

Beriberi, Vitamin B1 and World Food Policy, 1925–1970

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Beriberi has long been recognized as being of special significance among the avitaminoses. It was not the first disease to be associated with a specific nutritional deficiency, but the researches of Christian Eijkman into polyneuritis in the early years of this century, and Casimir Funk's apparent isolation of an anti-beriberi factor in 1911, led to the discovery and identification of vitamins and to important developments in the science and practice of nutrition.¹ Vitamin B1, or thiamine, was first isolated from rice polishings by the Dutch research workers W F Donath and B C P Jansen in 1926, and was first synthesized ten years later by the American Robert R Williams and his co-workers. Those involved in this research were impressed by its significance: for Jansen, the beriberi research generated the modern science of nutrition; for Williams it paved the way for the elimination of a disease that had brought suffering and death to millions.² During the 1920s, commercial companies had developed techniques for adding vitamins to processed foods, a process known as fortification,³ and following the synthesis of thiamine, Williams became convinced that the eradication of beriberi might be achieved by the distribution of thiamine-enriched rice in countries where the disease was endemic.

The path from Funk's insight to the implementing of rice enrichment programmes was far from smooth, however, either scientifically or administratively. Between 1911 and 1933, scientists struggled to elucidate the anti-beriberi vitamin, while the question of whether to encourage the enrichment of rice supplies with synthetic thiamine became an issue of importance for the food and health agencies of the United Nations in the decades after World War II. Superficially unrelated, the scientific arena of the 1920s and 1930s, and the administrative policy arena of the 1950s and 1960s were linked by the field observations of two British scientists, W R Aykroyd and B S Platt, whose early work on beriberi carried them to positions of influence in the world of international agencies and global policies which emerged as a principal determinant of change in developing countries after 1945.⁴ It was Williams's view in later years that Platt and Aykroyd were

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¹ Wyndham E B Lloyd, *A hundred years of medicine*, 2nd ed., London, Duckworth, 1968, p. 169.

² B C P Jansen, 'Early nutritional researches on beriberi leading to the discovery of vitamin B1', *Nutrition Abstracts and Reviews*, 1956, 26: 1–14; Robert R Williams, *Toward the conquest of beriberi*, Cambridge, Mass., Harvard University Press, 1961.

³ R P T Davenport-Hines and J Slinn, *Glaxo: a history to 1962*, Cambridge University Press, 1992, ch. 4.

⁴ The League of Nations was established in 1922, and its Health Organisation in 1923; widespread and active interest in nutrition surfaced only after 1935: N M Goodman, *International health organizations and their work*, London, J & A Churchill, 1952, p. 125.

responsible for obstructing the international sponsorship of the rice-enrichment policies on which he was himself determined and this disappointment clouded his sense of personal achievement.⁵ At the personal level, this disagreement over rice-enrichment provides an intriguing example of divergence in scientific styles; in the wider context of the history of nutrition and of development policy, it has implications for our understanding of the long-term patterns of development of these disciplines.

The history of the modern discipline of applied nutrition has been bedevilled by a continuing tension between technical fixes and structural policies—between “vertical” and “horizontal” solutions—within the international nutrition community.⁶ Although Michael Worboys has argued that nutrition was transformed “from being conceptualized as a major structural problem into being conceptualized as a technical problem” just before World War II,⁷ the story of the rice enrichment controversy shows that the structural convictions of individuals continued to exert an influence on the policies adopted towards specific nutritional problems, even within a context in which technical solutions had achieved general dominance. In the transition from malnutrition as a colonial problem to malnutrition as an international concern which took place in the early 1940s, technical solutions by no means replaced structural planning as the dominant ethos of the international nutrition community.

Wallace Aykroyd, Benjamin Platt and the Emergence of International Nutrition Policies

Food and nutrition were not prominent concerns of classical tropical medicine or of colonial administrators in the first decades of the twentieth century. In the mid-1920s, however, John Boyd Orr and John Gilks first reported on the poor nutritional status of indigenous African peoples, while the Indian researches of Robert McCarrison were helping to focus the attention of colonial medical officers on nutritional problems. While the African study stimulated further surveys of local colonial nutrition, McCarrison’s researches helped to shape opinion on how nutritional problems should be tackled.⁸ Although much of McCarrison’s work was focused on specific deficiency diseases, he laid great emphasis on the importance of natural foods in the diet. Thus his best-known publication, *Studies in deficiency disease* (1921), declared that the usual diet need only be reinforced by “natural foodstuffs in sufficient quantities to provide an adequate supply of vitamins, suitable protein, and salts for the varying needs of individuals”. Significantly, he noted the dangers inherent in the sub-division of vitamins into many classes: “Vitamins, like other essential constituents of food, are not to be regarded as independent of the assistance derivable from their associates in the maintenance of nutritional harmony. Each vitamin is but a member of a team, and the team itself but a part of a co-ordinated whole”.⁹ The influence of this holistic view of nutrition, which

⁵ This view has been perpetuated by Melinda Meade in her essay ‘Beriberi’ in Kenneth F Kiple (ed.), *The Cambridge world history of human disease*, Cambridge University Press, 1993, p. 610.

