

THE RELEVANCE OF THE MEAT VALUE CHAIN ANALYSIS TO REDUCING MALNUTRITION IN DEVELOPING COUNTRIES: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

This study examines the evidence from the literature relevant to analysing the meat value chain and its relevance in reducing the prevalence of malnutrition in developing countries. A systematic literature review was performed to synthesise a qualitative evidence base, including information on the study country, time frame, methodology, research question, sample population, limitations, and recommendations for future research. The Cochrane methodology was employed to review 46 studies systematically. It was noted that studies are often conducted in multiple countries, mainly in Asia and Africa. The specific period over which the studies were conducted, or the period of data collection or observation, was often less than one year, highlighting significant changes in outcomes after the intervention, for example, increased Fe status. However, interventions are not known to reduce the prevalence of malnutrition directly. Research questions are asked using a variety of methods. Quantitative, qualitative and mixed methods. Quantitative approaches focused on identifying potential risk hotspots, while qualitative research focused on assessing the impact of change. Economic systems and vulnerable groups are often investigated as concerns of developing countries. This study broadens the conceptual framework and demonstrates its potential to contribute to nutritional literacy and the meat industry.

Keywords: *malnutrition, meat, value chain analysis*

INTRODUCTION

Value chain analysis (VCA) identifies companies' main and supporting activities to analyse added values in the finished products, minimise costs, and enhance product differentiation. VCA has been applied comprehensively to deal with other specific issues, such as nutrition. This concept is modified into nutrition-sensitive value chain analysis (NSVCA). The basis of this research is the awareness that there have only been a few observational studies concerning Meat Value Chain Analysis (MVCA) aiming to minimise the severity of malnutrition. A few specifically focused on poor nutrition in relation to certain animal-sourced food commodities. The complexity of the studies on the meat value chain needs to be reviewed from the best studies through open and transparent procedures in research methodologies. This step needs to be conducted by reviewing published articles which emerge from a systematic literature review (SLR).

SLR discusses meat value chain analysis, including information on the study country, time frame, methodology, research question, sample population and boundaries, and its relevance to reducing the prevalence of malnutrition in developing countries. Used to examine evidence most commonly found in the literature and produce recommendations for future research.

MATERIAL AND METHODS

SLR used the Cochrane methodology (Higgins JPT, 2022). First, a literature search was performed using four major biological databases. The four recommended sources of food safety databases are Web Science, Scopus, Science Direct, and Medline. Next, a systematic literature review began with a search using a combination of relevant keywords.

The relevant keywords are livestock, animal products, meat, value chains, value creation, nutrition targets, malnutrition, micronutrient deficiencies, and developing countries. The researchers worked with the biology department librarian at Queen's University Belfast and her two reviewers to develop the criteria for the tailored search. The collected literature materials are peer-reviewed publications and written in English. References published after 1990 were selected. The value chain concept stems from a series of general review publications of the key conceptual and methodological tools used by the Center for Globalization, Governance and Competitiveness (Duke CGGC) at Duke University (Gereffi & Fernandez-Stark, 2016; Gereffi et al., 2009). There were a total of 941 search results in the bibliographic database, which were identified and exported using EndNote 20 before scanning for duplicate references. Observed literature considered duplicates was excluded, resulting in 490 relevant studies. The next process was screening based on inclusion and exclusion criteria (Table 1).

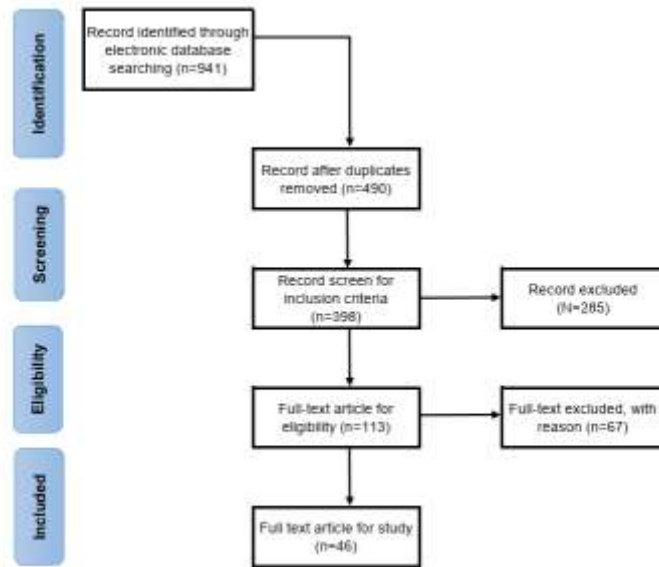
Table 1. Inclusion and exclusion criteria

