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# Captive school markets, industry self-regulation, and public-private partnerships: Narratives shaping the development of alternative proteins in the United States, 1965–1982

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ABSTRACT

This paper examines the interplay between government, industry and other stakeholders, and the key narratives shaping the development and regulation of alternative protein products in the US in the 1960s to early 1980s, paying particular attention to how the US National School Lunch Programme was used for the development of these products. Using internal food industry documents sourced from the University of California San Francisco (UCSF) Food Industry Documents Archive, we find that the US government proactively paved the way for industry to develop alternative protein products by: (a) providing government funding for textured vegetable protein product research and development; (b) opening the doors to lucrative markets; and (c) supporting a lenient regulatory environment for alternative protein products to be developed. A key market for textured vegetable protein products was the US National School Lunch Programme, which was treated as a captive market for developing new products and formulations. The motivations for introducing textured vegetable proteins in schools differed between government and industry, principally between: offering cost-savings and alleviating malnutrition and food insecurity versus developing profitable new food products. Industry actors actively sought to modify the regulatory environment to favour commercial interests, and the government was slow to regulate the alternative protein industry and relied on industry self-regulation. Our research is particularly relevant, because of what appears to be renewed interest in recent years in using school meal programs for the development of alternative-proteins, a phenomenon not limited to the US.

## 1. Introduction

With growing consumer awareness and concern for the environmental and animal-welfare impacts of the modern meat industry (Hilborn et al., 2018; Place, 2018), in recent years there has been increasing availability and variety of plant-based alternatives. These products are marketed as having key advantages over meat and advertised to the consumer as the sustainable diet of the future (Ransom, 2021). Evidence suggests that increased consumption of plant-based protein rich foods is of key importance from a global food security and environmental perspective (de Boer & Aiking, 2011; Detzel et al., 2022).

Critical perspectives of alternative protein products often highlight that they are ultra-processed, such as burgers, sausages, reconstituted slices, and prepared meals (Gehring et al., 2021; Khandpur et al., 2021), and typically less nutritionally balanced or nutritionally complete than animal protein products (Li et al., 2019; Lima et al. 2022). Concerns have also been raised about these products representing a corporate 'solution' to consumer interest in more ethical and sustainable food choices, in light of being industrially processed, value-added products (Nestle, 2020). Additionally, alternative-proteins may represent a nutritionally reductionist approach to food (Scrinis, 2008) that privileges individual nutrients, in this case protein, rather than replicating the complete nutritional benefits offered by meat products they are designed to replace (Leroy, et al., 2022). Thus, alternative protein products provide one of many examples of substitutionism, i.e. the replacement of end-products with similar alternatives (Palmer et al., 2022).

Many food companies developing alternative protein products are recipients of government funding (Choudhury et al., 2020; Dolgin, 2019), and given the potentially contentious relationship between

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private and public interests, the evolution of these products deserves some scrutiny. There is a vast body of literature regarding how the food industry employs tobacco industry tactics to subvert and influence public health policy especially in the context of ultra-processed unhealthy food commodities (Capewell & Lloyd-Williams, 2018; Granheim Ionata et al., 2017; Moodie et al., 2013). Though the balance of industry and public interests in relation to alternative protein products are closer aligned by comparison, it is still important to examine whether and how systematic political lobbying may influence the evolution of the 'substitution bioeconomy' (Palmer et al., 2022). Our aim is to examine how the interaction between key stakeholders drove and directed the development of alternative protein products, as well as what the key narratives were, and how these activities were perceived by contemporary stakeholders. Whether alternative protein products are nutritionally inferior, superior, or equivalent is a secondary concern, and not the focus of this manuscript, but readers interested in this issue may find the following recent publications useful (Baune et al., 2022; Sha & Xiong, 2020).

While there is substantial research on current developments in the alternative protein space, there is less information on the development of earlier iterations of industrially manufactured alternative proteins. Existing literature in this area points to the development of 'textured vegetable protein' (TVP) products in the 1960s and 1970s, in what can be termed the 'first generation' of meat substitutes (Penfield & Campbell, 1990; Tziva et al., 2020). TVP refers to the production method of using industrial extrusion and heating processes to transform raw materials, predominantly soy, into meat-like forms (Asgar et al., 2010; Featherstone, 2015).

The literature documents that TVP products were approved for use in the National School Lunch Program (NSLP) and in the lunch and supper of the Special Food Service Program for Children on 22 February 1971 (Shurtleff & Aoyagi, 2022, p. 44), as a mixed product composed of up to 30% TVP to 70% raw meat (FNS Notice 219) (Penfield & Campbell, 1990, p. 215). However, little is known about the narratives, rationales, and stakeholders involved in the development of TVP products and of any points of contention for including these in the NSLP. To inform current policymaking, it is of particular interest to examine whether there is a historical precedent for public-sector support for these products, and the mechanisms by which public and private collaboration occurred.

In this paper we employ a historical analysis of previously classified industry documents to investigate a) the early beginning of TVP research and development; b) the processes which led to TVP being widely introduced in the NSLP; and c) the roles that government bodies and the industry played in this process and how public and private interests interacted to affect relevant policy. Ours is an interesting case study of the interaction between public and private actors driving food product development, regulation and marketing, and contributes to a larger literature in this field (Clapp & Scrinis, 2017). What we go on to argue, in light of documentary evidence, is that the US government paved the way for industry to develop TVPs by funding supportive research and development; by offering access to the NSLP; and by allowing flexible nutrition standards to suit these products.

What follows in this manuscript is a detailed description of the research methodology followed by our findings, where we explore the following themes: (a) the narratives which shaped the development of TVP products; (b) the introduction of TVP products in the NSLP; and (c) how the food industry influenced nutritional requirements around TVP products. We end with a discussion outlining the implications of our findings for present day developments.

## 2. Methods

We use internal food industry documents sourced from the University of California San Francisco (UCSF) Food Industry Documents Archive (https://www.industrydocuments.ucsf.edu/), between May 2021 and July 2021. The Food Industry Documents Archive was created in November 2018, which, as of May 17, 2022 includes 140,303 documents. This publicly available repository contains a wide range of documents, including many previously secret internal industry documents, and private communications between industry, government, and food science researchers, among other stakeholders. This makes it well suited for analysis of the interaction and relationships between these various bodies, and how it shaped the development of TVP products. Our methodological approach borrows heavily from a well-established methodology employed in tobacco industry documents research (Anderson et al., 2011), which uses the similar Legacy Tobacco Documents Library (https://www.industrydocuments.ucsf.edu/tobacco/). By comparison, research using the food industry archive is in its infancy, but the methodological strengths and limitations of this approach have been discussed at length elsewhere (Anderson et al., 2011).

The archive was searched using keywords defined through both deductive and inductive methods. The search process began with broader terms including "alternative protein" and "meat substitutes", and then through document review, more specific search terms such as "textured vegetable protein", "national school lunch" and "captive markets" were used. A total of 841 results were produced from these keyword searches. Search results for these terms were overwhelmingly from the 1960s and 1970s, so it was deemed unnecessary to apply filters to restrict results by date. Exact date parameters were defined once documents had been reviewed: 1965 and 1982 were identified as starting and end points for analysis, as the first and final years containing documents relevant to the chosen research topic. Filtering by location was not used, as the archive was predominantly centred on the United States, and to allow for the possibility that development of TVPs had *trans*-national aspects worth investigating.

