

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences



**Factors affecting meat consumption in developing
countries over time**

BACHELOR'S THESIS

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Author: Mohammed Imran Nazir

Supervisor: doc. Ing. Klára Urbanová, Ph.D.

Declaration

I hereby declare that I have done this thesis entitled **Factors affecting meat consumption in developing countries over time** independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague 2024

.....
Mohammed Imran Nazir

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Abstract

Meat consumption has increased significantly in recent years globally, especially across developing countries. While economic growth played a crucial role, many other factors also significantly impact meat production and consumption. This bachelor's thesis examined and analysed the most important factors that shape the patterns of meat production and consumption in developing countries

Socioeconomic factors such as income levels and education stood out as the two of the most influential factors impacting meat consumption. Sociocultural factors such as religion and cultural traditions were also impactful although not to the degree of socioeconomic factors. The effects of the factors themselves were not uniform and varied across different countries.

This is not always positive as the rise in meat production and consumption led to increased deforestation, excessive water use and large emissions of greenhouse gases which often impact developing countries disproportionately.

Keywords: meat, developing countries, socioeconomic factors affecting meat consumption, meat production and consumption, access to meat-based protein

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List of the abbreviations used in the thesis

FAO– Food and Agriculture Organization

BRICS- Brazil, Russia, India, China, and South Africa

LDL cholesterol- Low-density lipoprotein cholesterol

HDL cholesterol- High-density lipoprotein cholesterol

CM- Cultivated meat

NAFTA- North American Free Trade Agreement

GHG- Greenhouse Gas

2. Introduction

Meat is a rich and important source of high-quality protein that provides the essential amino acids that are necessary for the proper functioning of the human body (Andreoli et al. 2021). Besides protein, meat also acts as a vital source of certain essential vitamins and minerals that are exclusively found in animal products and also have better bioavailability for the same reason (Font-i-Furnols 2023).

Meat consumption has dramatically increased globally in recent years and is nowadays considered to be at an all-time high with expectations to increase even more. One of the main reasons for this is the massive increase in meat consumption in developing countries, particularly those in Asia, as opposed to their developed counterparts where the consumption of meat had remained relatively stable for a long time (Wang & Scrimgeour 2021).

As per the estimates provided by FAO, developing nations had experienced a massive rise in meat consumption with the average annual per capita meat intake that had risen from 10 kg in the 1960s to 26 kg by 2000 with estimations that potentially indicate a further increase, reaching approximately 37 kg by the year 2030 (Vranken et al. 2014).

There are, however, multiple factors that play a significant role in their respective rights when it comes to meat production and consumption, especially within developing countries. These factors include:

1. Types of meat produced such as poultry, pork, beef, sheep, and goat (Whitton et al. 2021).
2. Social factors such as religious and cultural practises, particularly within ethnic and tribal traditions, and social status (Filippini & Srinivasan 2019).
3. Economic factors such as market prices and budget constraints are often a direct result of the effects of income (Andreoli et al. 2021) along with socioeconomic classes among the population.

4. Infrastructural factors such as storage and transportation facilities as these factors play a role in setting the market prices for meat as well as providing the general population access to the meat market (Ibarrola-Rivas & Nonhebel 2019).

5. Nutritional factors and increased awareness: As the literacy rate in developing nations is growing rapidly and more people are getting access to higher education, an increase in awareness regarding meat and its nutritional contents can be seen too, prompting more people to add meat to their daily diet as their primary protein source (Ge et al. 2022).

It should be noted that the factors that are mentioned above exhibit a broad scope and are a rather general description of the greater factors that run deep into the topic of meat consumption in developing nations and have many other smaller factors linked to them. As the rise in meat consumption in developing countries is relatively recent, there have been concerns that this fairly sudden but steady increase in global meat consumption aided by the growing world population might have a negative impact on our environment (Cole & McCoskey 2013). This can create an unsustainable food production practice that, in the long run, might cause irreparable environmental degradation.

It is therefore crucial to look deep into the factors that affect meat consumption in developing nations in order to understand and provide a solution to maintain the consumption of meat without compromising sustainability or the environment. This literature review will conduct an in-depth analysis of the factors that affect meat consumption in developing nations and how these factors can be enhanced and modified to promote healthy global meat consumption and sustainability at the same time.

3. Aims of the Thesis

This Bachelor's thesis aimed to recognise and describe the various factors impacting meat production and consumption across developing countries and how consumption changes over time, using a review and analysis of current scientific literature. Specific aims included an in-depth evaluation of socioeconomic influences, exploring cultural dimensions, assessing nutritional implications, addressing environmental sustainability concerns, and identifying policy implications.

4. Methodology

This Bachelor's thesis was completed by adopting a literature review methodology to thoroughly explore the factors affecting meat consumption in developing nations. The scientific articles used for the thesis were researched and collected from respected sources of scientific literature such as ScienceDirect, Scopus, Web of Science, Google Scholar, and Taylor & Francis. The main keywords that were utilised included 'meat production and consumption', 'sources of protein in developing countries', 'cultural perspectives on meat consumption', 'protein-rich diets' and 'meat industry in developing nations' among many others. The criteria to select and include the scientific literature focused on relevant, peer-reviewed studies addressing socioeconomic, cultural, nutritional and environmental aspects of meat consumption in developing nations. The selected scientific articles were then analysed and categorised to organise them well according to the planned structure of the thesis. The results were then used to create a structure that shows how different factors work together. All the scientific literature used in this thesis was cited as per the Conservation Biology style.

5. Literature Review

5.1. Understanding meat consumption in developing countries

Meat is a healthy and palatable source of food that when incorporated into the human diet can be a great source of protein and essential micronutrients such as iron, phosphorus, zinc, and a variety of B vitamins that are crucial for holistic health and wellbeing (Salter 2017). Over the past few decades patterns of food consumption in general and specifically meat consumption patterns have seen a massive spike globally. The bulk of the credit for this spike can be given to what we know as developing and emerging nations. While the topic of meat consumption in developing nations is a pretty complex phenomenon that is influenced by numerous factors such as economy, culture, nutrition, and environment, it often has wide-reaching consequences for adequate food access, community health and environmental preservation. As these countries undergo rapid economic growth and increased urban transformation along with increased earnings, the demand for meat products is also substantially increasing. In many developing countries, such as Vietnam, regular meat consumption is often considered to be a symbol of wealth and prestige (Markoni et al. 2023). In recent times many people especially within urban demographics, are starting to include meat as a staple in their diets. Developing countries, in this way, imitate Western dietary behaviour and include meat in their daily diet. As illustrated in Figure 1, although the developed nations in the European Union and North America are still dominant when it comes to per capita meat consumption, we can see that the Latin American and the Caribbean countries along with the BRICS nations (Brazil, Russia, India, China, and South Africa) are catching up swiftly too. African countries have shown the lowest per capita consumption of meat among all the regions as the area is still relatively behind other developing regions in terms of economic growth (Jiang & Kassoh 2023). It could be understood through the economic differences between the various regions of the developing world as the term ‘developing countries’ is often broad and is not always indicative of the economic status of the specific developing country in question. It is essential to understand the role that various factors

previously mentioned play in meat consumption across developing countries. In this chapter, we have looked into and described some of those factors.

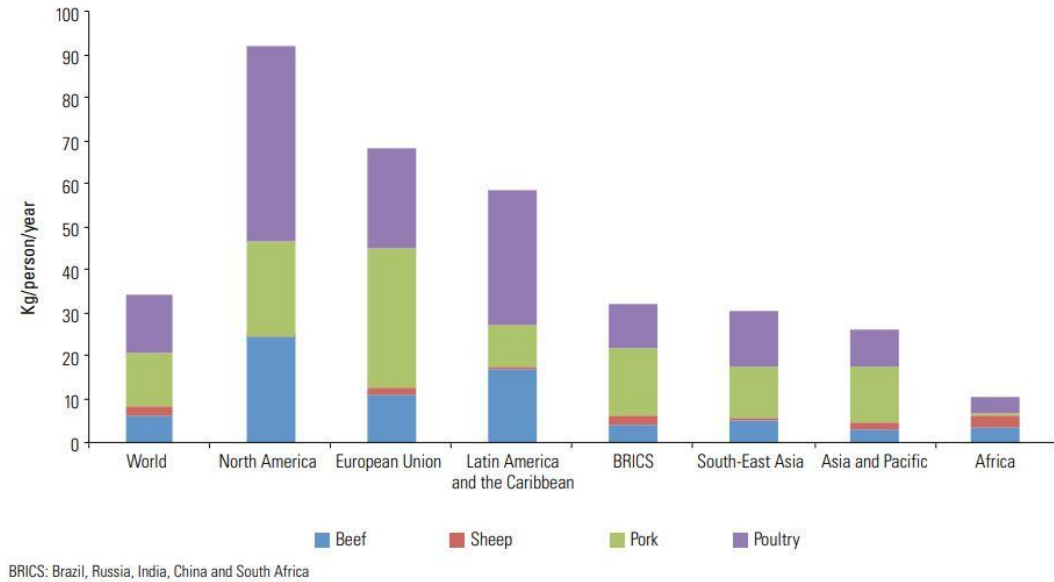


Figure 1 Estimated per capita meat consumption in selected regions (2014–2016) (Salter 2018)