Criteria	Inclusion Criteria	Exclusion Criteria
Type of reference	Peer-reviewed Journal	Non-Peer-reviewed Journal
Language used	English	Non-English
Year published	1990-current	Before 1990
Study Design	Quantitative, Qualitative, Mixed Method	Not applicable
Sample Population	Developing Countries	Developed Countries
Intervention/Observation	Livestock sectors and value chain Livestock sector and malnutrition Developing countries	Egg production Dairy production
Outcome	The prevalence of malnutrition Policy, economic, and business	Not applicable

Source: Summarised from many resources (2022)

Three hundred ninety-eight research papers were used for relevant studies, as 92 articles were excluded during the screening phase. Judging was done in two stages based on the title and

abstract. At this stage, two reviewers reviewed the rejected citations to determine whether they should be excluded. An aptitude test followed a systematic review, the purpose of which was to analyse the full text. There are several categories of eligibility based on research-purpose screening. Several articles that did not emphasise improving nutrition/nutritional status were rejected. There was also some literature whose publication dates fell outside the established annual timeframes, implying non-inclusion criteria. Some references do not use population samples from developing countries.



Source: Purnamasari (2022)

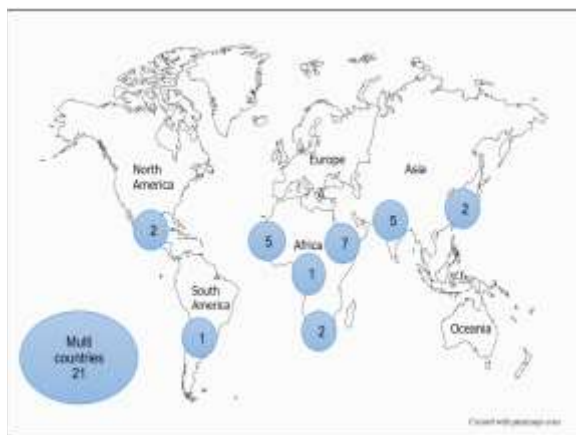
Figure 1. PRISMA (The preferred reporting items for systematic reviews and meta-analysis) flow

Data extraction was performed by summarising and later categorising findings based on observed themes. Applying meta-synthesis to broader results and general relationships between studies with respect to country, time frame, methodology, research question, population sampling, type of intervention, limitations and recommendations for further research. As a result, 113 references were recorded for further analysis after screening measures were applied. This result was done by reviewing all aspects that met compliance with the inclusion criteria. As a result of this analytical process, 67 articles were excluded, while the remaining 46 articles were accepted in the included studies (Figure 1).

RESULT AND DISCUSSION

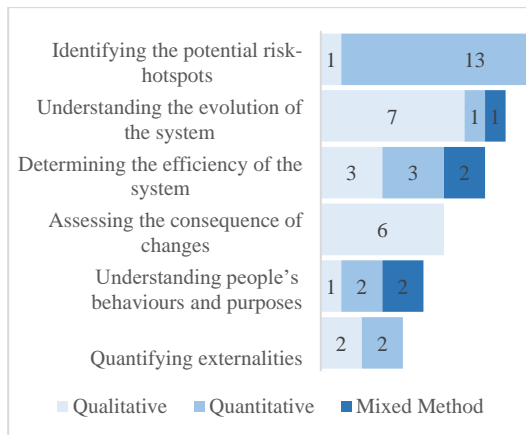
This study summarises the literature on meat value chain analysis and its impact on reducing malnutrition in developing countries. The research shows that 21 studies have conducted reviews comparing meat value chains in several countries (Figure 2). Asian and African countries were the main subjects of the survey. In addition, comparisons were made

between developing and developed countries (Christiaensen et al., 2020; Steinfeld, 2003; Trienekens & Zuurbier, 2008). As each country presents a specific nutrition problem and involves different key players, the implementation of solutions must be appropriate to the realities of those countries (Hawkes & Ruel, 2012). For example, Christiaensen et al. (2020) compared contracts between smallholder farmers and food processing companies in Ghana, India, Madagascar, Mozambique and Nicaragua, facilitating diversification of food trade with other countries.