Types of documents analysed include: conference proceedings, letters, reports, news articles, legal documents, tables, charts, newsletters, publications, scientific documents, memos, agendas, press releases, advertisements, notes from testimonies, diagrams, flow charts, proposals, and lists. No documents were excluded from analysis based on their type, however duplicates of documents were excluded (except where these duplicates contained additional information, such as handwritten annotations).

In total, 239 documents were reviewed, and 91 of these were deemed relevant to the development of TVP. A list of the 91 documents is provided in online supplement 1. Documents with clear ideological biases were deemed still useful for highlighting the variety of views, and therefore were not excluded from analysis. Document analysis involved the extraction of these documents into a master file, followed by iterative reading and coding of key document segments of interest. Segments were then coded thematically into lower and higher level codes following an iterative process until a satisfactory coding framework was achieved which was then applied systematically to all extracted segments. We enumerated the frequency of prevalence of specific codes within our extracted segments to obtain a relative sense of importance of the different emerging themes (for coding framework see Appendix A).

The identification of a narrative from the extracted document involved mapping the stakeholders involved, the development timeline and key dates, and the broader socio-political and historical circumstances which shaped the development of TVP. Some key themes of interest, such as the complex balance between private interests and public policy, were expected a priori based on similar related research in other fields (Bero, 2003). Other themes, such as the role that the National School Lunch Programme played in TVP product development emerged deductively, by being identified as being frequently mentioned in the documents being reviewed.

Our simple quantification of code prevalence highlighted that for some themes there was a considerable volume of evidence from a range of documents. For example, 23 government-related documents mention the cost savings potential of TVP products, and 16 industry-related documents mention their profitability. Similarly, 20 documents

contain critical perspectives regarding TVP nutritional inferiority, and 18 documents raise concerns about the targeting of children via school meal lunch programmes. Quantification however has its limits and the reliability and usefulness of specific documents is a qualitative assessment.

It is through the above processes that the narrative of our paper was constructed, and which focuses on the interplay of industry and public interests and priorities, and on the role that the National School Lunch Programme played in TVP development.

## 3. Findings

### 3.1. Key actors and organisations for TVP development

Throughout the rest of the paper, references will be made to key individuals and key organisations emerging from the documentary analysis. Readers will find key organisations listed in Table 1, and key individuals involved in the development of TVP products listed in Table 2. Organisations and individuals included in the tables were chosen on the basis of their names regularly appearing across analysed documents, as well as a judgement of whether they were of importance, and these tables are thus not exhaustive lists. Private organisations listed in Table 1 represent a complete list of all TVP producers that were found through archival research, though the analysis does not use documents from each of these.

### 3.2. Narratives shaping the development of textured vegetable proteins

A key narrative underpinning the development of TVPs was its role in alleviating growing domestic and international levels of food insecurity. A 1975 MIT news release states that U.S. agriculture will face 'rising costs and increasing pressure on our land, energy and environmental resources' in the delivery of protein foods, and that there is a need to push for 'long range development of novel protein sources' (Massachusetts Institute of Technology, Blake, 1975, 1, 7). Key concerns of the time regard the need to 'modify the present overemphasis on high per capita consumption of animal protein […] through increased production and consumption of […] textured vegetable analogues of meat products' (Protein Advisory Group of the United Nations System, 1974, p. 2). This reflects broader calls for a 'gradual change' in the American diet towards 'vegetable as opposed to animal protein' (Harvard University School of Public Health, et al., 1974, p. 548), and recommendations by the Secretary of Agriculture for 'Better vegetable protein technology', through the collaboration between NGOs, food companies and other agencies to 'help less developed countries produce better oilseed proteins' (Freeman et al., 1965, p. 34). These offer parallels to current narratives shaping the development of new alternative proteins, with concerns about population growth, inefficient animal protein production, and environmental strain continuing to be key themes in discussions of the benefits offered by these products (Sexton et al., 2019; Sadler, 2004).

Documents from the Joint Ag-FN Boards Task Force on Low Cost Foods identify TVPs as having 'potential importance' for addressing malnutrition in the United States, that 'merited serious study' (National Academy of Sciences et al., 1969, p. 44), and the Council on Foods and Nutrition (and Food and Nutrition Board) state a need for 'new and improved foods which will provide superior nutritional quality' (Council on Food and Nutrition & Journal of the American Medical Association, 1973, p. 16). This activity occurs within a contemporary government focus on addressing malnutrition, with the 1968 Select Committee on Nutrition and Human Needs and 1969 White House Conference on Food, Nutrition, and Health, which centred on the issue of nutritional deficiencies in America, and resulted in an expansion of national food assistance programs (Nestle, 2003/2013, 38-39, 98). One such recommendation from the 1969 conference was 'the implementation of an immediate food fortification program to relieve malnutrition' (CSPI, 1972, p. 4), which TVP as a fortified food fits within.

The perception of TVPs offering 'superior nutritional quality' particularly centres on its nutritional customisability. Documents relating to the 1974 Institute of Food Technologists convention discuss the possibilities for TVP products to simultaneously increase 'good' nutrients, while offering reductions in 'bad' nutrients, with Nabisco claiming their TVP-meat composite products offer 5% greater protein

**Table 1**
Key organisations identified in the documents.

| | Organisation Name |
|---|---|
| **Public** | National Science Foundation (NSF); Office of Economic Opportunity (OEO); United States Agency for International Development (USAID); United States Agency for International Development (USAID); United States Department of Agriculture (USDA); United States Department of Commerce (USDOC); United States Department of Defense (DOD); United States Department of Health, Education, & Welfare (HEW) |
| **Private** | Archer Daniels Midland Company; Bernard Food Industries, Inc.; Cargill, Inc.; Central Soya Company, Inc.; Far-Mar-Co, Inc.; Frozen Food Forum, Inc.; Galanides, Inc.; General Foods; General Mills; Griffith Labs; Institutional Wholesalers, Inc.; Jungk Seasonings Laboratories; Mead Johnson Research Center; Miles Laboratories, Inc.; Milwaukee Seasoning Laboratories, Inc.; Nabisco, Inc.; North American Laboratory Company, Inc.; Nuggett Distributors, Inc.; Pfizer, Inc.; Ralston Purina; Rykoff, S. E., and Company; Sexton, John, and Company; Staley, A. E., Manufacturing Co.; Swift Edible Oil Company; Taylor, H. B., Company; Thomas J. Lipton Foundation; Worthington Foods Inc. |
| **Academic** | Florida State University; Harvard School of Public Health; Massachusetts Institute of Technology; Rutgers University; University of Wisconsin; Washington State University |
| **NGO & Non-Profit** | Center for Science in the Public Interest (CSPI); National Research Council of the National Academies (NRC); Protein Advisory Group (United Nations) (PAG); The Nutrition Foundation, Inc.; United Nations Development Program |

