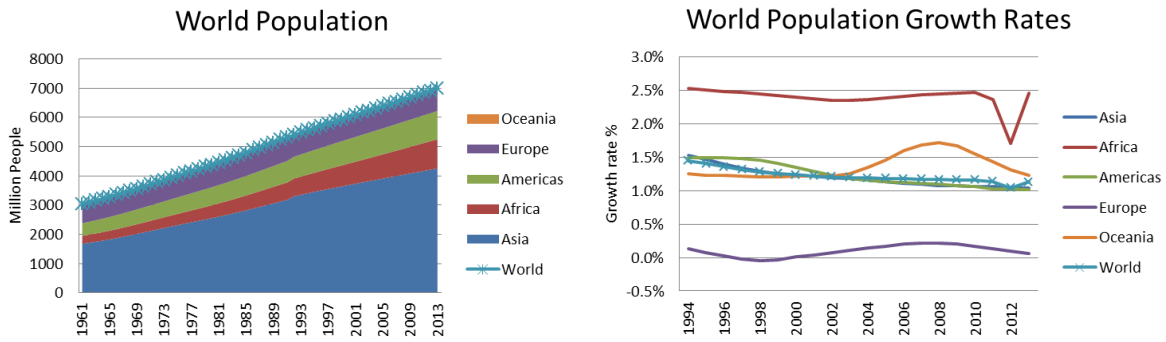


Figure 15: world population by continents 1961-2013 (a) and continental growth rates 1994-2013 (b)

As can be seen in figure 16 the top three most populous regions in the world are Asian namely, Southern Asia, Eastern Asia and South-Eastern Asia. These three regions account for around half of the world's population incorporating India, China and the many populous countries in this continent. The top three fastest growing regions in population terms are African namely Middle, Eastern and Western Africa. These three have seen growth increase over the time series from around 2% to nearly 3%. Major markets for Irish seafood here currently include Nigeria, Cameroon and Ghana with potential in Angola and the sizable Eastern African market. Southern and South-Eastern Asia show average population growth rates while Eastern Asian population growth has stabilised around 0.5% over the last 10+ years. Despite this, given their size, these lower growth rates will still result in these Asian regions growing by the largest numbers in the medium term.

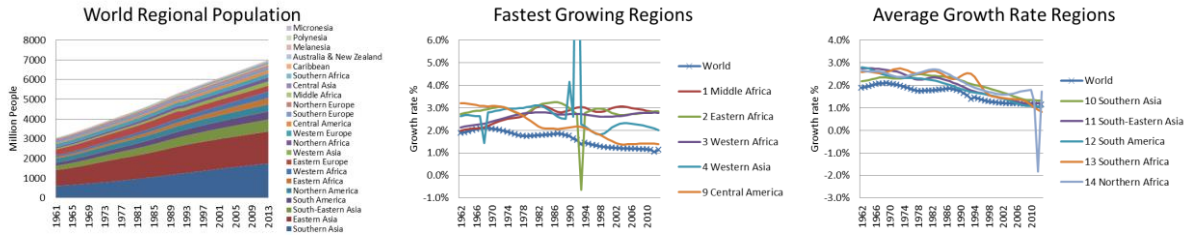


Figure 16: world population by regions (a), by fastest growing regions (b) and average growth regions (c)

In figure 17 the economic growth that has occurred from 1960 to 2015 is shown by world region. In part (a) it can be seen that the Northern America region is the world's most important economic area in nominal gross domestic product (GDP) terms. This has been the case since the 1960's however on purchasing power parity[3] (PPP) terms Eastern Asia has had the highest GDP since 2008. On a PPP basis Southern Asia (composed of India, Iran, Pakistan, etc.) overtook Western Europe as the third biggest global regional economy in 2010. If current growth rates continue the regions of South-Eastern Asia and Western Asia will overtake Western Europe in 2020 and 2026 respectively[4].