Source: Christiaenses et. al. (2020)

Figure 2. Countries analysed in the research (mostly in Asia and Africa) from N=46 literature



Source: Christiaenses et. al. (2020)

Figure 3. Relationship between methodology and research question topics

Another aspect of this SLR synchronised the methodology used in the research question (Figure 3). Only an evaluation of the consequences of changes is performed using qualitative methods. Therefore, there is no specific methodological gold standard for analysing VCA for dietary goals. Some researchers have even concluded that it is very difficult to generalise his detailed VCA design on nutrition. As a result, the concepts and methods involved have varied (Morgan et al., 2019). Table 2 divides the intervention or study observation types into seven groups. The intersecting dynamics of these aspects in nutrition value chain research highlight important areas for future research projects. Because it can indicate the types of policies and interventions that are potentially effective, for example, the study by Danse et al. (2020); Gómez and Ricketts (2013); Serra et al. (2020); Waterlander et al. (2018).

Table 2. Research intervention/kind of observation included studies

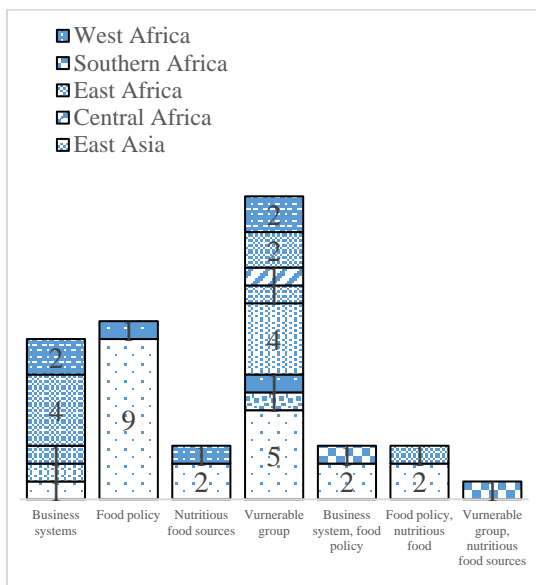
Intervention/Type of observations	Time Frame	Articles
Business systems		
• Type of business	49-60	(Ahmed et al., 2021)
• Agricultural land use, the marginal gain	49-60	(Alexander et al., 2019)
• Smallholders	>60	(Barrett et al., 2012)

Intervention/Type of observations	Time Frame	Articles
• Labor supply	>60	(Christiaensen et al., 2020)
• Type of business	<12	(Danse et al., 2020)
• Measurement of nutrition security	>60	(de Pee et al., 2009)
• Malnutrition and food systems	<12	(Gómez et al., 2013)
• An FVC (Food Value Chains) typology	<12	(Gómez & Ricketts, 2013)
• Market price, food list, food price	<12	(Parlesak et al., 2014)
Food policy		
• Food safety, quality regulations	<12	(Khalid, 2016)
• Theoretical rationale discussions	<12	(Krebs, 2007)
• Food policy, livestock production,	<12	(McDermott et al., 2010)
• Innovation in agri-food systems	<12	(Meynard et al., 2017)
• Improvement agri-food supply chain	<12	(Naik & Suresh, 2018)
• A multilevel perspective	<12	(Passos Medaets et al., 2020)
• Livestock policies	<12	(Serra et al., 2020)
• Food safety, quality regulations	<12	(Trienekens & Zuurbier, 2008)
• Food safety, quality regulations	<12	(Vogliano et al., 2015)
• Public health nutrition research	<12	(Waterlander et al., 2018)
Nutritious Food Sourced		
• Staple foods	49-60	(Adegboye et al., 2016)
• plant and animal-source foods,	<12	(Kuyper et al., 2017)
• Meat consumption	>60	(Speedy, 2003)
Vulnerable Group (including age)		
• Adolescent girls, 12 to 17	<12	(Alaofe et al., 2008)
• Non-pregnant, married woman	<12	(Ali et al., 2020)
• Women 19-60	<12	(Becquey & Martin-Prevel, 2010)
• Women 15-49	<12	(Das & Sahoo, 2011)
• Children 8 to 14	<12	(Erismann et al., 2017)
• Households	>60	(Gandhi & Zhou, 2014)
• Children 7 to 12	25-36	(Grillenberger et al., 2007)
• Non-pregnant women 18 to 30	<12	(Hall et al., 2017)
• Children 6-60 months	<12	(Jin & Iannotti, 2014)
• Women, children, livestock owners	13-24	(Jones et al., 2018)
• Children 6 to 59 months	<12	(Kejo et al., 2018)
• Children under 5	<12	(Khamis et al., 2019)
• Children 6-23 months, mother caregivers	<12	(Molla et al., 2020)
• Children, Primary school ages	25-36	(Neumann et al., 2003)
• Children under 3	<12	(Pachon et al., 2007)
• Women, aged 16-45	<12	(Pasricha et al., 2008)