**Table 2**
Key individuals identified in the documents.

| Name | Organisation & Positions |
|---|---|
| Ben Rosenthal | U.S. House of Representatives - Congressman |
| Clifford Hardin | (a) Ralston Purina - Board of Directors<br>(b) USDA - Former Secretary of Agriculture |
| Daniel Rosenfield | (a) USDA - Director, Nutrition and Technical Services<br>(b) Miles Laboratories, Inc - Director, Nutrition Affairs |
| Paul A. La-Chance | Rutgers University - Associate Professor of Nutritional Physiology |
| Earl Butz | USDA - Secretary of Agriculture |
| Edward J. Hekman | USDA - Administrator of the Food and Nutrition Service (FNS) |
| Frederick J. Stare | Harvard School Public Health - Founder of Department of Nutrition |
| Herbert D. Rorex | USDA - Director of the Child Nutrition Division, FNS |
| Herbert P. Sarett | Mead Johnson Research Center - Vice President of Nutritional Science Resources |
| Howard H. Hiatt | Harvard School of Public Health - Dean |
| Jean Mayer | (a) Harvard School of Public Health - Professor<br>(b) Tufts University - President<br>(c) Miles Laboratories, Inc - Director |
| Mark Hegsted | (a) Harvard School of Public Health - Professor of Nutrition<br>(b) Also held appointments in the USDA, and positions on advisory committees for WHO, FAO, NIH, and NRC |
| Max Milner | PAG - Director |
| Michael F. Jacobson | CSPI - Co-founder and Executive Director |
| Nevin Scrimshaw | (a) Massachusetts Institute of Technology – Professor<br>(b) Columbia University - Founder of MIT's Department of Nutrition and Food Science |
| Richard E Lyng | USDA - Assistant Secretary of Agriculture |
| Sanford Miller | USDA - Director of FDA Bureau of Foods |
| Stanley Gershoff | (a) Harvard School of Public Health - Professor<br>(b) Founding Dean of Tufts University School of Nutrition |
| William J Darby | (a) Vanderbilt University - Professor of Nutrition<br>(b) The Nutrition Foundation, Inc - President |

levels than a solely meat product and reduced fat and cholesterol levels, and likewise General Mills advertising that their product offers a lower fat percentage than meat (Institute of Food Technologists et al., 1974, p. 13). Such claims may therefore represent examples of the well-established and widespread use of health- and nutrition-related (HNR) claims in food advertising, which can be used for a range of purposes including conveying relevant food information to consumers, enhancing awareness of healthy dietary choices, or examples of the 'health halo effect', whereby nutrient content claims may lead consumers to perceive a product as healthy, regardless of its full nutritional profile (Nan et al, 2013; Hall et al, 2020).

This is one of a number of consumer benefits identified by industry stakeholders. Analysis of newspaper reports on the 1974 Institute of Food Technologists convention reveals four key themes used by TVP manufacturer representatives when discussing their products, that TVP is: tasty, nutritious, convenient, and economical, with particular emphasis on its economical and nutritional values (Institute of Food Technologists et al., 1974). This is supported by other documents on how food companies frame their TVP products, with a study examining nine major TVP manufacturers finding that they emphasised its economy, taste, and nutritional value (Austin et al., 1976, p. 13).

Besides proposed benefits for the consumer, industry interests in TVP products included perceived new marketing opportunities. A 1971 report by the industry publication C&EN on textured vegetable proteins suggests that 'the growing public and governmental interest in improving the nutritional value of foods presents the chemical industry with growing markets for vitamins, minerals, amino acids, and proteins' (Hadsell & C & En Special, 1971, p. 17), and an advert for a TVP product similarly states 'Find out more about this fabulous new food […] about the profit-making opportunities it affords' (Peden et al., Unknown, p. 32).

Additionally, there was an awareness that TVP products could help align industry interests with government and consumer interests. An article by Foremost Foods Company titled 'Can Nutrition Sell' discusses 'the necessity of bending to government or consumer advocate pressures; a desire to meet perceived corporate social responsibility; a need to match competitors' actions; and an effort to develop a marketing opportunity' (Austin, et al., 1976, 15). This messaging presents corporate activity in this space as simultaneously reactive to pressure from government (and consumer advocacy), while also being proactive in seeking out profit opportunities.

### 3.3. The introduction of TVP products into the National School Lunch Program

A determining factor for the introduction of TVP products into the NSLP was the perceived need for cost savings in the program, to 'help schools economize' (United States Department of Agriculture & Hekman, 1976, p. 2). Clayton Yeutter, USDA Assistant Secretary, states that authorising TVP products in the NSLP would assist in 'maintaining or enhancing the nutritional adequacy of the meals and increase the availability of nutrients to a greater number of children' (Federal Register, 1973, 1). A FNS document titled 'Using New Foods to Improve USDA Child Nutrition Programs' notes the increasing cost of animal protein relative to vegetable protein, and that 'Lower-cost sources of protein can help control costs of school feeding', estimating costs for hydrated extruded TVP products at 11 cents per pound, hydrated spun products at 17 cents per pound, and concentrates about 25–28 cents per pound. (CSPI, 1972, p. 7, 17). Similarly, the industry publication C&EN estimates that a patty with 30% soy protein would offer a 25% cost saving over a meat hamburger, and that 'serving the textured soy protein product twice a week in 20 million lunches would give savings of as much as $36 million annually' (Hadsell & C & En Special, 1971, p. 26).

The prioritisation of economical food options fits into existing literature on the contemporary budgetary constraints facing the NSLP. According to Levine, in the 1970s, an increasing number of free meals served and declining number of paying children resulted in a shortfall in school lunch budgets - which led to a decline in the quality of school meals, and increasing privatisation of the school cafeterias to meet limited program budgets (2010, p. 135). We also note that in some circumstances an increasing proportion of free school meals may not necessarily result in a shortfall. The Paid Lunch Equity provision part of the Healthy, Hunger-Free Kids Act of 2010[1] was intended in part to address free meal reimbursements cross-subsidising paid meals[2]. However, we cannot comment with certainty on the extent to which this applies to our selected time period.

#### 3.3.1. Innovation and public-private partnerships

The decision to introduce TVP into government-organised school meal programs also results from efforts by the US government to facilitate private sector innovation, through the distribution of contracts and provision of markets for industry to use for product development. The USDA and USAID joint publication *Protein Supplementation: Satisfying Man's Food Needs* states that while new protein foods were being developed without government subsidy, this 'puts the entire burden of promotion on the private sector. It is unlikely that many companies will be willing or able to undertake such an endeavour. More likely, government incentives will be required to help matters along' (US Department of Agriculture, 1970, p. 83). Such sentiments are shared in the cross-departmental document *Improving Nutrition Through Technology*:

> With the proper administrative climate on the part of the Federal and State governments, private industry would likely assume much of the costs of research and development needed to produce new nutritionally superior products, and/or fortified foods. Federal funds would be needed to generate supportive research by industry and educational institutions in the several related fields involved. (Hegsted, 1971, p. 14).

The focus on providing a suitable 'administrative climate' and engaging in complementary research activities again emphasises the perceived importance of government playing a facilitatory role for industry, as well as how government benefits from such action through industry 'assum[ing] much of the costs' as a result. This document also proposes a USDA 6 year investment of $5.5 million to monitor and evaluate the development of textured meat analogues and other engineered foods, 'to preserve or improve the nutritional quality of the food supply', and cost sharing with industry on R&D and market development studies 'only where needed to stimulate an effort considered to have special nutritional significance' (Hegsted, 1971, p. 12).