Type of meat: The type of meat consumed, which includes beef, pork, and poultry among others, plays a crucial role in the shaping of dietary habits in developing countries. Factors such as affordability, accessibility, cultural choices, and nutrient content strongly influence the patterns of meat consumption. Poultry is often hailed as one of the most affordable and available types of meat as opposed to other types of meat such as beef or pork. According to Uzundumlu and Dilli (2023), in 2019 alone roughly 207 million tons of meat was produced globally of which chicken meat comprised approximately 57 %. This is because poultry production has rapid growth rates and reduced production costs which in turn keeps its market price lower. These factors aided by the fact that poultry is a great affordable source of lean protein make it the primary choice of meat across most developing countries. Beef and pork, however, are very often less sought after primarily due to their higher cost. In the example of Brazil, which is one of the leading producers of beef in the world, between March 2020 and April 2021, the domestic price of beef increased by 42.6 % due to the inflation caused mainly by the rise in the already high production costs (Magalhaes et al. 2023). Due to the higher costs, beef and pork are often

considered to be ‘novel food’ and are usually kept for special occasions across many developing countries. Social factors such as religion also play a big role by setting certain restrictions on different types of meat such as pork in Islam and beef in Hinduism.

Economic factors: Economic factors have a significant impact on the patterns of meat consumption in developing countries. With rapidly developing economies and rising income, many consumers within developing nations are starting to prefer a shift towards a higher quality diet which naturally includes more meat products. According to Shen and Zhong (2023), the loss of income that took place during the COVID-19 pandemic had a profound impact on the diet of most people across developing nations. Shen and Zhong (2023) also go on to mention that the percentage of people experiencing income loss was significantly higher in developing countries, especially those in Africa, and most people experiencing the income loss tried to counter this by cutting down meat products which in turn increased to the risk of food insecurity in these countries. This goes on to show how diet and economy are almost intertwined in many developing countries. Disparities are often not acknowledged, especially between urban residents and their rural counterparts as meat products are often both more accessible and more affordable to the urban population. These disparities are often enhanced by harsh trade policies and market dynamics making it even more difficult for some people to access meat.

Cultural influences: The populations living in the developing world are diverse in every sense of the word and are therefore subject to various traditional practices, cultural beliefs, and dietary habits. Meat and its consumption are no exception to these traditional and cultural beliefs. Across many cultures, meat is symbolically significant and is crucial to many religious rituals, social festivals, and cultural celebrations. Food, which includes meat, is often considered to be a central pillar of our social and cultural identity (Voinea et al. 2020). Cultural preferences for certain types of meat such as pork, poultry, or beef vary greatly indicating geographical, historical, and religious influences. It should be noted that traditional cuisines and culinary practices greatly contribute to the variety of meat-based recipes consumed across developing countries (Beushausen et al. 2014). It is quite important to understand the ideas behind these cultural influences so that culturally delicate interventions can be created that can promote diversity in diet and introduce as well as encourage the idea of alternative protein sources to the population of developing countries (Nguyen et al. 2021).

Environmental considerations: In recent years there has been a substantial growth of concerns regarding the impact of meat consumption, particularly across developing countries, primarily due to the consequences that large-scale meat production has on the use of land, biodiversity, and climate change. Large-scale livestock production is often defined through intensive agricultural practices and plays an effective role in deforestation, degradation of soil quality and destruction of habitat, especially in ecologically sensitive areas (Nguyen et al. 2021). Needless to say, livestock farming is a massive source of greenhouse gas emissions, particularly nitrous oxide and methane, which add to global warming and climate change (Vranken et al. 2014) thereby damaging the planet. Whitton et al. (2021) state that the effects of greenhouse gases found in ruminant meat happen to be twenty to one hundred times higher than those found in plant-based foods. Undoubtedly, meat production and consumption leave behind a massive environmental footprint which must be confronted. To do that, however, it is necessary to understand as well as pave the road for the implementation of environmentally friendly farming methods and plan sustainable land use through policy interventions. This will not only encourage but also promote efficient use of resources all while playing a key role in maintaining biodiversity across the developing world.

Nutritional challenges: Meat is undoubtedly a healthy source of essential nutrients such as protein, zinc, and iron among others. Overabundant consumption, however, of meat can lead to various health risks, especially across developing countries where access to healthcare and nutritional and dietary knowledge can often be quite limited. Overconsumption of red and processed meat has been attributed to an elevated risk of non-communicable diseases like diabetes (both type 1 and 2), chronic kidney diseases and musculoskeletal disorders (such as osteoarthritis and osteoporosis) (Zhao et al. 2023b). Of course, insufficient access to diverse and healthy food choices will lead to malnutrition and also cause deficiencies of micronutrients which greatly contributes to the already existing public health challenges across developing countries. It should be noted that fresh white meat is not associated with the diseases mentioned above and is rather recommended as a healthy source of meat and micronutrients. Research shows that

substituting red meat with white meat in the diet might lead to improved blood cholesterol levels, which include reduced LDL cholesterol (also known as the unhealthy cholesterol) and improved LDL to HDL cholesterol (also known as the healthy cholesterol) ratio (Salter 2018). To be able to diversify the diet of the common people while continuing to tackle nutritional deficiencies across developing countries, balanced diets that include various protein sources together need to be promoted and the necessary dietary and nutritional education need to be offered.

Socioeconomic implications: Socioeconomic implications can be defined as the wider economic and societal effects or the results of a specific policy, action, or scenario, including changes in the distribution of income, job opportunities, social progress, access to resources, and general wellbeing within society. In developing countries, the socioeconomic implications of meat consumption encompass far beyond dietary preferences to the creation of income, maintaining social justice, and commoner livelihood. Livelihoods such as livestock farming, and meat production help create income generation for hundreds of thousands of small-scale farmers and livestock-rearing communities creating room for improved rural livelihoods and increased economic development (Salter 2017). Nevertheless, obstacles such as resource accessibility, market assimilation, and lack of efficiencies in the value chain commonly restrict the benefits obtained from livestock farming, especially for those from underprivileged communities. Evidence shows that the rise of modernised meat production systems, especially in more recent times, can often lead to land acquisition, forced relocation of local communities and severe disputes over access to natural resources (Ibarrola-Rivas & Nonhebel 2019). Unfortunately this phenomenon seems relatively common across many developing countries too. These socioeconomic obstacles can, to a good extent, be resolved if comprehensive policies are implemented, adequate financing of rural development is made and, environmentally conscious agricultural practices that promote inclusive growth are endorsed. Besides, if sustainable livelihoods and social unity across developing countries can be promoted then meat production and greater social, economic and environmental sustainability across developing countries can be reconciled.

5.1.1. Dynamics of meat production and supply chains

Meat production and consumption across developing nations are often impacted by a variety of socioeconomic factors. This is why understanding the greater context of meat production and supply chains which, in turn, helps provide a clearer insight into the relations that exist between the economic, agricultural and environmental systems. Through researching the dynamics of meat production and supply chains, a broader understanding of the sophisticated systems that are involved in satisfying the worldwide demand for meat products can be found. In this sub-chapter, we took a deep dive into the complex dynamics of meat production, processing, distribution and consumption, while showcasing the core concepts and existing obstacles that need to be resolved.

Meat production systems: Meat production systems are quite complex and therefore incorporate a broad range of agricultural practises, from extensive grazing systems to intensive feedlot operations, where each has its unique outcomes for ecological sustainability, animal wellbeing and food security. Grazing can be defined as keeping cattle in pastures where they acquire their feed directly from the vegetation (Kibona et al. 2022b).

Table 1 Comparison of cattle farming methods: Indoor housing system, Continuous grazing, and Regenerative grazing. Adapted from (de la Fuente et al. 2023).

Production system	Type	Characteristics	Productivity	Environmental impact
Indoor housing system	Intensive	Small, closed spaces. Concentrated feeding is involved.	Highly productive.	Generally negative due to high resource use.
Continuous grazing	Extensive	Large pastures and open spaces.	Generally low.	Mostly negative due to high greenhouse gas emissions.
Regenerative grazing	Extensive	Pasture grazing in a rotational system.	Moderately to highly productive.	Generally positive due to low water pollution and increased biodiversity.