Intervention/Type of observations	Time Frame	Articles
• Children 6 to 60 months	>60	(Shapiro et al., 2019)
The business system, Food Policy		
• Food supply, resilience, and security	>60	(Bakalis et al., 2020)
• Meat supply, related health outcomes	<12	(McNeill et al., 2017)
• Global Value Chain and cell-based meat	<12	(Reis et al., 2020)
Food Policy, Nutritious Food		
• Healthy diets, market systems	<12	(Donovan & Gelli, 2019)
• Production, health, and nutrition	>60	(Pelant, 1991)
• Policy typology, animal-sourced food	>60	(Steinfeld, 2003)
Vulnerable Group, Nutritious Food		
• Animal source food and milk, children	>60	(Allen & Dror, 2011)

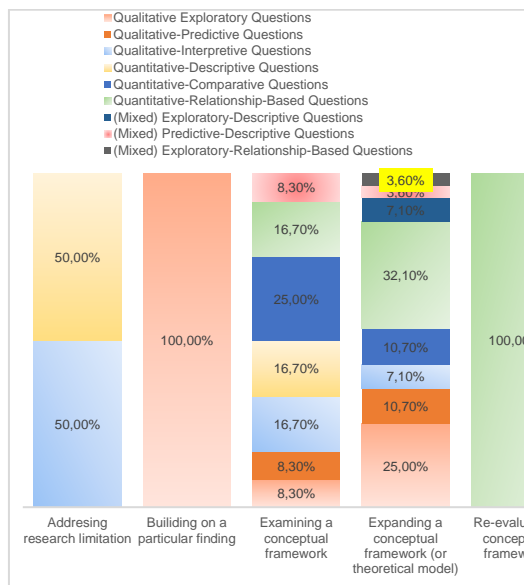
Source: Summarised from many resources (2022)

Research projects on topics related to the meat value chain were few in the early 1990s (Table 2). However, the number of published articles is increasing year by year. Observational processes and data collection periods during the study indicated that the majority of studies lasted less than 12 months (approximately one year). Studies conducted within one year (<12 months) by Jones et al. (2018)) examined the effect of pharmacological or nutritional therapy, such as increasing haemoglobin (Hb). However, the results of this study did not explicitly show that the prevalence of malnutrition was reduced. Regardless, no short-term beneficial effects of nutrient-dense consumption were felt (Maestre et al., 2017).



Source: Christiaensens et. al. (2020)

Figure 4. The type of sample population in included studies (N=46 literatures, 7 sample groups populations).



Source: Christiaensens et. al. (2020)

Figure 5. The relationship between limitations, the recommendation for future research and the type of methodology used.

A study that lasted five years showed better results. The discussion of these longer studies is more comprehensively elaborated, indicating that higher intakes of animal-based foods are associated with enhanced growth and higher proportions of micronutrients in the body in each country studied (Adegboye et al., 2016). In addition, it suggests that it improves cognitive function performance (de Pee et al., 2009), motor skills development and physical activity (Allen and Dror, 2011; Shapiro et al., 2019). The VCA concept has been used in many research areas with different applications in nutrition policy (Figure 4). It demonstrates the flexibility of his VCA concept of addressing various nutritional issues and addressing them through other issues. These study designs can provide diverse perspectives and highlight strengths and weaknesses that generate the potential for useful interventions. VCAs are essentially goal-achieving tools that provide specific and useful information for nutritional interventions. Six general areas for recommendations and future research were identified (Figure 5). In addition to addressing research limitations, building concrete evidence, and reviewing and reassessing conceptual frameworks, widening conceptual frameworks is most frequently used for future research. Therefore, it was the recommended framework. The conceptual framework can be broadened by identifying new areas of research that can provide further insight into the relationship between variables and malnutrition in the meat value chain.

CONCLUSION

The overall results of this study summarise the literature findings on the meat value chain and its importance for reducing malnutrition in developing countries. Malnutrition cases are commonly reported in Asian and African countries, and most results were obtained by comparing data from these countries. Observations on malnutrition reduction were made in research projects requiring longer durations (>1 year). Short-term studies were more common, but studies of this type failed to identify a decline in the prevalence of malnutrition. Emphasis is placed on quantitative methods to identify potential risk hotspots for specific treatments for specific variables of relevance. However, qualitative and mixed-method studies have used more diverse population samples related to business systems, food policies, and mixed population samples, including vulnerable dietary groups and specific foods. There are still research opportunities. The meat value chain analysis with specific community nutrition targets needs further development by reviewing, expanding and re-evaluating the framework. It will lead to more effective forms of intervention based on value chain mapping that shows the roles of key players and the potential benefits of specific commodities.

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