The role of government in enabling 'supportive research by industry and educational institutions' is in part through the awarding of research funding to research institutions, both for development of TVP products as well as their applicability into the school meal program. Identified examples are outlined below:

1) A contract funded by the Department of Agriculture to Rutgers University, for the development and testing of nutritionally engineered foods (including TVPs), to 'evaluate their merits and acceptability for school food service' (US Department of Agriculture., 1970, p. 5).
2) Another contract with Rutgers, led by Dr. Paul A. La-Chance, included partnerships with more than 50 companies for the development of new product concepts (Hadsell & C & En Special, 1971, p. 26; US Department of Agriculture, 1970, p. 6).
3) National Science Foundation funding for MIT research projects on 'Protein Texturization for Foods' and 'Development of Textured

[1] Healthy, Hunger-Free Kids Act of 2010, Pub L No. 111–296, 42 USC 1751, §205.

[2] https://www.wasbo.com/images/wasbo/documents/6/handouts/AC2017_FoodAndFinancePLE.pdf.

> Vegetable Protein and other Food Products from Soybean' (Massachusetts Institute of Technology, 1976, p. I–1, I–2).

Other research projects were also found, such as studies led by Drs. Young and Scrimshaw on the potential of protein sources (including TVP) to meet human nutrition requirements (Massachusetts Institute of Technology, 1976, 17). However, it was unclear whether these were recipients of government funding. Additionally, in the course of our research we also found evidence of other government contracts to research institutions for topics that we deemed to be of potential relevance, including contracts to study food acceptance of school lunch and breakfast programs, and for the development of guidelines for school food service financial planning. However, the specific relevance of these to the development of TVP was undetermined, so are excluded from our results.

In regards to the contract with Rutgers to develop and test nutritionally engineered foods including TVP, Richard E Lyng, Assistant Secretary of Agriculture, USDA, stated that 'The objective is to provide combinations of food that satisfy the nutritional needs of children and are appealing, yet can cost less and be more easily delivered and served (US Department of Agriculture., 1970, p. 5).

Explaining why the US government would perform a supportive role for industry development, rather than develop these products by themselves, is the recognition that 'a sizable capital investment is needed, as well as quite sophisticated engineering and food technology inputs. Much of this technology resides at present in privately held patents' (League for International Food Education, 1971, p. 1). This points towards the importance of public–private partnerships in bringing these products to market: that it was the combination of investment and research funding by the government, and technology resources of private companies that created favourable conditions for the development of these products.

### 3.3.2. Creating markets and captive audiences

While the distribution of government research funding to academic institutions served to assist the private-sector development of TVP products, the principal way that the government supported the food industry was through the provision of the school environment as a market for their products. From May 1972 onwards, the TVP products of all listed companies in Table 1 (with the possible exceptions of Mead Johnson Research Center[3], Nabisco, General Foods, and Thomas J. Lipton Foundation) were authorised as acceptable for use in the National School Lunch Program (CSPI, 1972, 23–6). Appendix B lists all authorised products identified in our research. Stated reasons for this activity were that governments could help food companies developing these products by providing 'markets for these foods in institutional programs, such as school lunches and child feeding' (US Department of Agriculture et al., 1970, p. 83), and that:

> USDA has set criteria for fortified and extended foods that can be used in its school feeding programs. These food products are intended to not only improve nutrition and lower costs, but also provide a market that the food industry has previously lacked. (Hadsell & C & En Special, 1971, p. 17).

School meal programs were potentially particularly advantageous, due to being what some contemporary commentators considered to be captive markets, as expressed in Michael Jacobson's testimony to the House Elementary, Secondary, and Vocation Education Subcommittee:

> Food processors see the school lunch as an excellent marketing device. For with one contract, hundreds of thousands of meals can be sold. Because the audience is a captive one, and one trained not to have any great expectations about the way the food tastes, the school cafeteria is an ideal opportunity to test out new food products without going to the expense of expensive consumer-oriented marketing programs (Jacobson & CSPI, 1976, p. 2).

This quote from Jacobson also suggests that by authorising access to the NSLP, food processors would be able to assure acceptance of their products prior to going on sale to the wider public:

> Over the last few years, USDA has authorized the use of protein-fortified macaroni, blends of textured vegetable protein and meat, and nutrient-fortified cakes in school food programs. Familiarizing children with new foods, tasteless foods, and pre-plated meals — at government expense — is an ideal way of assuring acceptance if and when these items are introduced into regular marketing channels (Jacobson & CSPI, 1976, p. 2)

This perception is shared by the industry publication C&EN, 'Foods developed for the government-subsidized school programs may then be able to succeed commercially. Thus one purpose of the new criteria is to encourage the food industry to improve nutrition for the public in general' (Hadsell & C & En Special, 1971, p. 17).

Similarly, the cross-departmental paper Improving Nutrition Through Technology, which proposed a nationwide nutrition program, identified federal child nutrition programs as having 'unique opportunities' to 'introduce improved food products', because the 'considerable role of the government as a purchaser of food' also will 'permit the creation of acceptability and demand' (Hegsted, 1971, p. 8).

The NSLP being a particularly advantageous market is demonstrated by the significant increase in volume of TVP products used in the programme, from 8.5 million lb (dry weight) in 1971–72, to 87.5 million lb in 1976–77 – a more than 1000% increase over five years (Shurtleff & Aoyagi, 2016, p. 1012). Likewise, a contemporary Business Week publication titled 'Making it cheaper to eat meat', published May 12, 1973, noted that 'TVP got its first big boost when the Agriculture Dept. [USDA] in 1971 approved its use in the national school lunch program. By the end of 1972, total demand had grown to about 55-million lb. a year, with ground beef as the largest single market' (Shurtleff & Aoyagi, 2020, p. 288), indicating that the school lunch had an immediate impact on overall sales of the product.

### 3.3.3. Critical stances on TVPs in the school meal programme

Criticism of the government's introduction of TVP into the NSLP included concerns about how business-centric policy decisions were being introduced with little concern about children's welfare:

> While children have a lot to lose, big business has a lot to gain from the proposed regulations and other recent changes in U.S.D.A policy. Rather than having to seek out individual buyers on the competitive market, major corporations have now captured a ready market of 25 million school children — a market which was created by U.S.D.A. (CSPI & Food Research and Action Center, 1973, p. 2).

Such opposition on the grounds of child welfare also includes concerns that children may not be fully aware of the addition of TVP to their meals, and that allowing access to the NSLP to develop the TVP market may constitute an 'experiment' or inappropriate form of product testing. Congressman Henry S. Reuss (D-Wis) noted that: 'Soy beans shouldn't be disguised as meat and forced on a captive clientele of school children' (CSPI, Mack, Reuss, 1973, 4). Similarly, Krikker (President of the Hemochromatosis Research Foundation) stated: 'Sadly, children seem to be the first target of policies on food and welfare […] such conduct by USDA would be tantamount to an experiment on humans, on a national scale' (Krikker, 1973, 5).