⁶ Celia Petty, ‘Foreword’, in Veronica Berry and Celia Petty (eds), *The Nyasaland Survey papers 1838–1943. Agriculture, food and health*, London, Academy Books, 1992, p. 4.

⁷ Michael Worboys, ‘The discovery of colonial malnutrition between the wars’, in David Arnold (ed.), *Imperial medicine and indigenous societies*, Manchester University Press, 1988, p. 221.

⁸ *Ibid.*, pp. 210–13, 214–15.

⁹ Robert McCarrison, *Studies in deficiency disease*, London, Henry Frowde and Hodder & Stoughton, 1921, pp. 244–5.

Worboys suggests led colonial medical officers to argue the importance of the general effects of diet as against attention to specific deficiency disease (a structural rather than a technical solution), extended beyond the colonial medical service. It related to nutritional concerns at home in Britain, and in this respect shaped the intellectual background of young scientists coming into the nutrition field in the later 1920s.

Ever since the Interdepartmental Committee on Physical Deterioration had reported in 1904 that incorrect choice of food was “prominent among the causes to which degenerative tendencies might be assigned”, nutrition had formed a continuing theme in British public health concern.¹⁰ By the inter-war period, there was a rising interest in the social and economic context of nutrition. As A L Bacharach, then a researcher at the Glaxo nutrition research laboratories, later noted, “an increasing interest in the scientific bases of nutrition accompanied a growing awareness that diet and health were closely connected . . . People were beginning to wonder . . . at the patent correlation between disease and poverty”.¹¹ Dietary surveys in Britain and elsewhere established links between low incomes, inadequate diets and poor health, while the publication, in 1932, of Audrey Richards’ dietary study of the Bemba people of Northern Rhodesia brought an anthropological perspective to the emergent discipline of nutrition. “The fact is,” wrote Richards, “that nutrition in human society cannot even be considered apart from the cultural medium in which it is carried on”.¹²

It was against this complicated intellectual background that Wallace Aykroyd and Ben Platt embarked on their own studies of beriberi in the years between 1925 and 1932.

Aykroyd’s Study of Beriberi

Beriberi, which is caused by lack of thiamine in the diet, was widely prevalent in the Far East in the 1920s. It was endemic in India, China, Hong Kong and Japan, in Malaysia, the East Indies and the Philippines; it was also reported from all parts of Africa, and was a serious problem in South America and the West Indies.¹³ As with other deficiency diseases, scientific research into the causes of beriberi was largely dominated by the laboratory in the early years of the century.¹⁴ After 1918, however, medical interest in the tropics expanded, and with the establishment of colonial research institutes and of research interest among local doctors, the etiology and epidemiology of beriberi also began to receive attention. In India, Robert McCarrison began his ‘Beriberi Inquiry’ under the auspices of the Indian Research Fund Association in 1918; the Far Eastern Association of Tropical Medicine was extensively preoccupied with the disease at its meetings of 1921, 1923 and 1925; in Canada, the presence of beriberi in Newfoundland

¹⁰ Celia Petty, ‘Primary research and public health: the prioritization of nutrition research in inter-war Britain’, in J Austoker and L Bryder (eds), *Historical perspectives on the role of the MRC*, Oxford University Press, 1989, p. 83.

¹¹ A L Bacharach, *Science and nutrition*, London, Watts & Co., 1938, p. 81.

¹² Audrey Richards, *Hunger and work in a savage tribe*, London, George Routledge and Sons, 1932, p. 10. For Richards and her work, see Jo Gladstone, “‘Venturing on the borderline’ Audrey Richards’

ethnographic contribution to the “Hungry Thirties” debate in Africa, 1927–1942’, *Bull. Soc. soc. Hist. Med.*, 1987, 40: 27–32.

¹³ E Burnet and W R Aykroyd, ‘Nutrition and public health’, *Q. Bull. League of Nations Health Organisation*, 1935, 4: 323–495, p. 430.