[3] Purchasing power parity is the quantity of currency required to purchase a common basket of goods and services. It is used to compare economies that use different currencies to account for differing costs of living.
[4] Please note that Western Europe refers to mainland Western Europe and does not include Ireland and the UK. For a full list of all region categories see Appendix C.

The fastest growing economic regions of the world can be seen in part (c) of figure 17, on a PPP basis. Eastern Africa and Eastern Asia both have consistent growth rates of above 5% year on year over the last 10 years. South-Eastern Asia and Northern Africa show the next highest growth rates, the latter recovering from recession in 2011 and 2012 throughout the period of the so-called '*Arab Spring*'. In part (d) average growth rate regions are shown, these regions generally outpacing average world growth rates. Central Asia, Middle Africa and Western Africa seem the most consistent growth regions within this group over the time series while the regions of Western Asia and Central America show erratic growth rates since the early 1990's.

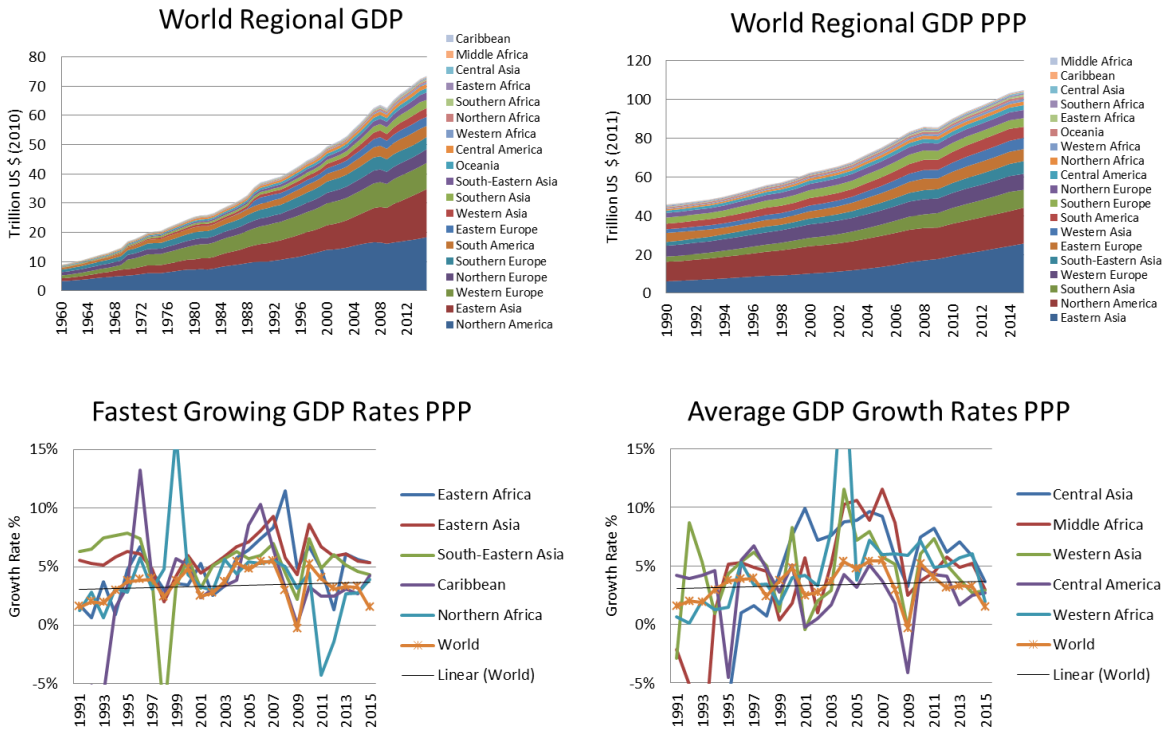


Figure 17: world nominal Gross Domestic Product by regions (a), world PPP GDP by regions (b), by fastest growing regions (c) and average growth regions (d), the latter two figures show GDP growth rates on a purchasing power parity (PPP) basis

Discussion

Trends in food consumption have changed considerably over time in Ireland and in many parts of the developed and developing world. What is clear is that at the global level the average human is now consuming more food than ever before which is a clear sign of global economic development and improving well-being of the earth's population. World population has grown by 130% since 1961 while nominal GDP of the world has grown by 652%. On the basis of purchasing power parity the world economy has grown by 118% since 1990 while population has grown by 33%. This proportionate growth in average wealth per person is reflected in the food consumption statistics analysed here.