The second area of concern was that the creation of a captive market is a business-centric action, firstly in the sense of allowing food companies to avoid 'having to seek out individual buyers on the competitive

[3] While there is evidence for Mead Johnson Research Center designing TVP products specifically for the National School Lunch Program, it was inconclusive whether these products were authorised for use.

market' (CSPI, Food Research and Action Center, 1973, 2), but also that the choice to use TVP to mitigate the NSLP's financial constraints, rather than addressing the root cause of such issues, represents an active choice to favour industry interests. These criticisms are in line with earlier discussion of how PPPs can unduly favour business interests. A statement submitted to the USDA by a coalition of nutrition, medicine, and education professionals, and citizen organisations argues: 'If the Department of Agriculture wants to deal with the rising cost of food […] let this be done in discussions of the budget. Lowering the standards of the meals served to our children in public schools is certainly not the answer' (Food Research and Action Center, et al., Unknown, 4). We discuss in the next section how the concern about TVP products being an inferior substitute for meat was a potentially valid one, in particular due to industry efforts to set loose nutritional requirements for the product.

### 3.4. Industry influence on nutritional requirements

#### 3.4.1. Industry misuse of government guidelines: RDA and 'Essential Nutrients'

Our findings indicate that contemporary to the introduction of TVP into the NSLP, companies producing TVP were seeking a lenient, commercially-favourable Standard of Identity for Textured Protein Products, with the consequence that in instances where TVP was to be used as a substitute or replacement for meat, such as in the aforementioned school lunch program, it may represent a less nutritionally-complete meal.

In 1969, key TVP manufacturers General Mills and Archer Daniels Midland Company, as well as Swift & Company, Ralston Purina Company, Worthington Foods, Inc, and Griffith Laboratories submitted a joint proposal for a single standard of identity for Textured Vegetable Protein, which led to the Proposed Standard of Identity for Textured Protein Products, in the Federal Register of December 5th, 1970. In this proposed standard, the petitioners chose to incorporate nutritional criteria in the standard of identity for reasons including: 'The nutritional elements are an identifying and characterizing feature of these foods', and a 'mandatory approach would assure the quality of these products, and a single undeviating measurement would simplify enforcement' (United States: National Archives and Records Administration: Office of the Federal Register, 1970, p.18530).

We identified two petitions preceding this proposal, one by General Mills and the other by Archer Daniels Midland Co, which were published in the Federal Register of October 13, 1967, but were subsequently withdrawn due to comments submitted by other manufacturers and State and Federal regulatory officials - including concerns that an established standard may hamper technological innovation of TVP, as well as a recognition that it would be in the consumer interest to establish that these products represented sources of good nutrition, and simulate taste, flavour and appearance of the products they may simulate. To accommodate this, the principal TVP manufacturers, including the two petitioners, and with contributions from FDA representatives from the Division of Nutrition, Division of Food Chemistry and Technology, and Division of Case Guidance, met to discuss whether a single standard of identity would be desirable for Textured Vegetable Protein (Unknown, 1969, pp. 1–2; United States: National Archives and Records Administration: Office of the Federal Register, 1970, p.18530).

In the subsequent joint proposal, petitioners proposed that TVP products should be required to meet the main nutrient requirements included in the government Recommended Dietary Allowances (RDA). Petitioners suggest that the product should only have requirements for 'protein content and biological value, and levels of Vitamin A and B12, thiamin, riboflavin, niacin, iron, calcium, and phosphorus', though, with no requirements on how the products may be manufactured, or on stipulations for where nutrients such as protein are sourced from, in order to not 'inhibit technological developments' (Covington & Burling & Lambert, 1969, p. 1, 3). According to the proposal, the only nutrients needing to be included would be ones that would be naturally present in the food being replaced 'in excess of 10% of the RDA in the portions commonly consumed' (Ibid, p. 5).

In contrast to this proposal, some stakeholders voiced concerns that a requirement only for key nutrients found in RDA guidelines would mean such products represent an inferior, rather than equivalent alternative in a scenario where TVPs would replace or substitute meat products, in particular making it harder for consumers to get essential micronutrients found in meat (Council on Foods and Nutrition et al., 1969, p. 39). The Dairy Council Digest, a publication likely to view the alternative protein industry as a threat to its market, raises this in a later 1974 publication:

> It is questioned whether sufficient investigation of these foods has been made to assure that they contain nutrients in similar concentrations and - proportions as their traditional counterparts. There is also the likelihood of micronutrient deficiencies and/or an imbalance of nutrients in these foods (1974, p. 4).

Similarly, the former president of the Campbell's Soup Company, W. B. Murphy says:

> 'As of today, textured protein products made in accordance with FNS Notice 219, are inferior to meat, to poultry, to fish, to milk and to eggs in nutrient quality. They do not have the same ideal balance of essential amino acids, they do not have all of the minerals and other micro-nutrients; and they do not have the same level of nutrient availability' (Food Research and Action Center, Pollack, Brooks, Unknown, 4).

The use of RDA as a benchmark for nutritional requirements for TVP products may also have represented a misuse of the intended purpose of the guidelines. According to the Food and Nutrition Board, RDA should only be used as a guideline alongside other factors including 'energy sources and other nutrients not covered by the RDA, the nature of the available food, acceptability, cost, and cultural practices', and that 'The use of RDA as 'rigid regulatory standards is clearly inappropriate' (Food and Nutrition Board et al., 1982, pp. 34, 37). A draft copy of 'Introduction to RDA' by Harper (University of Wisconsin) emphasises the limitations of using the RDA:

> The RDA provide guidelines below which dietary intake should not fall if the known nutritional needs of all people are to be met. The RDA are not recommendations for the nutrient composition of an ideal food supply nor of an ideal diet. (Hegsted et al., 1972, p. 3).

Harper further notes the issue of using RDA in regards to institutional feeding programs, that:

> It is important that they [RDA] be used appropriately. This is equally important when they are used as the basis for estimating food requirements and meal patterns for the school lunch programs, special food services and various child feeding programs' (Hegsted et al., 1972, p. 17).

TVP petitioners also opposed any requirements for products to have nutritional equivalence to the specific meat they were designed to replace (such as a TVP chicken substitute having the nutritional characteristics of chicken). The industry proposal instead recommended that TVP products 'contain the basic nutritional elements that might be found in any 'composite' good protein source' and that 'the consumer approaches these major protein sources as basically fungible "main course" alternatives, supplying desirable and adequate quantities of protein and other major vitamin and mineral requirements' (Covington & Burling & Lambert, 1969, p. 13–14).

An explanation given in the proposal for these reduced nutritional requirements was that it 'fully protects the needs of the consumer while being within the reach of commercial feasibility' (Covington & Burling & Lambert, 1969, p. 12). However, not all TVP manufacturers shared this view. In a letter from Sarett (Mead Johnson), to McCullar (HEW) (Jan 29, 1971), he argued that that '[i]t may be necessary to have separate minimum levels for textured protein products flavored as meats

(as a group), as poultry (or fish), and as cheeses' and that 'essential nutrients hitherto considered as "minor," must be considered since the fabricated foods are displacing important sources of these nutrients from the diet' (Mead Johnson Research Center et al., 1971, pp. 5, 7). Similarly, in a letter from Sarett to Rorex discussing a subsequent publication into the Federal Register in April 12, 1973 that expanded on the December 5th 1970 entry (United States: National Archives and Records Administration: Office of the Federal Register, 1973), he requested that in the 'interests of good nutrition in the Special Food Service Programs' the USDA should require additional nutrients usually provided by meat, poultry, and fish, such as folic acid, zinc, and potassium (Mead Johnson Research Center et al., 1971, p. 2), thereby challenging the argument about the 'fungibility' of protein sources.