Table 1 shows the different types of cattle farming methods common across many developing countries along with their characteristics and impacts. Extensive farming systems, which are common across many developing countries, often depend on traditional herding and grazing practices and are usually incorporated with small-scale farming and agroforestry (Fuseini & Sulemana 2018). On the other hand, intensive systems, usually found in technologically advanced nations, include massive confinement processes, high-input feed regimes, and automated production systems (Tenrisanna & Kasim 2020). If the necessary discussions on sustainable agricultural practises as well as livestock farming practises are to take place, it needs to be first understood how diverse the meat production systems are as it will help showcase the concessions that exist between the effectiveness, environmental consequences, and social awareness with regards to the meat production systems across developing countries.

Supply chain dynamics: The meat supply chain includes a sophisticated system that involves various actors, procedures and infrastructure that are entailed in the journey

of meat products. This includes production, processing, distribution and selling, from farming to consumption. The essential elements of the meat supply chain involve livestock farming, animal slaughter facilities, meat processing facilities, transportation logistics, wholesale markets, and retail outlets (Najafi & Zolfagharinia 2024).

Figure 2 below shows a relatively simple meat supply chain model using the example of the pork supply chain model in Vietnam. The integral components of the meat supply chain, which includes the feed producers, animal farmers, intermediaries, and retailers also well depicted in in Figure 2.

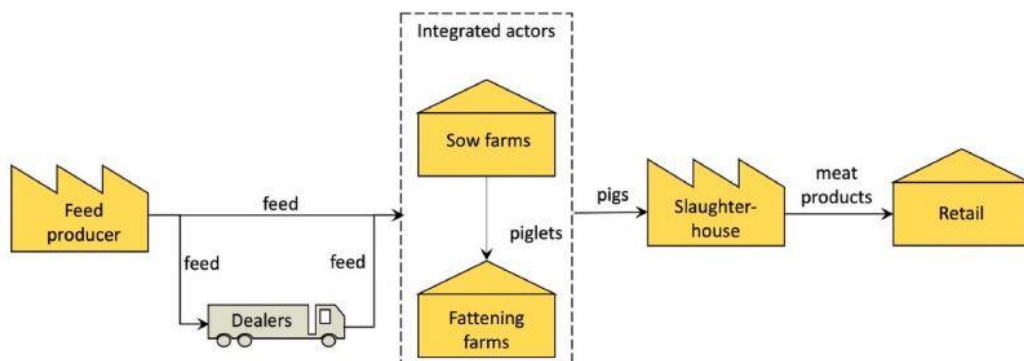


Figure 2 Pork meat supply chain in Vietnam (Kassahun et al. 2023)

Kassahun et al. (2023) argue that a clear and transparent meat supply chain is crucial to be able to supply high-quality meat to consumers. This is particularly important as every stage of the meat supply chain presents distinct challenges and prospects, such as guaranteeing food safety and quality, reducing waste and loss, providing efficient transportation, and satisfying consumer choices and demands. This shows how important it is to analyse the meat supply chain dynamics as it discloses the interconnections and weaknesses that are present in the global meat supply chain. This in turn shows how necessary it is to have robust and versatile meat supply chain strategies, especially in developing countries.

Market forces and trade dynamics:

Meat markets are structured by a sophisticated interconnection of supply and demand dynamics, impacted by various factors such as consumer choices, dietary preferences, earning levels, state policies, and global trade agreements (Kibona et al. 2022). Figure 3 below highlights that by 2029, the worldwide processed meat market is anticipated to account for roughly USD 463 billion and a fair share of that increase would be due to the increasingly rising meat production and consumption markets in the developing world (Mohammadi et al. 2023).

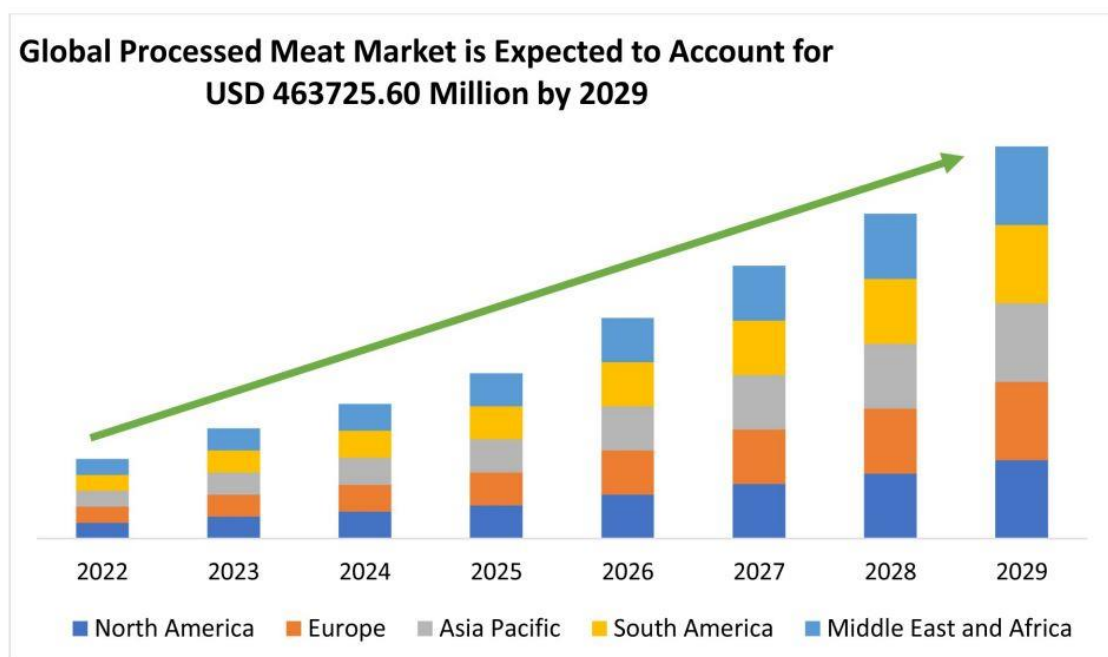


Figure 3 Regional breakdown of the worldwide processed meat market (2022–2029) (Mohammadi et al. 2023)

With increasing globalisation, there has also been a massive increase in the unification of meat markets therefore enabling the distribution of products across nations and continents (Kibona et al. 2022a). Nevertheless, the meat supply chain can also experience disparities and weaknesses, especially for small-scale meat producers and people from underrepresented communities. These disparities and weaknesses often arise due to a lack of proper understanding of the meat market dynamics across developing countries. One of the best ways this can be confronted is by understanding the forces that shape the meat market and the trade dynamics of the global meat market to be able to tackle the issues of barriers to access the market, market consolidation, and price

volatility. This in turn will promote a comprehensive and fair involvement in meat value chains.

Technological innovations and future trends: The meat production industry is being greatly reshaped thanks to the progress in technology and innovation. This is causing meat production and the meat supply chain to get more efficient, more sustainable, and achieve improved animal welfare (El Wali et al. 2024). El Wali et al. (2024) also mention that technological innovations such as precision farming, genetic selection, smart logistics, and blockchain traceability are transforming the production, processing and distribution of meat products and how such innovational practices in the meat industry are becoming more mainstream with time. In addition to that, there have been quite several growing trends such as plant-based alternatives, cultivated meat (CM), and insect-based protein in recent times.

Figure 4 below illustrates a rather general process of obtaining cultivated meat. A significant factor that makes the process of preparing and obtaining cultivated meat unique and brilliant is the elimination of the need to slaughter animals making it much more ethical in the eyes of the consumers. However, this also means that the prices of the cultivated meat products will be significantly higher than standard meat or meat obtained from slaughtered animals which might reduce sales and interest. In a survey conducted by Fujiwara and Tachikawa (2024), it was found that only the younger generation in Japan showed some level of acceptance, while maintaining some hesitancy, towards cultivated meat but was worried about the prices. Fujiwara and Tachikawa (2024), however, mention that other alternatives to meat such as plant-based products and insect-based products are much more likely to be accepted primarily because these products have a much longer history in the food markets in comparison to cultivated meat. Santos et al. (2023) argue that while the costs of cultivated meat may initially be high, the prices will significantly decrease over time as cultivated meat becomes more mainstream in the food market. Understanding these emerging technological trends is important as they can significantly alter the meat market and also promote sustainable meat consumption.