¹⁴ See Jansen, *op. cit.*, note 2 above; E V McCollum, *A history of nutrition: the sequence of ideas in nutrition investigations*, Boston, Houghton Mifflin Company/Riverside Press, 1957.

began to cause concern; and in China the newly established Henry Lester Institute for Medical Research included beriberi among its clinical research interests. During the 1920s, therefore, two distinct strands of interest in beriberi developed. On the one hand there were the scientists working to isolate the anti-beriberi factor, on the other there were those who were additionally concerned with the behaviour of the disease in the field.

Wallace Ruddell Aykroyd (1899–1979) belonged to the latter group. After qualifying MB at Trinity College, Dublin, in 1924, Aykroyd went out to St John's, Newfoundland, as a house surgeon.¹⁵ Here he became interested in deficiency diseases, which he took as the subject of his MD thesis, completed in 1928. He was particularly concerned with beriberi, which was endemic among the isolated fishing communities of Newfoundland and Labrador in the winter months, and was awarded a Beit Medical Research Fellowship to pursue this interest. His findings were published in article form in 1930.¹⁶ From the beginning, Aykroyd was aware of the wider implications of his study. "While such work would be of scientific interest", he wrote in his fellowship application, "it would have an important social bearing. Recommendations could be made to the Newfoundland government as to the best way of dealing with their food problem". Significantly he added, "Beriberi has not so far been studied clinically with reference to laboratory research work of recent years".¹⁷ The observations which Aykroyd made during the course of his study confirmed his initial lines of thought, shaped his approach to health and nutrition, and, as his career developed, became influential in shaping international approaches to nutritional problems.

Aykroyd's beriberi study is a small masterpiece of epidemiological observation and analysis. Drawing on hospital records, and information supplied by local doctors, he began by noting that beriberi had become common among the Newfoundland coastal communities in the early years of the twentieth century, and had been endemic ever since. In the 1920s, however, it had become increasingly less frequent. The appearance of beriberi was associated with the replacement of wholemeal by white flour as a staple winter food. By custom and necessity, the outlying communities of Newfoundland laid in winter stores during November and December to last them through to the following May and June, when the snows vanished and communication with the outside world again became possible. In the late spring months, notably among the poorest families, food shortages became pressing; the seasonal curve of hospital admissions for deficiency diseases, including beriberi, showed a clear peak in April, May and June. Careful inquiry revealed that the families who suffered from these diseases were the very poorest, whose diet was rapidly reduced to white bread, with some salt meat and molasses, in the winter. Families on slightly higher incomes, whose stores included a fair supply of potatoes, did not suffer from beriberi.¹⁸

The conclusions which Aykroyd drew from this study were plainly informed by consideration of the wider problem of tropical beriberi. The findings with regard to Newfoundland were clear: here beriberi was "indirectly the result of poverty and the

¹⁵ 'R. P.', 'Wallace Ruddell Aykroyd', *Lancet*, 1979, i: 450.

¹⁶ W R Aykroyd, 'Beriberi and other food-deficiency diseases in Newfoundland and Labrador', *J. Hyg.*, 1930, 30: 357–86.

¹⁷ W R Aykroyd, Application for a Beit Memorial Medical Research Fellowship, Beit Grant Applications, Contemporary Medical Archives Centre (CMAC), SA/BE/A-120.

¹⁸ Ackroyd, op. cit., note 16 above, pp. 357–65.

difficulties, due to hard climate, which attend the production and transport of foodstuffs. *Its prevention is an economic rather than a medical problem*" (my italics).¹⁹ This was the crux of the matter as far as Aykroyd was concerned. Moreover, he looked beyond the Newfoundland experience to focus on tropical beriberi. "In connexion with Newfoundland beriberi", he continued, "there is no necessity, as perhaps exists in the case of tropical beriberi, for attempting to alter ingrained food habits". While the introduction of white flour had caused the problem, the reintroduction of whole-wheat flour would not resolve it: wholewheat flour has poor keeping qualities, and in the circumstances, good keeping qualities were essential. With the insight that was to dominate his later thinking and writing on the subject of nutrition, he then noted: "Moreover, whole-meal flour would check only one dietary deficiency and it is wiser to aim at general all round improvement. It is possible that more headway would be made with beriberi in the tropics if administrators would come to regard it, not as a question of polished or unpolished rice, but simply as a problem of poverty".²⁰ If tropical peoples could afford a wider range of foods, in other words, tropical beriberi would disappear.