It is worth noting that Mead Johnson and Company specialised in producing nutritional products for special dietary uses (1971), and special dietary foods were required to include all essential and micro nutrients (Food Research and Action Center, Pollack, Brooks, Unknown, 6). A more restrictive requirement for TVP products may therefore have benefitted Mead Johnson, representing a protectionist strategy to gain competitive advantage over other companies without this expertise. Another reason is an awareness that a more nutritionally complete product would have greater likelihood of being accepted by consumers, and more likely to be used in the future as a standalone protein source without needing to be mixed with animal protein sources:

> We realize that the present proposal [Federal Register, April 12, 1973] permits the textured vegetable protein to be used only in combination with meat, poultry, or fish at specified levels, and that at these levels the omission of some of the essential nutrients provided by these animal products might not be a serious problem, but these same nutritional standards may-well be applied to "Textured Vegetable Protein Products" that are used in greater amounts in the diet, with little or no animal protein, in which case serious nutritional inadequacies could result if these nutrients are omitted. (Mead Johnson Research Center, et al., 1971, 2).

These findings align with existing literature on fortification, which highlights a range of strategies and reasons for industry support for and initiation of fortification activity, including public health motives, profit and competitive advantage opportunities, and interest in avoiding additional legislative action (Bishai & Nalubola, 2002, pp. 37-53).

#### 3.4.2. *Government perspectives on regulating industry*

Documents indicate that some key government stakeholders held that nutritional requirements were a matter for industry to manage themselves. A report by the Joint Ag-FN Boards Task Force, while raising concerns that higher nutritional requirements should be set than those proposed, expressed the hope that 'higher nutritional quality proteins would result from future research developments' (National Academy of Sciences, et al., 1969, 44). This notion that future research would lead to products with better nutrition makes the implicit assumption that food companies would willingly use such research to improve their products. Such an assumption reflects a large body of literature on 'industry self-regulation', the approach of allowing industry to voluntarily improve standards without firm legislative regulations imposed on them.

The potential improper use of RDA guidelines in proposals by TVP manufacturers was an issue that actors involved in producing the guidelines were aware of. In a letter from Sarett to Harper, referring to Harper's draft 'Introduction to RDA' document, he writes:

> You no doubt know the important role that the [RDA document] plays in the decisions of industry on nutrient levels in foods and vitamin supplements […]. However, many groups refer only to the table in the publication as the basis for proper or "complete" nutrition. Thus, it is difficult to encourage manufacturers to increase vitamins and minerals in foods and in supplements, if these nutrients are not listed in the table. (Hegsted et al., 1972, p. 22).

Miller, the director of the FDA Bureau of Foods at that time, notes that nutritional equivalence is important 'only when [formulated foods] represent a significant portion of the diet. At the moment they don't, but theoretically they could' (Wedman et al., 1979, p. 12). The focus on only bringing in stricter regulations based on the potential future increase in consumption is also raised by the FNS, who state: '[w]e intend to be flexible enough to incorporate new knowledge and nutritional requirements brought out by nutritional surveys or new consumption patterns' (CSPI, 1972, 5). Thus, prevailing views in government were that enforcing true nutritional equivalency should be postponed, only being necessary when the combination of increased consumption and nutritional knowledge makes it viable and worth pursuing.

## 4. Discussion & conclusion

Our paper analyses the stakeholders and narratives shaping the development of TVP products in the 1960s to early 1980s, and offers an analysis of the historic use of the NSLP for commercial product development. We find that the US government knowingly and proactively paved the way for industry to develop TVPs. It did so mainly by: (a) offering government funding for TVP research and development; (b) by opening the doors to lucrative markets; and (c) by supporting a lenient regulatory environment for TVPs to be developed.

### 4.1. *Public private partnerships*

It is important to contextualise historical support for TVP product development within the broader USDA agenda. Product innovation was, and currently remains, a key priority for the USDA, and includes innovation to address both dietary and environmental concerns. This priority manifests itself in the form of significant financial research investments and via partnerships with universities and private companies. For example, the USDA's Agricultural Research Service has a fiscal year budget of approximately $1.5 billion[4]. Currently featured products include, for example, a pea-based dairy alternative[5], as well as other products such as fortified chocolate[6], or bio-based kitty-litter[7]. The USDA proactively seeks to work with industry to create products which align with USDA priorities (USDA Food and Nutrition Service, 2022). Thus, the exploration of the evolution of TVP products should be understood as one of what may likely have been several simultaneous developments in the food industry sector.

We find that the US Government's support for TVP development was informed by a desire to address an impending protein sourcing crisis, and in the interest of cost savings in the NSLP. The provision of research funding and authorisation of use in the NSLP resulted from the convergence of these concerns with USDA perceptions that public–private partnerships represented a favourable solution. There is a consequent need to reassess any preconceptions of industry access to 'captive markets' being solely a result of weak governance and industry lobbying (Haskins, 2005), and to recognise that government bodies may actively facilitate such industry activity in the pursuit of their own priorities, such as addressing food insecurity.

Our findings also speak to broader concerns regarding the consequences of public–private partnerships, especially in regards to the increased corporate influence in policymaking and policy choices that are particularly favourable to industry. Of particular relevance is Baker, *et al.*'s research on ultra-processed foods, that 'PPPs involving food manufacturers have focused more on nutrient-based responses, such as

[4] https://www.ars.usda.gov/about-ars/.
[5] https://tellus.ars.usda.gov/stories/articles/drink-your-peas-please/.
[6] https://tellus.ars.usda.gov/stories/articles/a-healthier-milk-chocolate-yes-please/.
[7] https://tellus.ars.usda.gov/stories/articles/biobased-kitty-litter-is-the-cat-s-meow/.

reformulation. This depoliticises food environments by deflecting attention away from the structural determinants of unhealthy diets' (Baker et al., 2020, 14–15). The creation of value-added, nutricentric TVP products aligns with this, as a distinctly industry-favourable option for supporting government objectives of reducing malnutrition.

### 4.2. Regulatory environments & self-regulation

In our case study we find that industry was very proactive in trying to modify the regulatory environment to favour their interests. Among other strategies, TVP producers sought to loosen the criteria for nutritional equivalence in favour of nutritionally inferior products, and also incorrectly used RDAs as a benchmark or dietary guideline, as opposed to an indicative and knowingly incomplete bare minimum threshold. The government did not perceive a sense of urgency in regulating the TVP industry, and there were prevailing sentiments that the market was too small to warrant further regulation, and that the industry would self-regulate to produce increasingly superior products.

However, as the literature in this area suggests, self-regulation is often unsuccessful in the food and tobacco domains and represents weaker policy approaches than firm public legislation (Landman et al., 2002; Mello et al., 2008). For industry, voluntary 'self-regulatory' efforts primarily represent a means to avoid government regulation, and thereby facilitate industry profit-motives (Sharma et al., 2010). In our case, the industry push for lower nutritional standards shows an unwillingness to voluntarily produce a higher standard product.

### 4.3. Nutritional reductionism

We note how TVP developments during this period bear the classic signs of nutritional reductionism (Scrinis, 2008), or what some have called exclusive reductionism (Fardet & Rock, 2020). Generally speaking these terms summarise the trend of perceiving foods to be merely the sum of their nutrients, which has been a pervasive and dominant paradigm in public health policy and nutrition research since the mid-nineteenth century (Scrinis, 2016). Yet, the evidence suggests that nutritional reductionism is a flawed approach and provides an inaccurate understanding of nutrition as a result of synergistic effects of different food components with each other and with human physiological processes (Jacobs & Tapsell, 2013).