The typical diet in Ireland has undergone significant change since the 1960's. Milk and grain foods remain the base of food consumed but consumption of vegetables, fruits and alcohols have all risen significantly on a per capita basis. The consumption rate of animal foods excluding milk is high throughout the last 50 years peaking in the late 1990's. Pigmeat is the main food category here

followed by poultry meat, bovine meat and seafood. Pigmeat has been the main non-milk animal food consumed in Ireland at all stages of the last 50 years however the other categories have shifted to a large extent. In the 1960's cheaper proteins were mainly consumed here such as butter/ghee, eggs, offals and mutton. By the 1980's and onwards consumption of poultry grew rapidly to become the second protein consumed in Ireland from the 2000's on. Consumption of seafood in Ireland has increased from 20,000 tonnes to 100,000 tonnes since 1961. On a per capita basis the average Irish person is estimated to consume 22kg per annum, a tripling since 1961. Seafood grew strongly throughout the Celtic Tiger years to a similar level as bovine meats in 2013 with demersal fish the main category of seafood consumed.

Average world food consumption per capita increased 25% since 1990. Ireland ranks third in the world for the quantity of food consumed per person only surpassed by Montenegro and Luxembourg. Developed countries rank the highest as expected and food consumption in China has now reached Western levels, approaching 1 tonne per person per year. Animal-based food consumption has stabilised around 400kg per capita in Western countries with trends declining slightly. China now consumes around the world average of proteins, circa 200kg per capita. Ireland is in the top ten countries for both animal food consumption and non-animal food consumption. Developing countries eat the highest levels of non-animal foods.

In Western countries the main food categories are milk, grains, alcohols, fruits and vegetables. Milk products are the main category in all Western countries except for Spain, Canada and New Zealand where Grains/Beans is the main followed by milk. In East Asia grains were the main category but vegetable consumption has increased significantly. Total food consumption in China continues to grow while in Japan rates are declining and Korean rates have stabilised. In Africa grains form the majority of food consumed in the countries of Nigeria, Ghana and Cameroon.

Animal-based consumption is dominated by milk in Western countries, with milk consumption significant in the Asian and African countries analysed, especially Japan. Pigmeat is the next main category for most Western countries except for the UK, Denmark, USA, Canada, Australia and New Zealand where poultry is more popular and France where seafood is more popular. In the Asian and African countries seafood is the main animal food except for Japan.

A surprising result in this study is that the data shows that the average Irish person consumes significantly more than the average American in terms of weight of food per capita per annum (1,150kg vs 1,002kg for all food in 2013; 425kg vs 411kg for animal-based foods in 2013). This measure is very distinct to a common measure of food consumption namely the calorific content. Calorific content is a measure of the energy content of foods and is measured in kilocalories or kilojoules. When food consumption is measured in terms of the calorific content then the USA surpasses Ireland marginally and ranks at near the top of the global scale. In figure 18 the two measures are juxtaposed for Ireland and the USA to highlight the difference in contribution in some food products according to each measure. It is clear that while milk products contribute significantly less calories than their weight the opposite is the case for *Grains/Beans*, *Teas, Coffees, Spices, Sugars* and *Oils All* which contain calories far exceeding the weight consumed. These latter two categories which are mainly composed of sugars, sweeteners and soyabean oil contribute a major part of the current American diet. The latter two products are increasingly consumed in Ireland but not to the extent of the USA.