Although Aykroyd had perhaps derived some inspiration from McCarrison, who, he noted, "seems to be approaching this view", it was his own experience in Newfoundland that opened his eyes to the relationship between poverty and nutritional deficiency.²¹ His thesis had attracted the attention of Charles Martin and Harriette Chick at the Lister Institute in London, who sponsored his Beit fellowship,²² and were probably instrumental in his appointment, in 1931, as "Secretary-Investigator" in Nutrition to the League of Nations Health Section; an appointment which made him at once "one of the first international civil servants and the first international nutrition worker".²³ For the rest of his life, his principal work was to be in the organization of research, "in the collection, co-ordination and ordering of information, and the administration of practical work for the prevention of malnutrition".²⁴

It was from the League of Nations that Aykroyd published, with his colleague Étienne Burnet, the highly influential report 'Nutrition and public health' in 1935.²⁵ While the report as a whole addressed the general issue of state-sponsored work in nutrition for public health ends, part of the sub-section 'New directions' specifically addressed the 'colonial dietary problem'.²⁶ Here the consolidation and development of the views Aykroyd had formulated while in Newfoundland are apparent. Among the individual examples of public health nutrition work discussed was beriberi, of which the authors noted that the problem of its international control was highly complex but worthy of further study.²⁷ The most significant passages occurred in the section on colonial dietary

¹⁹ *Ibid.*, p. 375.

²⁰ *Ibid.*, p. 375. In this context it is worth noting Jennifer Beinart's observation: "It is not to be expected that a medical researcher in 1937 would analyse the relations of production in [a] semi-colonial setting . . . and see that problems such as perennial indebtedness were probably more fundamental causes of pellagra among peasants than were vitamin shortage and worms": "The inner world of imperial sickness", in Austoker and Bryder, *op. cit.*, note 10 above, pp. 123–4.

²¹ Aykroyd's reference was to Robert McCarrison,

'Beri-beri columbarum', *Indian J. med. Res.* (Memoir No. 10), March 1928, pp. 1–146, and not to *Deficiency disease*. I have been unable to locate this particular volume.

²² *Lancet*, *op. cit.*, note 15 above, p. 450.

²³ 'T. P. E.' (Trewavas Pearce Eddy), *Br. Med. J.*, 1979, i: 544; Harriette Chick to Professor J Elliot, 4 May 1931: CMAC SA/BE/A-120.

²⁴ *Ibid.*

²⁵ Burnet and Aykroyd, *op. cit.*, note 13 above.

²⁶ *Ibid.*, pp. 448–53.

²⁷ *Ibid.*, p. 433.

problems. "In districts which suffer from avitaminoses", they observed, "means of prevention may be found close to hand . . . policies of prevention should not involve unnecessary disturbance of traditional dietary habits. It is preferable that the foodstuffs necessary to supplement native diets should be bought locally". Education, they considered, could achieve something: national and tribal dietary customs were "not inviolable physiological laws"; native colonial populations were observed readily to adopt the European habit of three meals a day, while millet-eating populations would accept rice as a substitute in times of shortage.²⁸ In the immediate pre-war period, there was little enough time for international action to take the direction suggested by Aykroyd and Burnet, but in 1945 Aykroyd was appointed Director of the Nutrition Division of the new United Nations Food and Agriculture Organisation (FAO).²⁹ Both these themes, the importance of easing malnutrition through local measures, and the value of education re-emerged as central features of the FAO's nutrition policy under his directorship after 1945.

Platt's Researches

While Aykroyd was evolving into a premier international civil servant in the service of nutrition and public health between 1925 and 1945, a not dissimilar path, intellectually and professionally, was being followed by Benjamin Stanley Platt (1903–1969). Although the two men were very different in personality, both became central figures in the emergence of nutrition as an international health concern. Aykroyd, genial, diplomatic and guided by clear professional ideals, was to be a "leader in establishing nutrition as a main component of public health programmes in many countries";³⁰ Platt, reserved, somewhat difficult, with great intellectual energy, became a pioneer in the establishment of tropical nutrition as an academic discipline in both England and her former empire.³¹

Just as Aykroyd discovered the economics of poverty in Newfoundland, so Platt discovered them in China. Trained initially as a chemist, Platt obtained his PhD at Leeds in 1926, and then qualified as a doctor in 1930. In 1925–26 and again in 1931–32, he held Beit fellowships, but his financial circumstances necessitated secure employment, and in 1932 he accepted the post of Associate in Medicine at the Henry Lester Institute for Medical Research at Shanghai.³² The Henry Lester had been founded in 1927 under the will of an English businessman, who left money for the establishment in China of "an institute for the study of and the instruction in the English language in medical science, surgery . . . and other useful and scientific knowledge".³³ The moving spirit behind the Henry Lester was Herbert Gastineau Earle (1882–1946), professor of physiology at the University of Hong Kong since 1915, who acted first as adviser to the Lester Trustees and subsequently as first Director of the Institute. Staff shortages in Hong Kong meant

²⁸ *Ibid.*, pp. 451–2.