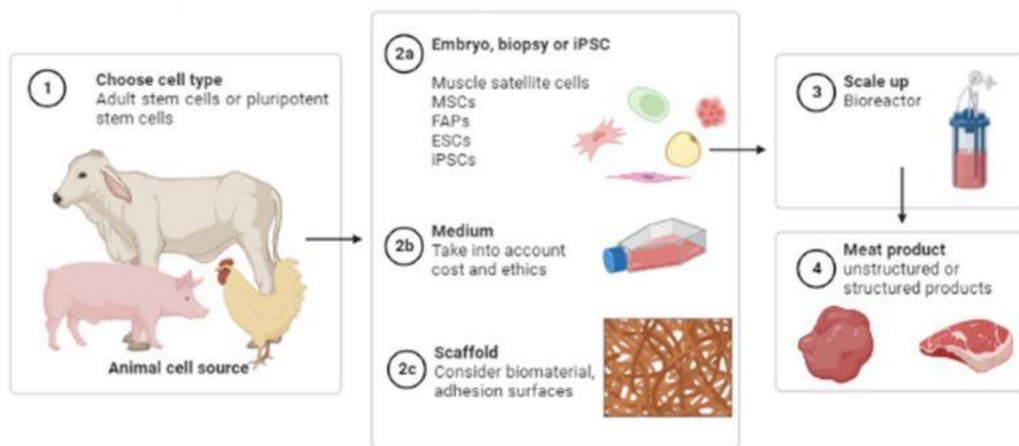


Figure 4 A standard workflow for cultivated meat production (Santos et al. 2023)

5.2. Socioeconomic factors affecting meat consumption in developing countries

Socioeconomic factors play quite a significant role in shaping meat production and consumption patterns across developing countries. Economy, education, culture, and other institutional factors play a crucial role in structuring food consumption patterns as well as determining nutritional outcomes (Andreoli et al. 2021). In recent years, many developing countries have been urbanising as well as industrialising at a rapid pace causing massive changes to the existing socioeconomic structures along with the way of life and meat production and consumption were no exemptions. For most people living in developing countries, the ability to access and afford meat products is directly linked to several socioeconomic factors such as income levels, state policies, job opportunities and education among others (James et al. 2022) as these factors are crucial in deciding dietary preferences and nutritional outcomes.

The primary influencers of meat consumption in developing countries are considered to be income levels and employment as they are directly related to a person's purchasing power as well as accessibility to a variety of protein sources which includes meat (Andreoli et al. 2021) and those with higher income levels are usually associated with higher socioeconomic status.

Governmental policies also have a significant impact on both meat production and consumption. Governmental policies are commonly implemented in the form of regulating meat prices, controlling market dynamics, negotiating trade agreements, providing subsidies or increasing taxes (Udomkun et al. 2018). Such policies also play a role in other areas of meat production and consumption such as maintaining the standards of food safety.

Education is another vital factor in shaping meat consumption patterns across the developing world. As the levels of education are nowadays getting increasingly higher, so is nutritional awareness along with diversity in diet. Educated people in developing countries are more likely to include meat and other animal products in their diet while considering the dietary recommendations to prevent overabundant and unhealthy consumption of meat (Modlinska & Pisula 2018). Several courses and programmes on food and nutrition are nowadays a mandatory part of school curriculums across many developing countries and these courses are crucial for providing the necessary dietary knowledge and promoting healthy eating behaviours at a young age (James et al. 2022).

In this chapter, we took an in-depth look at the aforementioned socioeconomic factors that affect meat production and consumption in developing countries and tried to understand how these factors play their respective roles and what are the gaps and underlying issues within these factors that need to be addressed to promote sustainable and fair consumption of meat in developing countries.

5.2.1. Effects of income levels on meat consumption

Income can be defined as the money earned by a person or an organisation through a variety of sources such as salaries, wages or investments over a certain period and is indicative of financial means available to a person or organisation and is a key factor in determining their economic wellbeing and purchasing power (Vranken et al. 2014). Income often plays a key role in shaping dietary patterns both globally and across developing countries and that includes shaping meat consumption patterns too. When it comes to consuming meat in developing countries, Andreoli et al. (2021) state that income was found to be the most important factor for the most part although to which extent income affects meat consumption can vary. According to Chen et al. (2023), the per capita meat consumption had increased to 42.76 kg globally from 41.62 kg in 2010, which is a

2.7 % increase in a decade. Chen et al. (2023) believe that the factor that aided this increase the most was the rise in income levels across developing countries as many of these countries saw relative economic growth during 2010-2020.

Income levels have been increasing rapidly across many developing countries and this in effect has also been causing an increase in urbanisation. An increase in food consumption, especially meat and other animal products, is found to be directly proportional to increasing income levels and urbanisation across many developing countries and this is backed up by research conducted by Cole and McCoskey (2013) on several developing countries across Asia and Africa where it was found that increasing income levels and urbanisation had a considerably favourable influence on meat consumption. In relative contrast, although there was an increase in overall meat consumption, rural residents did not tend to show a significant increase in meat consumption with increasing income levels when compared to their urban counterparts and this was often noticeable even within smaller areas such as provinces within countries. It should, however, be noted that there was a considerable increase in overall food consumption in the rural areas due to income growth, but that growth was more evenly distributed across the different types of food. This can be seen in the example from China where, with increasing income, there was a relatively decent growth in meat consumption but when it came to the regular dietary pattern most of the rural residents chose to incorporate a variety of protein sources and included items such as fish, eggs, milk instead of only adding meat (Zhao et al. 2023a).

Another factor that should be considered here is income elasticity which can be broadly defined as the measurement of responsiveness of the quantity demanded of a product or service to changes in income levels or simpler terms how much the demand for a specific good can change according to the changes in income levels for a given population (Cole & McCoskey 2013). The formula that is used to calculate income elasticity is

Income Elasticity of Demand = % change in demanded quantity/% change in income

Income elasticity can be either positive, negative, or zero where positive (more than zero) shows that the demand for a particular product will increase with increasing

income, and negative (less than zero) shows that the demand for a particular product will decrease with increasing income, and zero indicating that the demand for a particular product will remain constant without regards to any changes in income (Cole & McCoskey 2013).

With that in mind, we can use some examples of the income elasticity of meat from different developing countries to get an idea of how changes in income affect the demand for meat products. In the case of China, Cole and McCoskey (2013) state that the data for urban Chinese residents show that the income elasticity of pork and beef is 0.462 and 0.496 respectively. This indicates that a good number of urban Chinese residents consider both beef and pork to be a relatively necessary part of their diet and even if their income level increases, their demand for beef and pork will see a relatively slower increase. This shows that both beef and pork play a relatively staple role in the diet of urban Chinese residents. Cole and McCoskey (2013) state another example, this time in the Umzumbe community of Kwa-Zulu Natal in South Africa. The data shows that the estimated income elasticity of meat is 1.04, which means that the residents of the Umzumbe community find meat consumption to be positively affected by any changes to their income levels and meat is more or less considered to be a luxury food for which a larger portion of their income is needed if meat is to be consumed on a relatively regular basis. One final example to look at is from Vietnam where Markoni et al. (2023) state that the estimated income elasticity of meat is 1.068 for rural residents whereas 0.692 was estimated to be for urban residents. From this it can be understood that for rural Vietnamese residents meat consumption is much more sensitive to their changes in income levels and their demand for meat will increase at a proportionally higher rate as their income increases whereas urban Vietnamese residents will only keep a smaller section of their income for consuming meat as it is not a priority spending for them.

Meat consumption in developing countries varies greatly and Figure 5 gives examples of red meat consumption in different developing countries in 2020. Although,

with the sole exception of Australia, all the other countries are considered to be developing countries, including Australia can be beneficial when comparing the data to see how income levels and even other factors affect meat consumption in these countries. Mongolia can be seen with the highest per capita consumption of red meat at 92.89 kg/capita/y, and this can be attributed to the importance red meat and meat, in general, has in Mongolian cuisine. Due to having quite a small population living in a massive country with large areas of pastoral lands, meat and more specifically red meat is quite accessible and affordable for the vast majority of the people, although most people have relatively lower levels of income, leading to its high consumption. In the cases of Argentina and Australia, the per capita consumption of red meat is at 48.35 kg/capita/y and 47.64 kg/capita/y respectively which makes these countries moderate consumers of red meat. Although Australia is a developed country and Argentina is a developing country, both countries massively invest in livestock farming industries and are major exporters of beef (Font-i-Furnols 2023). Australia, in particular, is also ranked as the largest exporter of goat meat globally (Abhijith et al. 2023) which makes red meat like beef and mutton relatively accessible to the local populations. This is particularly helpful for the Argentine population on the lower end of the income spectrum that can still afford to consume meat regularly with relative economic ease. For both Chad and Zimbabwe, red meat consumption is slightly on the lower side at 45.42 kg/capita/y and 44.16 kg/capita/y respectively but not significantly lower than that of Australia or Argentina. This is mainly because while income levels are relatively low, when compared to global standards, they have been increasing which encourages the locals there to buy more meat products to diversify their diet. In the cases of the DRC, Mozambique and Liberia, it should be noted that while Figure 5 shows that the per capita red meat consumption is 0 kg/capita/y, Font-i-Furnols (2023) mentions that it is less than 1 kg/capita/y which is borderline negligible. This is understandable as all three of these countries face high levels of poverty while having very low levels of income which makes red meat almost unaffordable for a good portion of the population.