Scrinis has discussed at length how nutritional reductionism as a paradigm has been used by the food industry to engineer and market new processed foods (Scrinis, 2016). In our case study we see that nutritional exclusive reductionism drove the focus on nutritional optimisation which resulted in the neglect of other food characteristics. The privileging of particular nutrients, mainly protein, in TVP products could in part explain how producers were able to push for a lax regulatory environment, placing emphasis on 'key nutrients' and in turn deprioritising other nutritional characteristics of meat. It is unsurprising that protein ranked so highly as a concern for policy, as this 'master' nutrient has remained an enduring concern across time (Ridgway et al., 2019). Policymakers should recognise the importance of ensuring access to nutritionally complete products, especially in light of current trends of food companies marketing products based on individual nutritional characteristics (Scrinis, 2016).

### 4.4. School lunch programmes

A key market for TVP products was the National School Lunch Programme. This was lucrative to industry because it was perceived as a captive market of passive consumers, as well as a testing ground for new product development and formulation. The motivations for introducing TVPs in schools differed between the government and industry. Cost savings were a key concern for the former, while profit was a key driver for the latter. Our findings build on a significant body of literature regarding how corporations target schools as key markets. Existing studies show how food companies seek to introduce products into the school meal program, including 'competitive foods' such as sodas, in vending machines, snack bars and on-site stores or as alternatives within the lunch hall (Briefel et al., 2009; Haskins, 2005; Price & Kuhn, 1996). Parallels can be found in how tobacco companies seek to market cigarettes to schoolchildren (Fang et al., 2020; Gilmore et al., 2015).

It may be argued that school lunch programmes do not fully meet the criteria for constituting a captive market, for reasons including: local school districts having a degree of autonomy in choosing foods served, and children being able to bring a lunch from home if they do not want the school meal. The approval of TVP for the NSLP may therefore in theory only open a market to the product but not guarantee widespread consumption. Nonetheless our view is that for schools serving TVP, the description as a 'captive market' remains an applicable term, especially in light of TVP being served as a combined meat-TVP product which, as expressed by some stakeholders identified in our research, may not be fully recognised by children, thereby limiting their ability to make an informed choice. We also recognise that for children from low-income backgrounds, a home lunch alternative may not be an option. Furthermore, our examination of school lunch programs as captive markets builds on existing literature that shows industry are well aware of the 'captive' nature of schoolchildren, and that children aged 12 + are stated as a target demographic for food industry actors (Harris & Fox, 2014, p. 206). US food companies in 2009 spent $149 million marketing their products in schools (Harris & Fox, 2014, p. 206). Terry-McElrath, et al., note that 'most US elementary, middle, and high school students attended schools where they were exposed to commercialism aimed at obtaining food or beverage sales or developing brand recognition and loyalty for future sales' (Harris & Fox, 2014, p. 241). Furthermore, Nestle has written on food companies 'incentivising' their commercial activity, by offering investment of resources into financially struggling schools in return for market access (Nestle, 2003/2013, p. 118).

School meal programme aside, we know the food industry considers children to be a particularly lucrative market, and more effort should be put into protecting children's interests. Recent research into industry self-regulation in relation to food advertisements to children suggests that the criteria for self-regulation are often heavily influenced by the industry, meaning that schemes aimed at protecting children via this policy approach risk being too weak and permissive to effectively achieve public health goals (Landwehr & Hartmann, 2020). Similar research from the UK suggests that industry actors actively seek to undermine public health arguments for limiting children's exposure to advertising of unhealthy foods, and attempt to discredit the effectiveness of such policies (Carters-White et al., 2021).

Much can be learned by the UK example of the Public Health Responsibility Deal with regards to industry self-regulation. An analysis of the national food pledge scheme suggests that among the different approaches to self-regulation, several companies had partnered with schools in the effort to meet the calorie reduction pledge, but it is possible this offered an opportunity to cultivate brand recognition while disguising this as nutrition education (Knai et al., 2015). In our case-study, we note that though some critics mentioned the lack of consideration about children's welfare in introducing TVPs in schools, it appeared no one was officially tasked with looking out for the welfare and interests of children, nor was this a prevailing concern among the main actors involved.

### 4.5. Policy implications

Our research is particularly relevant, because of what appears to be renewed interest in recent years in using school meal programs for the testing of alternative-proteins. This comes hand in hand with a notable growth in consumer interest in, acceptance of, and demand for alternative protein products compared to what was the case five decades prior (Onwezen et al., 2021), and it is important to recognise that consumer demand is a key driver for change, and it is through consumption

that citizens become political actors (Palmer et al., 2022). The environmental implications of animal-derived foods have been a key contributor to recent demand for plant protein alternatives (Onwezen et al., 2021), which is also an aspect differentiating the present day from the era our research focuses on.

In 2010, The Healthy School Meals Act[8] unsuccessfully proposed a pilot study of plant-based protein products through the US School Lunch Program (Polis, 2010), and in 2013 a paper by Schneider recommended that the US federal government incorporate plant-based protein alternatives in the School Lunch Program to: 'accomplish important sustainability goals', 'improv[e] the health of our nation's children', and significantly, 'be an active force in encouraging the development of the plant-based food industry' (Schneider, 2013, p. 173). A paper published in June 2021 conducted a study introducing plant-based protein products into two Georgia schools, to measure food acceptability (Cox et al., 2021). Finally, in the UK, the 2021 National Food Strategy Independent Review made recommendations that the Government should offer support and investment for companies developing novel proteins, and that the government should utilise food consumption in state-funded institutions as a commercial lever to drive changes in the food system (Dimbleby, 2021, pp.125–126). These represent examples of the continued relevance of the issues our research raises.

Policymakers should ensure institutional markets are responsibly used when product innovation is at stake and investment in development of meat substitutes should take into account the nutritional qualities of the products substituted for - both where these are greater than proposed substitutes, as well as in cases where these may be inferior. Future research could explore the circumstances behind the renewed efforts to use the NSLP for product development, as this paper has done for the first-generation of these products.

### 4.6. Limitations

One limitation from the chosen methodological approach is that self-selection of keywords to use for document searches leads to the potential exclusion of many documents which may be relevant to the topic. Though this is partly inevitable in archival document research, reaching saturation point with the chosen keywords points to a good level of coverage. The documents available will reflect the nature of the collections they originate from, most frequently from the collections: William Darby Papers, Nevin Scrimshaw Papers, CSPI Collection, D Mark Hegsted Papers, and Frederick Stare Papers. This presents potential issues of biased selectivity (Yin, 2003), where the perceived influence of individuals, such as Darby or Hegsted, in the domain may be skewed by the large number of documents relating to them.

It is worth noting that our chosen methodology allows us to paint a picture of these historical events which is exclusively driven by the information in these documents. The scope of our research is therefore principally focused on issues and narratives arising from discussions by various stakeholders. While this provides important detail, some arising questions remain unanswered, including comprehensive overviews of research funding, product acceptance data, and further details about what constituted TVP product testing in the NSLP. We hope that future research in this area adds further clarity on these specific areas to build a more complete picture of this activity.