²⁹ He spent the intervening decade as Director of the Nutrition Research Laboratory at Coonoor, India, in succession to Robert McCarrison.

³⁰ *Lancet*, op. cit., note 15 above, p. 451.

³¹ *Br. med. J.*, 1969, i: 243; London School of Hygiene and Tropical Medicine (LSHTM), *Annual report*, 1968–69, p. 18. 'T.P.E.' (Trewavas Pearce

Eddy) noted that "either you were his friend or his enemy": *Lancet*, 1969, ii: 224.

³² B S Platt, Application for a Beit Memorial Medical Research Fellowship, CMAC SA/BE I/A-101.

³³ K Chinin Wong and Wu Lien-teh, *History of Chinese medicine*, 2nd ed., Shanghai, National Quarantine Service, 1936, vol. 2, p. 808.

that most of Earle's time had been absorbed in teaching and administration, and he was determined to create an institute whose primary end should be medical research. His ambition had been focused by the contemporaneous creation of the London School of Hygiene and Tropical Medicine (LSHTM), which he used as a model for the Henry Lester.³⁴ It was Earle's hope that, since the LSHTM was to serve as a central institute for the British Empire, it might "assist an institute established in China to bring into closer contact the work of British and Chinese scientists".³⁵ In the event, there is no evidence of contact between the two institutes, but Earle's hopes found fulfilment of a sort when Platt became the first Professor of Human Nutrition at the London School in 1946.

Earle's policy as Director of the Henry Lester was to emphasize that "disease is a general biological problem and that all medical research should have a fundamental philosophical background if it is to be intelligently pursued".³⁶ Platt was clearly influenced by this approach, which seems to have guided his thinking on nutritional deficiency disease along the lines which Aykroyd had already begun to formulate. His principal research work at the Henry Lester was on beriberi, albeit in biochemical research and clinical investigation.³⁷ Platt's interests were not limited to the laboratory and the clinic, however, but encompassed the social context of the disease. His work on infantile beriberi, for example, led him to study Chinese methods of infant feeding, and to the observation, in which may be traced echoes of Audrey Richards, that "In any attempt to improve the dietary of a community, it is preferable to evolve from existing practices rather than indiscriminately to substitute foreign ones. It is obvious, then, that these indigenous practices must be known and preferably understood".³⁸ Many years later when, as a dying man, he addressed his last nutrition class at the LSHTM, he gave a vivid description of fulminating beriberi as he had seen it in young factory workers in Shanghai in the 1930s. He had been deeply angered by the knowledge that these youngsters died because they "were forced to work when they were badly fed", and it was this anger that fuelled his laboratory researches and helped him to develop an outlook which saw "the science and logistics of nutrition as inseparable from economics and sociology as well as from medicine and health".³⁹ As Platt himself noted in one of his departmental annual reports,

A successful attack on problems of nutrition, in any given country, depends on the activities of various government ministries, departments and services, research institutes, universities etc.; co-ordinated into a national programme. Among the fields of work especially concerned are nutrition itself, health, agriculture, animal husbandry, food technology, education, home economics and community development.⁴⁰

³⁴ H G Earle, 'The Institute of Medical Research, its origin, nature and functions', *National medical Journal of China*, 1930, 16: 267–80, p. 277.

³⁵ Ibid. He also wanted to establish a medical museum on the successful model of the Wellcome Museum of Medical Science in London: *ibid.*, p. 279.

³⁶ B S Platt, 'Herbert Gastineau Earle', *Br. med. J.*, 1946, i: 1001.

³⁷ Platt's publications from this period included: B S Platt and S Y Yin, 'Some observations on a preliminary study of beriberi in Shanghai', *Far Eastern Association of Tropical Medicine, Transactions*, Ninth Congress 1934, 2: 407–13; L G

Djen and B S Platt, 'Occasional creatinuria in adult Chinese males', *ibid.*, 1: 379–86; B S Platt, 'An approach to problems of infant nutrition in China', *Chinese medical Journal*, 1936, 50: 410–24; B S Platt and G Lu, 'Chemical and clinical findings in beriberi', *Q. J. Med.*, 1936, 5: 355–73.

³⁸ B S Platt and S Y Yin, 'Chinese methods of infant feeding and nursing', *Archives of Diseases in Childhood*, 1938, 13: 343–54, p. 343.