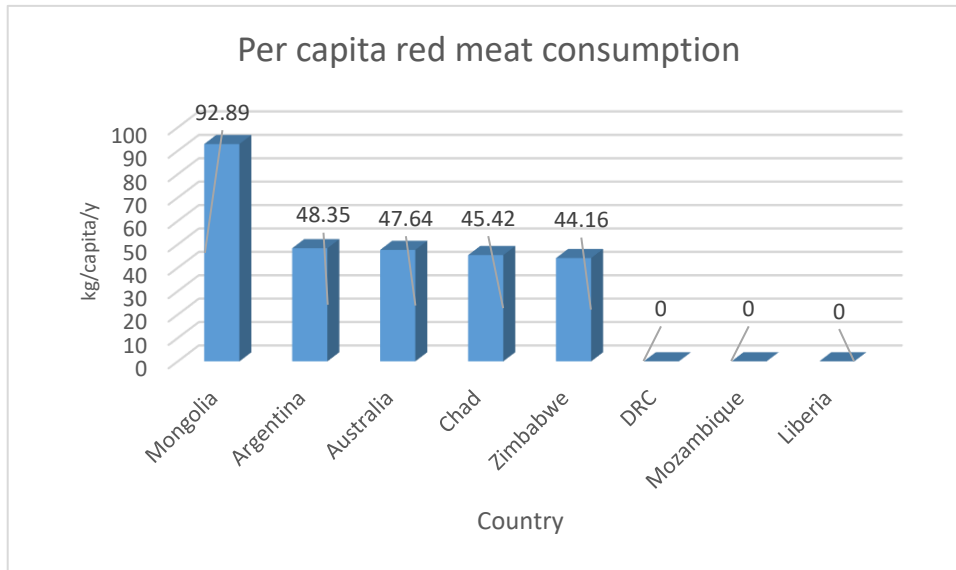


Figure 5 Examples of per capita red meat consumption in 2020. Adapted from (Font-i-Furnols 2023)

5.2.2. Effects of governmental policies on meat consumption

Governmental policies have quite a significant effect on both the structure of the food and agricultural market and economy and, meat production and consumption are no exception. Such policies often play a direct role in shaping the dietary patterns of the populations living in developing countries and that also includes meat consumption patterns. From providing subsidies to lower meat production costs to signing trade agreements that shape the retail prices of meat products, governmental policies play a key role in the economics of meat consumption (Lundström 2019). Not to forget the other types of governmental policies that include social policies such as food safety policies to regulate meat safety and quality and environmental policies to minimise the environmental damage caused by meat production (Stoll-Kleemann & Schmidt 2017). In this sub-chapter, we looked into the different types of policies that affect meat consumption that are being implemented in developing countries along with some examples to get a more practical understanding.

Figure 6 below illustrates the different categories of governmental policies that affect food production and consumption in developing countries which of course includes meat production and consumption too. Economic and social policies make up the vast majority of the governmental policies that are introduced and implemented at 46 % and 32 % respectively while environmental and political policies make up only 13 % and 10

% respectively which is an indication of the fact that when it comes to meat consumption, developing countries highly prioritise economic and social policies and often, to a certain extent, tend to downplay the significance of the environmental and political policies.

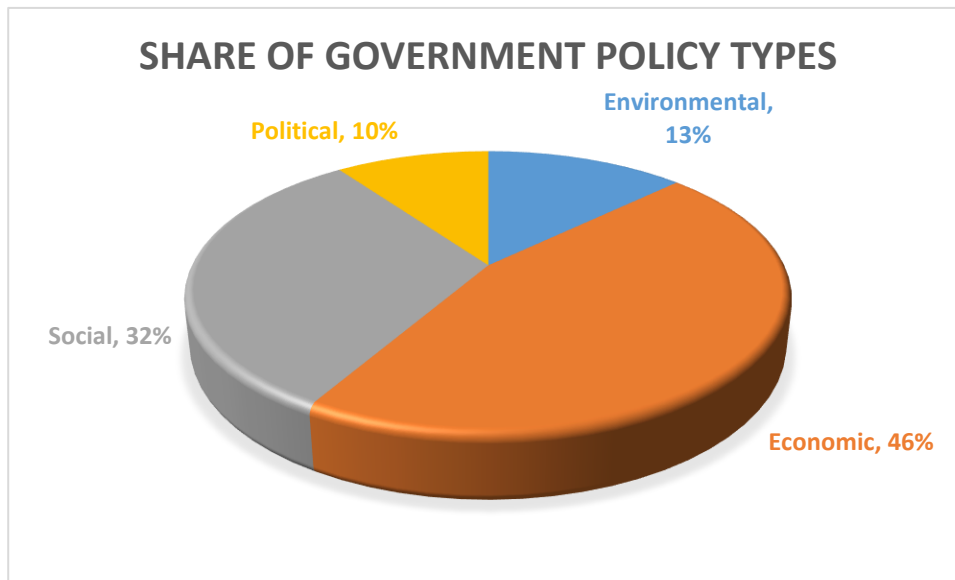


Figure 6 Different factors that shape governmental policies regarding food and agriculture. Adapted from (Lencucha et al. 2020)

Food safety and public health policies: Governmental policies related to food safety and public health play a major role in shaping both meat production and consumption across developing countries. Shaping the retail prices of meat and influencing the confidence of meat consumers which in turn influences the demand for meat products, are some of the ways in which such policies can affect the consumption of meat. When effectively implemented, food safety policies can significantly improve the confidence of the average consumer in the existing meat markets which, in effect, increases the demand for meat products (Walker et al. 2005). The opposite, however, is true too as any scandals arising from failed implementations of food safety policies often receive severe public backlash which in turn often results in lower demands for meat. For example, Gizaw (2019) mentions that when news of any foodborne pathogen such as E. coli or Salmonella is reported to have been found in meat, the average consumers often respond by a near complete avoidance of meat products out of fear that they might catch the illness. This showcases the necessity to consider consumer confidence when

implementing food safety policies. Food safety policies, when properly implemented, can also lead to major economic benefits. Walker et al. (2005) find that food safety policies that are implemented to reduce the spreading of foodborne illnesses can help save approximately US\$ 110 billion per year in productivity and reduce medical costs across low-income and middle-income nations. This financial saving can often help increase disposable incomes and thereby increase the consumption of meat. Proper implementation of strict food safety policies can help significantly increase the overall quality of meat production (Burgaz et al. 2023) by producing higher quality meat products at individual meat production facilities. Policies that particularly target the adequate handling, processing and storage of meat products can immensely reduce the spread of foodborne diseases by reducing the risks of contamination which is encouraging to customers. In an example from Godfray et al. (2018) from Brazil, which is currently a major exporter of poultry globally, proper implementation of strict food safety regulations saw a massive success. The Brazilian government had implemented strict food safety policies through a thorough inspection and also simultaneously increased the quality standards for meat production which in turn caused Brazil to mass produce high-quality poultry meat. Godfray et al. (2018) also mention that the implementations of the aforementioned policies helped not only significantly increase meat consumption domestically but at the same time greatly increased the confidence of international meat consumers in Brazilian meat products. Conversely, a lack of proper food safety policies can seriously reduce meat consumption. Lencucha et al. (2020) mention that the clenbuterol-contaminated pork scandal in China led to a massive decrease in not just pork meat but also other types of meat due to increased public fear and decreased public trust emphasising the need for effective food safety policies.

Subsidies and trade agreements: Some of the most common forms of governmental policies affecting meat production and consumption across the developing world are implemented in the forms of providing subsidies and negotiating trade agreements. These policies can often strongly impact both meat production and consumption in developing countries as these policies have the power to decide the affordability and accessibility of meat products which in turn impacts the attitudes of consumers towards meat products (Walls et al. 2018). Meat production cost is a major factor in shaping the retail prices of meat products and higher production costs, of course, result in higher meat prices for consumers. Financial support from the government in the

form of subsidies can significantly reduce the costs of meat production and thereby lowering the retail prices of meat increasing its affordability for the average consumer (Raihan 2023). An example here can be animal feed, which is often costly for many small-scale livestock farmers across the developing world. Governmental subsidies aiming to reduce the costs of animal feed can significantly decrease the livestock farming costs for such small-scale farmers who can then sell their meat products for much lower prices making it more affordable to a larger group of consumers resulting in increased meat consumption (Walls et al. 2018). It should be noted that providing subsidies does not always end up as beneficial as often excessive subsidies can cause distortions in the meat market which in turn often leads to an unnecessary overproduction of meat and can also cause significant damage to the environment (Pais et al. 2020). Pais et al. (2020) also mention that subsidies aiming to support small-scale livestock farmers often motivate them to incorporate highly unsustainable farming practices which can have detrimental effects on the environment in the long run. This can drastically affect meat consumption over time as constant deterioration of the environment will undoubtedly cause meat production capacity to decline.