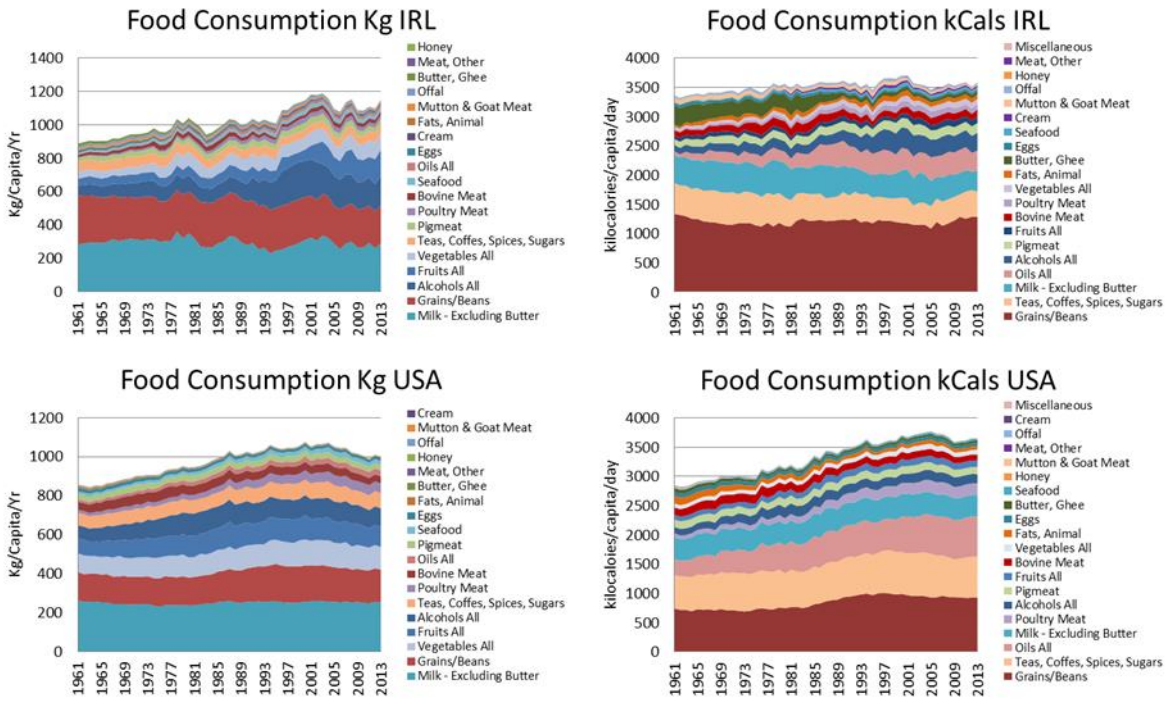


Figure 18: comparison of food consumption measures for Ireland and the USA, 1961-2013

The Maldives, Iceland and South Korea are the top three consumers of seafood in the world in 2013. While seafood consumption has increased in all countries over the time series growth continues in Korea, Hong Kong, Macao and China. Growth is stable or increasing slightly over the latest years in Spain, France, Italy and Ireland. Seafood consumption rates have declined in the latest years in Portugal, Japan and Ghana. Eastern Asia is the top region in the world consuming over 45kg per capita on average. In second place is South-eastern Asia with an FCR of 33kg, followed by Southern Europe (29kg), Australia and New Zealand (26kg) and Northern Europe (26kg). Over the last ten years FCRs in Europe and Australia/NZ have stabilised while growth continues in Eastern and South-eastern Asia. Russia and Eastern Europe were the highest seafood consuming regions of the world until seafood consumption declined by over 50% in both regions after the fall of Communism, reaching their lowest points in 1995. Since then both regions have seen increases in consumption. In 2013 Russia, the EU and North America all show seafood FCRs of around the global average of 23kg. Western Africa shows promising signs for continued seafood consumption in the future.

Looking to the future population growth and economic development will dictate the destination of Ireland's seafood exports. Africa is by far the fastest growing continent in the world in population terms with annual growth of 2.5%. World population growth is declining over the time series, being led by declining Asian growth rates with growth for Asia, Oceania and the Americas around 1% while European population growth averages 0%. Southern Asia, Eastern Asia and South-Eastern Asia are the most populous regions while Middle, Eastern and Western Africa are the fastest growing. Given their size, the Asian regions' lower growth rates will still result in these regions growing by the largest numbers in the medium term.