³⁹ 'Benjamin Stanley Platt', *Lancet*, 1969, ii: 224; LSHTM, *Annual report*, 1968–69, p. 18.

⁴⁰ LSHTM, *Annual report*, 1962–63: p. 41.

By the 1930s, the incidence of beriberi in China was clearly lending itself to economic and sociological explanations. In the southern coastal province of Fukien, for example, the disease was found only in the large cities of Amoy and Foochow, where the diet of the poorest classes consisted mainly of highly polished rice and very limited quantities of vegetables.⁴¹ Further, as Platt himself noted, there was a very marked seasonal distribution of cases: in Shanghai more than half the cases which presented at the Lester Chinese Hospital did so in the months July–September, when a smaller variety of vegetables was available than in the winter months.⁴² As in Newfoundland, beriberi was thus a seasonal disorder associated with general undernutrition, often exacerbated by hard physical labour. The Chinese experience, however, also suggested the power of education. Observers in Foochow found that the number of hospital admissions declined over a five-year period, and noted that “Popular knowledge of the disease exists to some extent and there is a demand for less highly polished rice among certain classes and this kind of rice is carried in the rice shops”.⁴³

The experience of China was a crucial formative influence on Platt’s professional life, and shaped an essentially holistic approach to his chosen discipline.⁴⁴ In an early report to the LSHTM he noted, “the improvement of the nutrition of backward peoples must . . . begin with the people themselves and with the development of their immediate resources”.⁴⁵ T P Eddy later wrote,

Platt always believed that an immediate start should be made with such local resources as there might be on the prevention and treatment of undernutrition and the diseases of poverty. It was clear to him that a study of local foods, of local customs and taboos, and education at all levels in the elementary principles of nutrition could always effect substantial improvements.⁴⁶

It was essentially a structural approach, and it was one that persisted in Platt for the rest of his career, despite the swing of the tide in the direction of technical fixes after 1945.⁴⁷

Nutrition in the Colonial Empire

In the autumn of 1937, the unofficial war between China and Japan, which had been simmering since the summer, erupted into action. The Japanese invaded in November, capturing Shanghai and penetrating inland up the Yangtze River to capture Nanking in December. The outbreak of war “considerably curtailed” the activities of the Henry Lester Institute,⁴⁸ and Platt returned to England, where he obtained a post on the

⁴¹ B W Jarvis and T Kang, ‘Observations on beriberi in Fukien Province with special reference to Foochow’, *Chinese medical Journal*, 1935, **49**: 1150–5.

⁴² Platt and Yin, *op. cit.*, note 37 above, p. 407; see also Jarvis and Kang, *op. cit.*, note 41 above, p. 1151.

⁴³ Jarvis and Kang, *op. cit.*, note 41 above, p. 1151. As the number of beriberi cases admitted to the Foochow hospital was very small, the decline in admissions may have been more apparent than real.

⁴⁴ *Lancet*, *op. cit.*, note 39 above, p. 224.

⁴⁵ LSHTM, *Annual report*, 1947–48: p. 71.

⁴⁶ ‘B. S. Platt’, *Br. med. J.*, 1969, **iii**: p. 243.

⁴⁷ Platt’s career was not unsullied by co-operation

with the advocates of technical solutions, as his behaviour over the Gambia Field Working Party project demonstrates: see Petty, ‘Foreword’, *op. cit.*, note 6 above, p. 6. None the less, Platt viewed the rising preoccupation of the nutrition community in the 1950s with kwashiorkor and protein malnutrition with reservation: see Donald S McLaren, ‘The great protein fiasco’, *Lancet*, 1974, **ii**: 93–6, p. 93; see also B S Platt, ‘Protein malnutrition—a note on nomenclature’, *Proc. Nutr. Soc.*, 1958, **17**: xl–xli, p. xli; B S Platt and D S Miller, ‘The quantity and quality of protein for human nutrition’, *ibid.*, 106–113.

⁴⁸ *Br. med. J.*, 1946, **i**: 1001.

scientific staff of the Medical Research Council. It was a timely return. Although the MRC had been financing research in nutrition for some years, this had been limited—like academic nutrition science generally—to biochemical investigations and family diet surveys.⁴⁹ Late in 1935, however, Aykroyd and Burnet's report, 'Nutrition and public health', appeared, and came to the attention of J E Thomas, Secretary of State for the Colonies.⁵⁰ In a circular of April 1936, Thomas asked the governors of British colonies to turn their attention to nutrition. The "surprisingly great" response to this circular resulted in the setting up of an Advisory Committee on Nutrition, on which the MRC was represented, to collate the material received.⁵¹ The membership of this committee was distinguished: it included E P Cathcart, Raymond Firth, Audrey Richards, Edward Mellanby and John Boyd Orr. Platt, in a junior MRC appointment, was not officially on the Committee, but was sufficiently involved in the preparation of the report for his assistance to be acknowledged with "special gratitude" by the authors.⁵²