Trade agreements can be highly beneficial for both the meat production industry and meat consumers in developing countries. Reduction in tariffs, opening up markets and, aiding the import/export of meat products are some of the ways in which trade agreements can benefit developing countries (Upton & Otte 2004). Negotiating such trade agreements can increase the import of affordable meat to developing countries which in turn can increase the accessibility of meat products to the local consumers (van Berkum 2021) although this can also have quite a negative economic effect on the local meat producers. Developing countries can also benefit from such trade agreements through export opportunities of domestically produced meat to other countries which can cause an increase in both the production and consumption of meat domestically (Ederer et al. 2023). The North American Free Trade Agreement (NAFTA) is a great example of such a successful trade agreement where Mexico negotiated with the United States and Canada to have tariff-free access to their markets (Ibarrola-Rivas & Nonhebel 2019). Thanks to NAFTA, Mexico was able to significantly increase its meat exports which in turn caused the meat production industry in Mexico to undergo a massive growth and also greatly increased meat production. This not only led Mexico's economy to improve but also made meat much more accessible to the Mexican people.

Environmental policies: The meat production industry and livestock farming practices often play quite a big role in environmental degradation. Besides being a massive source of greenhouse gas emissions, the meat production industry and livestock farming practices also aid in deforestation and biodiversity loss (Stoll-Kleemann & Schmidt 2017). Governments across many developing countries try to minimise these environmental damages through implementing environmental policies and these policies impact both meat production and consumption across developing countries.

Meat production industries across developing countries need to be well regulated and governments often use environmental policies as the means of such regulations when it comes to environmental concerns. Setting certain quotas and standards for greenhouse gas emissions, land allocation and, maintaining animal welfare are some of the ways in which environmental policies are used to regulate the meat industries (Raihan 2023). This, however, can also affect meat consumption quite negatively and an example of this can be taken from Falchetta et al. (2021) who mention that environmental policies that aim to reduce deforestation can often limit grazing lands from further expanding which, in turn, decreases the production of meat while increasing the retail prices of meat and therefore making meat less affordable for many consumers.

Another way environmental policies are used to reduce environmental degradation from meat production is by encouraging sustainable farming practises in the form of providing subsidies or discouraging unsustainable farming practices by increasing taxes on meat products that leave high environmental footprints (Stoll-Kleemann & Schmidt 2017). Falchetta et al. (2021) mention that financial incentives or a lack of them can make quite a difference as they can motivate meat producers to seek more sustainable ways to produce meat.

Environmental policies are also often used to raise consumer awareness through campaigns and various educational programmes on the topics of the environmental degradation caused by the production and consumption of meat across developing countries (Godfray et al. 2018). Alternative diets, especially plant-based ones, are often promoted and consumers are encouraged to incorporate such diets into their dietary patterns. While this can help reduce the environmental degradation caused by meat production and consumption, this will also lead to a decrease in overall meat consumption (Pais et al. 2020).

5.2.3. Effects of education on meat consumption

The rate of education has been rising rapidly across the developing world and as such the number of educated people has been increasing. When it comes to food consumption patterns and dietary choices, which include meat consumption, it is borderline undeniable that education plays a key role in it. In this sub-chapter, we looked at the particulars of how education affects meat consumption in developing countries.

Educational attainment and dietary choices: Individual who are moderately to highly educated are often more aware of their nutritional requirements and are also more knowledgeable about the implications that dietary choices have on one's health (Mandolesi et al. 2020). As more and more people can receive education across developing countries, a quite noticeable trend has emerged where meat consumption has in most cases increased and, in some cases, even decreased in connection to the education achieved. Modlinska and Pisula (2018) find that across many developing countries where the rate of education has been significantly increasing, there has been a relatively noticeable rise in the consumption of poultry meat due to its relatively cheaper price which indicates that many educated people across developing countries want to incorporate some kind of meat product in their diet in order to diversify their diet. However, there has also been a decrease in meat consumption with increasing rates of education in some places. According to a study conducted by Azizi Fard et al. (2021), it was found that across some developing countries people who were moderately to highly educated often tended to incorporate more fruits, vegetables and fish into their diet while decreasing the amounts of red meats and sweets. Urban areas in India are a good practical example of this where due to the increasing levels of education there was a noticeable rise in vegetarianism while quite a decrease in meat consumption which reflects the health awareness caused by increasing education levels (Scudiero et al. 2023).

Economic implications of educational influence: Across most developing countries people with decent educational backgrounds tend to have better jobs which in turn leads to better sources of income. This allows them to be quite flexible in making their food choices and that also includes purchasing higher quality meat products which

become more affordable (Magalhaes et al. 2023). This can be seen in Brazil where the rapidly growing middle-class population has significantly increased the consumption of red meat, which was considered to be quite expensive more than a decade ago, as the education rate in Brazil has been increasing quite fast resulting in an increase in employment and higher paid jobs (Travassos et al. 2023).

As illustrated in Figure 7 below, we can see that per capita meat consumption in Vietnam increases significantly with increasing levels of education. Harris et al. (2020) state that increasing levels of education leads to higher chances of getting not just a job but also much higher paying jobs which motivates consumers to incorporate more meat into their regular diet. Another factor is the increasing nutritional awareness due to the increasing levels of education which leads many consumers to consider the nutritional benefits of meat and therefore increase consumption.

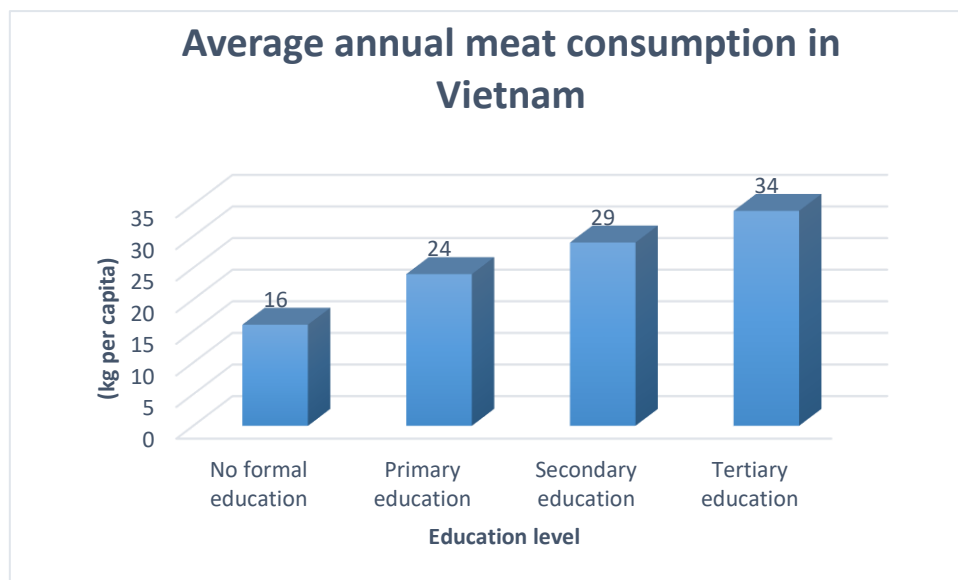


Figure 7 Impact of education level on meat consumption in Vietnam. Adapted from (Harris et al. 2020)

Environmental awareness and meat consumption: Due to the increasing rate of education across developing countries a good amount of people are aware of the environmental effects of both meat production and consumption and this affects their dietary choices, which includes meat consumption, to a good degree. Kim and Maeng (2023) state that a relatively high number of young and educated Koreans are actively trying to reduce meat consumption and are primarily motivated by environmental reasons. Not only meat consumption but also meat production is impacted by increasing education levels. Environmental education is being actively provided to many communities across developing countries to promote sustainable agricultural practices. In Kenya, many rural communities are reducing their dependency on livestock farming and are actively promoting sustainable agriculture thanks to community-based environmental education (Bukachi et al. 2022). While this does not necessarily mean that meat consumption will reduce, a reduction in livestock farming will reduce meat production which in turn may affect meat consumption.

Health outcomes and education: It is without a doubt that educated individuals tend to be more health conscious than undereducated or uneducated individuals. As Azizi Fard et al. (2021) mention educational attainment can often be directly associated with healthier dietary choices. Azizi Fard et al. (2021) also mention that educated individuals tend to consume significantly more white meat than red meat and also often incorporate alternative sources of protein such as fish or lentils into their diet which indicates that many educated consumers possess a relatively good amount of dietary knowledge. An example of this can be seen in South Africa where many educated consumers have significantly increased the consumption of alternative protein, such as plant-based protein, as a replacement for meat thanks to the dietary knowledge gained from the various educational programmes that showcase both the health and environmental risks of overconsumption of meat (Lloyd-Sherlock et al. 2020).

Social and cultural factors about education: For a long time, meat was considered to be a symbol of wealth and social status as the poorer people were often unable to consume meat regularly. However, as education levels rise these outdated ideas start to fade away. Levasseur et al. (2024) state that most educated consumers across developing countries no longer consider meat to be a symbol of wealth or status but rather view it as food, which is what it is. This creates a shift in the cultural values across these

countries which, to a certain degree, can cause meat consumption to decrease as the educated consumers in these countries will shape their dietary habits according to global health and environmental trends. This can be seen in the example from Mexico where many schools are now implementing a policy called ‘Meatless Mondays’ which intends to decrease meat consumption while raising awareness of its environmental consequences (Martínez-Martínez et al. 2023).