Eastern Africa, Eastern Asia and South-Eastern Asia are highest growing economic regions of the world with growth rates around 5% per annum (PPP). The Middle East regions of Northern Africa

and Western Asia also show strong economic growth, recovering from recession in 2011 and 2012 throughout the period of the so-called '*Arab Spring*'.

Note must be taken here that what has been presented in this document are estimates of the FAO on food consumption patterns. The same methodology has been applied to all countries therefore any errors that may be present are present for all countries. Some anomalies that could be seen here was the dramatic shift in consumption of animal-based foods in New Zealand. It is possible that this may be as a result of some trade anomalies in the data collected as New Zealand is a major exporting country of animal-based foods. Also, there may be some uncertainties in relation to seafood consumption as it may be possible that pelagic species are assigned as human consumption where they may actually be converted to fish food for the aquaculture sector. Future work will be carried out by BIM to verify these FAO seafood consumption statistics for Ireland (22kg per capita) and the composition of this consumption.

Conclusion

The Irish have the biggest appetites in the world! Ireland is the third highest consumer of food in the world and is in the top ten consumers of animal-based foods and non-animal-based foods. The Irish diet has changed significantly over the years with economic development surely playing an important role. Cheaper food stuffs have been replaced with more expensive foods such as fruits, alcohols and seafood. Poultry consumption has increased the fastest in Ireland of all animal-based foods, a trend similar in Western countries but also around the world. Technological advances in poultry production have clearly influenced growth in this category. In Ireland, seafood is nearly consumed as much as beef. The trend of seafood consumption seems relatively stable over the last 15 years in Ireland according to this data however it seems likely that consumption has increased in most recent years after the emergence of the Irish economy from the crisis years from 2013 on.

The analysis of population and economic growth by regions indicates that Eastern Asia will remain a priority growth market for the seafood sector in the medium term, with purchasing power increases inevitably leading to higher demand for seafood. South-Eastern Asia, with its current high seafood consumption and its strong economic growth will also grow in importance as an export destination. Northern Africa and Western Africa have strong economic and population growth rates while also having near average seafood consumption rates. Current Irish export markets in these regions include Nigeria, Cameroon, Ghana and Egypt and the trends indicate that these regions will increase their consumption of pelagic species pushing up average prices for the limited supply of these species and opening up opportunities for substitution with alternative pelagic species. The re-opening of the Russian market to EU exporters would accelerate these trends given their demand for pelagic species.

Acknowledgements

All errors are the responsibility of the author. The opinions expressed in this document are of the author and are not necessarily representative of his institution.

References

Food and Agriculture Organisation of the United Nations. *FAOSTAT*. Bulk Downloads at: http://www.fao.org/faostat/en/#data/CL. Last Updated January 17, 2018.

World Bank. *World Development Indicators*. Databases at: https://data.worldbank.org/products/wdi. Last Updated 1 June, 2017.

Appendix A

FAO Methodology

This dataset refers to…Estimates of per capita food supplies available for human consumption during the reference period in terms of quantity, caloric value, protein and fat content. Calorie supplies are reported in kilocalories (1 calorie = 4.19 kilojoules). Per capita supplies in terms of product weight are derived from the total supplies available for human consumption (i.e. Food) by dividing the quantities of Food by the total population actually partaking of the food supplies during the reference period, i.e. the present in-area (de facto) population within the present geographical boundaries of the country. In other words, nationals living abroad during the reference period are excluded, but foreigners living in the country are included. Adjustments are made wherever possible for part-time presence or absence, such as temporary migrants, tourists and refugees supported by special schemes (if it has not been possible to allow for the amounts provided by such schemes under imports). In almost all cases, the population figures used are the mid-year estimates published by the United Nations Population Division. Per capita supply figures shown in the commodity balances therefore represent only the average supply available for the population as a whole and do not necessarily indicate what is actually consumed by individuals. Even if they are taken as approximation to per capita consumption, it is important to note that the amount of food actually consumed may be lower than the quantity shown here, depending on the degree of losses of edible food and nutrients in the household, e.g. during storage, in preparation and cooking etc. In many cases commodities are not consumed in the primary form in which they are presented in the commodity balance, e.g. cereals enter the household mainly in processed form like flour, meal, husked or milled rice. To take this fact into account, the caloric value, the protein and fat content shown against primary commodities in the commodity balances have been derived by applying the appropriate food composition factors to the quantities of the processed commodities and not by multiplying the quantities shown in the commodity balance with the food composition factors relating to primary commodities. Source: FAO Statistics Division.