Although the Committee's report, *Nutrition in the colonial empire*, attracted little initial attention, and in its final version differed in emphasis from the original draft,⁵³ it none the less became a document of some influence. According to Aykroyd, it was one of the key documents considered at the United Nations' 1943 Hot Springs conference, at which the UN's Food and Agriculture Organisation was conceived and its objectives outlined.⁵⁴ Secondly, it pulled together a number of strands of thought on the subject of colonial malnutrition and presented them in an accessible form. In this sense, it helped to perpetuate a structural perception of nutrition problems beyond the immediate context of the colonial medical world. John Waterlow, for example, then in his mid-twenties and just entering on a career in nutrition science, later recorded his sense that the Report was "one of the first indications that clinical disease is only the tip of the iceberg and that malnutrition is part of the background of life in large parts of the world". Before this, wrote Waterlow, deficiency diseases had been thought of as isolated phenomena, occurring largely in undeveloped countries, in the special circumstances of war, famine or privation; after, it was recognized that clinical disease was the extreme manifestation of widespread and generalized malnutrition in large parts of the world.⁵⁵

While the overall emphasis of the Report can be read as stressing "native education" as the cause of the agricultural problems which brought about colonial malnutrition, wider concerns were also reflected, notably in the second chapter, 'The importance of the problem'. Here it was stated that the aim of those concerned with nutrition policy "should not be only the negative one of eradicating deficiency diseases but the wider and more positive aim of security, so far as economic circumstances and medical knowledge permit, that populations under their charge secure optimum nutrition". The authors

⁴⁹ Celia Petty, *op. cit.*, note 10 above, pp. 83–108.

⁵⁰ Beinart, *op. cit.*, note 20 above, p. 124.

⁵¹ Medical Research Council, *Annual report, 1937–38*, London, HMSO, 1939, p. 17.

⁵² Economic Advisory Council, *Nutrition in the colonial empire*, PP 1938–39 x (Cmd 6050), p. 63. Nutritionists closely associated with Platt emphasized the part he played in shaping this report. Thus Aykroyd stated that he was largely responsible for it, while J C Waterlow always thought of it as the 'Platt Report': *Br. med. J.*, 1969, *iii*: 364; *Lancet*, 1969, *ii*: 276.

⁵³ Worboys, *op. cit.*, note 7 above, p. 221, considers that the draft and final reports differed substantially in emphasis, the first having a structural orientation, the second a technical one. Celia Petty considers this interpretation arguable: Petty, 'Foreword', *op. cit.*, note 6 above, p. 8 fn 7. I have not compared the two reports, but I agree with Petty that the final report shows a much greater and more significant structural emphasis than Worboys allows.

⁵⁴ 'W. R. A.', 'B. S. Platt', *Br. med. J.*, 1969, *3*: 364.

⁵⁵ Waterlow, *op. cit.*, note 52 above, p. 276.

stressed the importance of education and agricultural diversity, especially of crops, but concluded that, in the final event, the problem of nutrition was “fundamentally an economic one”. Malnutrition, they observed,

will never be cured until peoples of the Colonial Empire command far greater resources than they do at present . . . From a nutritional point of view . . . the constant aim should be so to increase the resources of colonial peoples that they are able either to purchase or to grow the foodstuffs needed for satisfactory nutrition.⁵⁶

Such themes were clearly echoed in the debates and final conclusions of the Hot Springs conference. Thus the conference’s Final Act declared that,

it is useless to produce food unless men and nations have the means to acquire it for consumption. Freedom from want cannot be achieved unless there is a balanced and world-wide expansion of economic activity . . . Moreover . . . poverty is the first cause of malnutrition and hunger.⁵⁷

While the attraction of technical fixes was also evident in the conference proceedings, recognition of the underlying importance of economic solutions remained a significant theme in the public expressions of the international community as represented at the Hot Springs conference.