5.3. Sociocultural influences and environmental considerations

Meat consumption in developing countries is indeed quite a complex topic. It is not just the economic or infrastructural issues that affect meat production and consumption across the developing world but also social factors such as culture, traditions and, environmental concerns. These social factors are quite prevalent across developing countries and have a profound impact on meat consumption.

Cultural practises and local traditions significantly impact the dietary patterns, which include meat consumption, across many developing countries and as such meat is highly valued even beyond its nutritional benefits. A great amount of indigenous and local cultures consider meat to be crucial when performing rituals or enjoying festivities and also use meat as an indicator of growing prosperity (Leroy et al. 2023). However, as many of these developing countries continue to grow economically, they also experience the evolution of their societies, and this has led to a significant change in their cultural patterns which often directly or indirectly causes meat consumption patterns to change too.

Meat production and consumption significantly impact the environment and often negatively so. From contributing to climate change via greenhouse gas emissions, excessive use of land and water resources, and aiding the loss of biodiversity, meat production and consumption are doing considerable damage to the planet (Valli et al. 2023). Developing countries often find themselves to be even more harshly impacted by these environmental degradations in comparison to their developed counterparts mostly because agricultural practices in these countries are usually not sustainable enough and the need to satisfy the growing food demands due to the increasing population often overshadows the need to balance the ecological preservation (Chatti & Majeed 2024).

5.3.1. Social and Cultural Influences on Meat Consumption

Cultural factors play a dramatic role in shaping the patterns of food, which include meat, consumption across developing countries. The term ‘cultural factors’ is pretty broad and can be broken down into a variety of factors such as religion, women empowerment, globalisation, social class, food taboos, and media influence. Every single one of these factors impacts food, including meat, consumption in ways that are distinct from each other.

Religion: The presence of religion is very strong across many countries in the developing world. Not only is religion practised and revered by a vast number of people in developing countries, but religion often also holds a great amount of power, especially at a legislative level (Mrchkovska et al. 2023). As such, religious leaders in developing countries are often able to dictate certain laws and that also includes laws regarding food, including meat, production and consumption. Religious leaders are often allowed to dictate the permissibility of certain foods and can declare certain types of food products to be legally or even de facto forbidden (Mrchkovska et al. 2023). It should, however, be noted that a lot of times religious consumers across these countries are willing to abide by these religious decrees too. A good example of this comes from India where due to a strong presence of Hinduism, a large number of practising Hindus choose to be vegetarian due to a belief called ahimsa or the practice of non-violence which calls for equal respect for all living beings (Filippini & Srinivasan 2018). This is also aided by the fact that certain animals are considered to be sacred, such as cows, and are therefore almost not consumed at all. All of these religious beliefs generally lead to relatively low consumption of meat products and often encourage consumers to seek alternative protein sources throughout India (Arora et al. 2020). In other cases, the restrictions are often related to the meat production or consumption technique and not the meat itself. This can be seen from cases of the Islamic and Jewish faiths where certain types of meat or other animal products are only allowed if the animal was slaughtered as per the religious regulations (Boereboom et al. 2022) and the meat is then certified as Halal in Islam or Kosher in Judaism. This religious practice can decrease meat consumption as religious consumers will abstain from meat consumption if the religious protocol is not followed during the slaughter process. Both Islam and Judaism also forbid the consumption of pork which decreases meat consumption even further.

Women empowerment: Women play a significant role in our societies and when properly empowered, women can positively impact the dietary patterns in developing countries. Yila and Sylla (2019) find that providing a woman adequate control in deciding matters related to household and resource management can significantly improve the eating habits of the household members, which includes an increase in meat consumption, as women often decide to prioritise health and nutritional wellbeing when making household decisions. Jemaneh and Shibeshi (2023) state that families in developing countries in which women are empowered enough to make household decisions are much more likely to increase the consumption of meat in an effort to reduce food insecurity and diversify the household diet. This argument can be supported by an example from the Gamo Zone of Southern Ethiopia where Beriso et al. (2023) found that households where the women had a say in making the household decisions had increased meat consumption in comparison to the families where men made most of the household decisions. Beriso et al. (2023) also go on to mention that empowered women in developing countries are often employed in various fields and therefore have an active source of income which can positively impact meat consumption and increase food security. This is further supported by the fact that in many developing countries women, particularly in the rural areas, play a significant role in livestock production and management which not only empowers them but also makes them more influential over decisions related to meat production and consumption within their respective communities (Das & Singh 2020). As mentioned above, this leads to an increase in meat consumption within their respective communities.

Globalisation: The world today is highly interconnected thanks to globalisation, and this has caused various diverse cultures, including food cultures, to interact with each other resulting in local food cultures changing across many developing countries. Fabiosa (2011) states that it is predominantly the Western dietary patterns that have strongly but positively impacted the dietary patterns of many developing countries and as a result, many of these developing countries have now increased both meat production and consumption. In an example from Ghana, Yenibehit (2023) mentions that the influence of Western dietary patterns has not only increased the production and consumption of meat but also increased the market prices of meat to a certain degree due to the rising demand for meat products. There is, however, evidence of quite the opposite happening too. Lu and Wang (2024) mention that globalisation has caused food supply chains in many developing countries in Asia to modernise rapidly and this in turn attracted

investments in large-scale food production units leading to a reduction in the costs of food, including meat, production while simultaneously increasing productivity. This can help reduce the retail prices of meat products and increase meat consumption. Globalisation, however, has also caused many consumers across developing countries to be more aware of the environmental implications of meat production and consumption which in turn may have led to a considerable decrease in meat consumption too.

Social class: Social hierarchies are very common in societies across the developing world and one of the main factors that determine social hierarchies is the economic status of an individual (Ge et al. 2022). This undoubtedly affects the food, including meat, consumption by the average consumer and often visibly so. As many developing countries are experiencing rapid economic growth and increasing income levels, many of the relatively wealthier consumers are starting to consume meat more frequently and often view this dietary progress as an indicator of prosperity (Chen et al. 2023). This is in stark contrast to the consumers from low-income households who consume meat at a much lower rate due to low affordability and high meat prices and usually consume more vegetables and pulses instead (Hase Ueta et al. 2023). An issue here that needs to be tackled is that as wealthier consumers in developing countries increase meat consumption thereby aiding the rise in the demand for meat products, the retail prices of meat will increase significantly which in turn will make meat even more unaffordable for the poorer consumers than it already is (Henchion & Zimmermann 2021). This will not only reduce the overall meat consumption but will also lead to increased inequalities among the wealthier and poorer populations.

Food taboos: Taboos and superstitious beliefs are widespread across many developing countries and often play a decent role in influencing certain societal practices including food consumption. Often linked to religious beliefs, Mengesha (2021) finds that in many developing countries, taboos are de facto used to dictate certain boundaries regarding what is or is not allowed in many aspects of society and that also includes the consumption of certain types of meat. An example of this can be seen in the rural areas of Tajikistan where pregnant women are generally recommended to strictly avoid lamb or goat meat, which are otherwise commonly consumed, as it is believed that consuming lamb or goat meat during pregnancy will negatively impact the growth of the foetus (McNamara & Wood 2019). It should, however, be noted that such superstitious beliefs

are mostly prevalent in rural areas and are usually taken more seriously by the older generation as opposed to the urban residents or the younger generation who tend to be more educated and think logically (McNamara & Wood 2019). These beliefs often have a very negative impact on not just meat consumption but also on the physical health of the consumers with such beliefs who often come from vulnerable communities and are in dire need of foods rich in nutrition such as meat but avoid it due to their archaic beliefs. It is not the personal avoidance that is always the case, sometimes even the society itself imposes such beliefs on its members and often forcefully so. This can be seen in the example of rural Nigeria where the less privileged members of certain rural communities, primarily pregnant women and older people, are sometimes deliberately denied certain foods, including meat, due to social or religious taboos (Onuorah & Ayo 2003).

Mainstream media influence: Media can be a powerful tool when it comes to influencing public perceptions and social behaviour and that also includes its influence on food consumption. However, there can be various types of influential media that impact meat consumption in different ways and the type that we looked into here is the mainstream media.

Mainstream media is arguably the most effective type of media when it comes to influencing the public narrative on meat consumption as it often enjoys the highest levels of trust from the common audience (Happer & Wellesley 2019). Common types of mainstream media such as news channels and newspapers are usually at the frontline when it comes to showcasing the health and environmental implications of meat consumption and hence often play a direct role in shaping public dietary behaviour (Veiga et al. 2023). According to a study conducted by Happer and Wellesley (2019) across China and Brazil, it was found that the vast majority of people were willing to believe any information regarding meat and other food products provided by news channels without much objection or thinking. Happer and Wellesley (2019) continue by saying that the reasons behind such trust come from the belief that mainstream media organisations have access to a vast number of verified resources such as the government, famed experts and scientists etc. as well as the fact that historically mainstream media was the only source of accurate information available for the public. This level of trust in the mainstream media can significantly impact food, including meat, consumption by influencing consumer opinions. This is supported by Attwood and Hajat (2020) who find

that during the COVID-19 pandemic, many news outlets have focused on the biological risks of intensive animal farming and how it can potentially aid the transmission of infectious diseases. Attwood and Hajat (2020) continue that this had quite a negative impact on consumer behaviour who are much more careful now while purchasing certain meat products and this has led to a decrease in meat consumption in many places across the developing world.