Appendix B

Table 1: categorisation of foods consumed in the world

Animal Based Foods	Non-Animal Based Foods	
Bovine Meat	***Alcohols All***	***Teas, Coffes, Spices, Sugars***
Butter, Ghee	Beer	Cloves
Cream	Beverages, Alcoholic	Coffee and products
Eggs	Beverages, Fermented	Groundnuts (Shelled Eq)
Fats, Animals, Raw	Wine	Nuts and products
Meat, Other	***Fruits All***	Pepper
Mutton & Goat Meat	Apples and products	Pimento
Offals, Edible	Bananas	Rape and Mustardseed
Pigmeat	Citrus, Other	Sesame seed
Poultry Meat	Coconuts - Incl Copra	Spices, Other
Seafood	Dates	Sugar (Raw Equivalent)
Aquatic Animals, Others	Fruits, Other	Sunflower seed
Aquatic Plants	Grapefruit and products	Sweeteners, Other
Cephalopods	Grapes and products (excl wine)	Tea (including mate)
Crustaceans	Lemons, Limes and products	Sugar non-centrifugal
Demersal Fish	Oranges, Mandarines	***Vegetables All***
Fish, Body Oil	Pineapples and products	Olives (including preserved)
Fish, Liver Oil	Palm kernels	Onions
Freshwater Fish	***Grains/Beans***	Peas
Marine Fish, Other	Barley and products	Tomatoes and products
Molluscs, Other	Beans	Vegetables, Other
Pelagic Fish	Cereals, Other	***Infant food***
Meat, Aquatic Mammals	Cocoa Beans and products	***Miscellaneous***
Milk - Excluding Butter	Maize and products	***Oils All***
Cow milk, whole, fresh,	Oats	Coconut Oil
Milk Skm of Cows,	Plantains	Groundnut Oil
Milk Whole Cond	Potatoes and products	Maize Germ Oil
Whey Condensed	Pulses, Other and products	Oilcrops Oil, Other
Yoghurt	Rice (Milled Equivalent)	Oilcrops, Other
Yogh Conc.Or Not	Rye and products	Olive Oil
Butterm.,Curdl,Acid.Milk	Soyabeans	Palm Oil
Milk Whole Evp	Wheat and products	Palmkernel Oil
Milk Skimmed Evp	Yams	Rape and Mustard Oil
Milk Skimmed Cond	Roots, Other	Sesameseed Oil
Milk Whole Dried	Sweet potatoes	Soyabean Oil
Milk Skimmed Dry	Millet and products	Sunflowerseed Oil
Milkdry Buttrmilk	Sugar beet	Cottonseed Oil
Whey Dry	Sugar Crops	Ricebran Oil
Cheese of Whole Cow Milk	Sugar cane	
Cheese of Skimmed Cow Milk	Sorghum and products	
Whey Cheese	Cassava and products	
Processed Cheese	***Honey***	
Reconsti.Ted Milk		
Casein		
Buffalo milk, whole, fresh		
Milk Skim of Buf,		
Cheese of Bufmilk,		
Sheep milk, whole, fresh,		
Cheese of Sheep Milk,		
Milk Skmd Sheep,		
Goat milk, whole, fresh,		
Cheese of Goat Mlk,		
Milk Skimd Goats,		
Camel milk, whole, fresh;		
nutrient data only:		
Whey Fresh,		
Prod.of Nat.Milk Constit,		
Ice Cream and Edible Ice		