The nature of the archive, containing documents primarily from industry, government, and third-sector stakeholders, means some valuable perspectives are missing. In particular our archival research did not find perspectives from school food service groups who would purchase products for school meal usage. We hope future research will provide information on their attitudes towards the products. While archival documents cannot necessarily be considered as 'firm evidence of what they report' (Atkinson & Coffey, 1997, 47), archival research is nonetheless the best available option to address our research questions.

## CRediT authorship contribution statement

**Freddie von Kaufmann:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Valeria Skafida:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Coding framework – Themes identified in the reviewed documents

| *Parentheses indicate number of documents with each theme* [a] | Government | Industry | Academic, Third Sector & Other | *Sum of documents identified* [a] |
|---|---|---|---|---|
| Rationales & motivations in relation to TVP product development | | | | |
| *Favourable to TVP* | | | | |
| Cost savings opportunities of TVP in relation to meat | gm01 (23) | im12 (3) | | 26 |
| Health benefits of TVP products | gm02 (13) | | | 13 |
| Sustainability of protein availability | gm03 (4) | | om03 (4) | 8 |
| Addressing malnutrition | gm04 (3) | | | 3 |
| Profitability of new products | | im05 (16) | | 16 |
| Profits from new markets (school lunch programme) | | im06 (3) | | 3 |
| Co-funded research and development | | | om07 (1) | 1 |
| Corporate social responsibility | | im08(1) | | 1 |
| *Critical of TVP* | | | | |
| Nutritional inferiority of TVP | og01 (5) | oi01(4) | oo01 (11) | 20 |
| Inappropriate to target children for product development (school lunch programme) | og02 (1) | | oo05 (17) | 18 |
| Monitoring of nutritional content becomes necessity | | oi02(4) | | 4 |
| Business favourable product | | | oo04 (4) | 4 |
| Government conflict of interests | | | oo06 (5) | 5 |
| Actions & strategies in relation to TVP product development | | | | |
| Sponsoring Research and Development | gs01 (3) | | | 3 |

(*continued on next page*)

[8] https://www.congress.gov/bill/111th-congress/house-bill/4870.

(*continued*)

| *Parentheses indicate number of documents with each theme* [a] | Government | Industry | Academic, Third Sector & Other | *Sum of documents identified* [a] |
|---|---|---|---|---|
| Facilitate access to markets | gs02(4) | | | 4 |
| Create a favourable regulatory environment | gs03 (7) | | | 7 |
| Utilise industry experience and technology | gs05 (3) | | os02 (1) | 4 |
| Lobby for favourable nutritional requirements | | is01 (3) | | 3 |
| Use of nutritional reductionism to defend TVP | | is03 (1) | | 1 |
| Pursue access to School Lunch Programme for product development and expansion | | is04 (3) | | 3 |

a. Numbering illustrates the number of documents including each theme, not the number of single extracts coded with each theme within documents.

## Appendix B. List of the accepted products for use in the US National School Lunch Programme as of May 1972

| Company | Product Name |
|---|---|
| Archer Daniels Midland Company, Decatur, Illinois 62,525 | Fortified TVP |
| Bernard Food Industries Incorporated, 1125 Hartrey Avenue, Evanston, Illinois 60,204 | TEX-PRO with seasonings (identical to Fortified TVP manufactured by Archer Daniels Midland, or Fortified Textured Vegetable Protein manufactured by Pfizer Incorporated). |
| Cargill Incorporated, Cargill Building, Minneapolis, Minnesota 55,402 | TEXTRATEIN |
| Central Soya Company, Inc., 1825 North Laramie, Chicago, Illinois 60,639 | PROMOSOY-SL (concentrate product) |
| Far-Mar-Co, Incorporated, 960 North Halstead, Hutchinson, Kansas 67,501 | ULTRA-SOY |
| Frozen Food Forum, Inc., 120 West Wieuca Road, Atlanta, Georgia 30,342 | FROSTY ACRES TEXTURED VEGETABLE PROTEIN (identical to MIRA-TEX manufactured by A. E. Staley |
| Galanides, Incorporated, P. 0. Box 168, 1249 Wicker Drive, Raleigh, North Carolina 27,604 | GALANIDES (identical to MIRA-TEX manufactured by A. E. Staley) |
| General Mills, Inc., 9200 Wayzata Boulevard, Minneapolis, Minnesota 55,440 | - Frozen BONTRAE: Diced-ham flavor; Diced-chicken flavor; Crumbles-beef flavor;<br>- Dehydrated BONTRAE: Crumbles-beef flavor; Crumbles-unflavored |
| Griffeth Laboratories, 1415 West 37th Street, Chicago, Illinois 60,609 | GL-219 (concentrate product)<br>GL-7721 (textured vegetable protein) |
| Institutional Wholesalers, Inc., P. 0. Box 4747, Macon, Georgia 31,208 | SAXONY (identical to TVP manufactured by Archer Daniels Midland) |
| Jungk Seasonings Laboratories, Box 4537 Overland Park, Kansas 66,204 | FORTIFIED TEXTURED VEGETABLE PROTEIN, with seasonings |
| Miles Laboratories, Inc., Elkhart, Indiana 46,514 | TEMPTEIN:<br>Meat-like Nuggets<br>Beef-like Flavored Granules |
| Milwaukee Seasoning Laboratories, Inc. 2803 North 32nd Street, Milwaukee, Wisconsin 53,210 | TVP Brand (identical to TVP manufactured by Archer Daniels Midland) |
| North American Laboratory Company, Inc. 725 Gardner Lane, Indianapolis, Indiana 46,206 | SLP-761 (Combination of ULTRA-SOY manufactured by Far-Mar-Co and PROMOSOY-SL manufactured by Central Soya Company |
| Nuggett Distributors, Inc., P. 0. Box 8309, Stockton, California 95,204 | MAGI-PRO (identical to MIRA-TEX brand manufactured by A. E. Staley) |
| Pfizer Incorporated, 235 East 42nd Street New York, New York 10,017 | FORTIFIED TEXTURED VEGETABLE PROTEIN |
| Ralston Purina Company, Checkerboard Square, St. Louis, Missouri 63,188 | SUPRO 50A<br>*TEXTURED EDI-PRO |
| Rykoff, S. E., and Company, 761 Terminal Street, Los Angeles, California 90,021 | S.E.R. PRO-TEAM (identical to TVP manufactured by Archer Daniels Midland) |
| Sexton, John, and Company, P. 0. Box JS, Chicago, Illinois 60,690 | *PR0TEIN-PLUS |
| Staley, A. E., Manufacturing Co., 2200 Eldorado Street, Decatur, Illinois 62,525 | MIRA-TEX<br>NUTRA-MATE |
| Swift Edible Oil Company, 115 West Jackson Boulevard, Chicago, Illinois 60,604 | TEXGRAN<br>SFP (concentrate product) |
| Taylor, H. B., Company, 4830 South Christiana Avenue, Chicago, Illinois 60,632 | TESTRASOY No. 412 |
| Worthington Foods, Inc., 900 Proprietors Road, Worthington, Ohio 43,055 | MEAT-LIKE NUGGETS<br>GRANULES: Granburger; Beef-like; Hamburger-type |

## Appendix C. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodpol.2023.102437.

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