5.3.2. Environmental Considerations

One of the worst side-effects of meat production is the massive degradation it causes to the environment. Voinea et al. (2020) state that among all the types of food consumption, meat takes the first place when it comes to damaging the environment. Through excessively large emissions of greenhouse gases, large-scale deforestation and frequent water pollution, meat production stands as a key player in contributing to climate change. The effects of these environmental degradations tend to be much worse across developing countries as these countries do not tend to be too environmentally resilient and hence not only is the environment affected in these countries but so are the food consumption patterns of common people among other things. In this sub-chapter we looked deeper into some of the main environmental damages of meat production and how they can be minimised without needing to affect meat consumption across developing countries.

Mechanisms of GHG emissions from meat production: One of the main ways through which meat production contributes to environmental degradation is by releasing massive amounts of greenhouse gases into the atmosphere. According to Stoll-Kleemann and Schmidt (2017), a study finds that the livestock farming sector contributes roughly 14.5 % of the total greenhouse gas emissions on Earth which, looking from another angle, makes up approximately 57 % of greenhouse gases that are released from the combined food production. As depicted in Figure 8 below, beef and dairy cattle account for the majority of emissions.

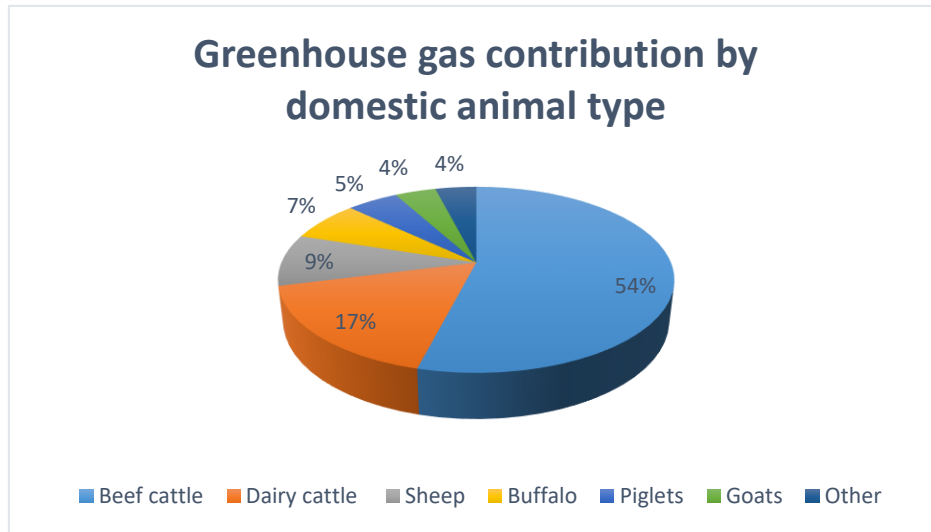


Figure 8 GHG contribution of different types of domestic animals. Adapted from (Raihan 2023)

There are three main sources of GHG emissions from meat production and they are enteric fermentation, deforestation and energy intensity. Enteric fermentation is the microbial digestion process in ruminant animals which releases methane (CH₄), which is a very potent greenhouse gas, to the atmosphere (Raihan 2023). This process makes up a significant amount of all livestock sector emissions, especially within countries that are home to large populations of cattle. Moreover, as pasturelands and feed crops continue to expand, so does deforestation. This causes all the stored carbon to be released into the atmosphere and also leads to forests having much lower capacities of carbon sequestration (Petrovic et al. 2015). In addition to all that, meat production also involves a variety of processes that are quite energy-intensive. These energy-intensive processes include feed cultivation, processing, and transportation, and play a big role in carbon dioxide emissions (Raihan 2023). The complex relationship that exists between meat production and GHG emissions is showcased via these mechanisms.

Environmental impact: GHG emissions from meat production have quite severe effects on the environment. Climate change, which is significantly impacted by increasing GHG concentrations, presents a massive threat to the human wellbeing, ecosystems and socioeconomic systems of the world (Recanati et al. 2015). For example, frequent fluctuations in temperature and rainfall patterns, a common effect of climate change, can greatly disturb the ecosystems and reduce agricultural efficiency which, in turn, increases food insecurity as well as threatens commoner livelihood, particularly across developing

countries. In addition to that, increasing deforestation, commonly done to expand pasturelands, leads to a significant loss of habitats as well as promotes decreasing biodiversity (Tilman et al. 2017). Tilman et al. (2017) also add that deforestation can significantly limit the carbon sequestration capacity of forests which is crucial to combat climate change. Another implication that should be considered here is water scarcity. Meat production is a very water-intensive process and significantly increases water scarcity. Not only is this very stressful on the planet's ecosystem but it also leads to various types of conflicts over the distribution of water resources, which is unfortunately quite common across many developing countries (Mekonnen & Hoekstra 2012).

Challenges and opportunities for mitigation: Dealing with the environmental effects of meat production and consumption can be quite challenging and often needs collaborative efforts across various sectors. A great way to reduce the intensity of GHG emissions in the livestock sector is by taking advantage of the current technological innovations. Incorporating the use of feed additives and dietary supplements, for example, can lead to a reduction in methane emissions from enteric fermentation (Reyes Ramos & López Lara 2015). In addition, if efforts are undertaken to ensure a proper transition to renewable energy sources and policies are implemented to enforce practises that are energy-efficient in both meat processing and transportation, then carbon emissions can be significantly reduced (Raihan 2023). This highlights the necessity of policy interventions which are crucial to bringing a meaningful systemic change. Governments can play a key role by putting regulations into effect to encourage sustainable land use practices, impose restrictions on deforestation, and provide incentives to encourage the incorporation of low-carbon agricultural practices (Godfray et al. 2018). Finally, a variety of educational programmes and campaigns to raise consumer awareness can be introduced and advertised that can promote reduced meat consumption and encourage a transition towards plant-based proteins (Springmann et al. 2018).

An example from Brazil: Brazil is currently one of the largest producers and exporters of beef in the world. The meat production industry in Brazil has grown significantly over the years and is continuing to grow too due to the high demand for beef both domestically and globally (Nepstad et al. 2014). Although this has helped the Brazilian economy to grow, the environmental implications were quite bad. Deforestation was common especially in the Amazon rainforest as large areas were cleared to make

pasturelands for cattle ranching (Vale et al. 2019). Not only did this lead to a decline in biodiversity and disruption of the ecosystem but it also led to an increase in the release of carbon emissions (Nepstad et al. 2014). To combat the environmental implications of deforestation, the Brazilian government has taken a few initiatives. One such initiative is known as the Soy Moratorium. Basically, it prevents the selling of soybeans that were produced on any piece of land that was a result of recent deforestation (Nepstad et al. 2014). The Brazilian government has also funded various campaigns to raise consumer awareness regarding the negative environmental implications of beef production and also provided various incentives to beef producers across the country in order to motivate them to incorporate sustainable beef production practices (Vale et al. 2019). Although some beneficial outcomes were visible from the initiatives taken, challenges related to tackling deforestation remained along with other unsustainable practices.

6. Conclusions

Meat consumption in developing countries has increased significantly over the last few decades and is still continuing to increase. As developing countries continue to rise economically, food consumption patterns are also changing and getting increasingly diverse, primarily through the incorporation of more meat products. However, there are a variety of other factors that impact the consumption of meat in developing countries and that is what this bachelor's thesis aimed to explore.

Socioeconomic factors which include income levels and employment rate, education levels and governmental policies were collectively found to be the most influential factors impacting meat consumption across many developing countries. Studies found income levels to be the most important factor that influences meat consumption at an individual level with education levels coming at a close second. Governmental policies were uniquely impactful as they influenced not only consumer dietary patterns at an individual level but also the structure of the food market and economy. These factors played a crucial role in shaping the dynamics of meat consumption across developing countries.

Environmental degradation resulting from meat production was found to be a major issue across many developing countries. With the rising population and increasing rates of meat production and consumption globally, environmental degradation will only continue to worsen if they are not immediately and adequately confronted. The situation is often much worse in developing countries due to a lack of adequate environmental resilience resulting in disproportionate levels of environmental damage. It is, therefore, necessary to conduct more research into the topic of environmental degradation caused by meat production in developing countries to ensure that developing countries can continue to produce meat without damaging the environment.

7. References

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