Appendix C

Table 2: categorisation of countries by region

Europe	Africa	Asia	Americas	Oceania
Eastern Europe	***Eastern Africa***	***Central Asia***	***Central America***	***Oceania-AUS_NZ***
Belarus	Burundi	Kazakhstan	Belize	Australia
Bulgaria	Comoros	Kyrgyz Republic	Costa Rica	New Zealand
Czech Republic	Djibouti	Tajikistan	El Salvador	***Oceania-Melanesia***
Hungary	Eritrea	Turkmenistan	Guatemala	Fiji
Moldova	Ethiopia	Uzbekistan	Honduras	Solomon Islands
Poland	Kenya	***Eastern Asia***	Mexico	New Caledonia
Romania	Madagascar	China	Nicaragua	Vanuatu
Russian Federation	Malawi	Hong Kong SAR, China	Panama	***Oceania-Micronesia***
Slovak Republic	Mauritius	Japan	***Northern America***	Kiribati
Ukraine	Mozambique	Korea, Dem. People's Rep.	Bermuda	Guam
Northern Europe	Rwanda	Korea, Rep.	Canada	Marshall Islands
Denmark	Somalia	Macao SAR, China	Northern Mariana Islands	Micronesia, Fed. Sts.
Estonia	South Sudan	Mongolia	United States	Nauru
Faroe Islands	Sudan	***South-Eastern Asia***	***South America***	Palau
Finland	Tanzania	Brunei Darussalam	Argentina	***Oceania-Polynesia***
Greenland	Uganda	Cambodia	Bolivia	French Polynesia
Iceland	Zambia	Indonesia	Brazil	Samoa
Ireland	Zimbabwe	Lao PDR	Chile	American Samoa
Isle of Man	***Middle Africa***	Malaysia	Colombia	Tonga
Latvia	Angola	Myanmar	Ecuador	Tuvalu
Lithuania	Cameroon	Papua New Guinea	Guyana	
Norway	Central African Republic	Philippines	Paraguay	
Sweden	Chad	Singapore	Peru	
United Kingdom	Congo, Dem. Rep.	Thailand	Suriname	
Southern Europe	Congo, Rep.	Timor-Leste	Uruguay	
Albania	Equatorial Guinea	Vietnam	Venezuela, RB	
Andorra	Gabon	***Southern Asia***		
Bosnia and Herzegovina	Sao Tome and Principe	Afghanistan		
Croatia	***Northern Africa***	Bangladesh		
Gibraltar	Algeria	Bhutan		
Greece	Egypt, Arab Rep.	India		
Italy	Libya	Iran, Islamic Rep.		
Kosovo	Morocco	Maldives		
Macedonia, FYR	Tunisia	Nepal		
Malta	***Southern Africa***	Pakistan		
Montenegro	Botswana	Seychelles		
Portugal	Lesotho	Sri Lanka		
San Marino	Namibia	***Western Asia***		
Serbia	South Africa	Armenia		
Slovenia	Swaziland	Azerbaijan		
Spain	***Western Africa***	Bahrain		
Western Europe	Benin	Cyprus		
Austria	Burkina Faso	Georgia		
Belgium	Cabo Verde	Iraq		
Channel Islands	Cote d'Ivoire	Israel		
France	Gambia, The	Jordan		
Germany	Ghana	Kuwait		
Liechtenstein	Guinea	Lebanon		
Luxembourg	Guinea-Bissau	Oman		
Monaco	Liberia	Qatar		
Netherlands	Mali	Saudi Arabia		
Switzerland	Mauritania	Syrian Arab Republic		
	Niger	Turkey		
	Nigeria	United Arab Emirates		
	Senegal	West Bank and Gaza		
	Sierra Leone	Yemen, Rep.		
	Togo			