A World Food Policy

With the return of peace in 1945, the careers of both Aykroyd and Platt took a fresh turn. Aykroyd was appointed as first Director of the FAO’s Nutrition Section in 1946, and in the same year Platt took up the new Professorship of Human Nutrition at the LSHTM. In this capacity, he took his place as an expert consultant, advising international organizations and teaching students from all over the globe.⁵⁸ Between them, as Director of the Nutrition Division and expert adviser, and with very similar views on the economic roots of malnutrition, Aykroyd and Platt exercised a significant influence on the policies of the Food and Agriculture Organisation and associated agencies. While the story of the FAO’s policies and of its work remains to be written, it is plain that the tension between technical and structural solutions to problems of nutrition and malnutrition was present from the organization’s earliest days. On the one hand, the “Great Protein Fiasco”—beginning with identification of kwashiorkor, or protein malnutrition in children, and the distribution of surplus dry skim milk as a solution—stands out as the ultimate example of the application of the technical fix; and Aykroyd was especially proud of his part in setting up this fix.⁵⁹ On the other hand, the recognition of deficiency diseases as the extreme manifestation of local malnutrition which had informed the work of both Aykroyd and Platt in the 1930s remained significant, and contributed to the discouragement of policies designed to relieve specific nutritional deficiency problems, especially where these would involve tampering with the local

⁵⁶ Economic Advisory Council, op. cit., note 52 above, pp. 66–8.

⁵⁷ *Final act of the United Nations conference on food and agriculture*, London, HMSO, 1943 (Cmd 6451), p. 4. See also *United Nations conference on food and agriculture, Hot Springs, Virginia, 1943*, London, HMSO, 1943 (Cmd 6461).

⁵⁸ *Lancet*, op. cit., note 31 above, p. 224.

⁵⁹ ‘T. P. E.’, ‘Wallace Ruddell Aykroyd’, *Br. med. J.*, 1979, ii: 544. For the great protein fiasco see McLaren, op. cit., note 47 above, pp. 93–6; Alan Berg, *The nutrition factor. Its role in national development*, Washington, DC, The Brookings Institution, 1973, ch. 7.

Beriberi, Vitamin B1 and World Food Policy

“food ecology” whose integrity it was thought essential to maintain. The application of this policy was evident in regard to beriberi, the disease which had helped both men to formulate their ideas on malnutrition; and in its application, it provoked a clash of scientific cultures which revealed that the perspectives of the new professional applied-nutrition scientists had departed radically from those of the traditional, laboratory-based nutrition scientists.

The world of the laboratory nutrition scientists who had laboured to establish the chemical constituents of a balanced diet altered in the late 1930s. For the laboratory researchers, as E V McCollum noted, “the end of an era had been reached” by 1940 with the identification, isolation and chemical characterization of most of the chemical substances required for an adequate diet. These nutrition investigators were obliged to find new objectives.⁶⁰

Robert R Williams and Vitamin B1

Among the nutrition scientists obliged to develop new objectives was Robert R Williams (1886–1965), whose interests had been exclusively focused on the chemistry of beriberi and the pursuit of vitamin B1 since 1910. Williams was not a scientific “insider”; among the different scientific communities being established in the nutrition field in the 1930s he had no recognizable affiliation; but his life-long intellectual passion was beriberi. The son of an American Baptist missionary, Williams began his career as chemist with the Philippine Bureau of Science in Manila. He was asked to assist E B Vedder with his experimental studies on beriberi, searching, as so many were to do, for that substance in rice-polishings which was curative of beriberi.⁶¹ For much of his time in Manila, Williams appears to have worked largely on his own, or with one other collaborator.⁶² When, in 1914, the Philippine government announced its intention of replacing American civil servants with Filipinos as quickly as practicable, Williams returned to the United States. In the years that followed, he held various government and industrial posts, ending his career as director of the chemical laboratories at the Bell Telephone Laboratories from 1925–46. During these years, that is to say up to 1936, he continued to work on the chemical problem of beriberi in his spare time.

By 1933, Williams and his assistants had obtained pure crystals of vitamin B1, and in 1935 they succeeded in synthesizing the vitamin, naming it thiamine. Williams then patented the process, in order that “the manufacture and sale of the vitamin should be conducted in a way to ensure that public ends would be served”.⁶³ He was anxious that his discovery should not serve the “mercenary ends” of the big pharmaceutical companies; he noted in his memoirs, “Though I have departed rather radically from the theological doctrines of my missionary parents, I have adhered very closely to their fundamental purpose of ministering to the poor, needy, and ignorant segment of the world’s population”.⁶⁴ Williams’s conception of helping the poor and needy differed

⁶⁰ McCollum, *op. cit.*, note 14 above, pp. 240–1.

⁶¹ *Dictionary of Scientific Biography*, 16 vols, New York, Charles Scribner’s Sons, 1970–80, vol. 14, pp. 393–4; see also Williams, *op. cit.*, note 2 above, ch. 1. For a brief review of Vedder’s work see Harriette Chick, ‘The discovery of vitamins’, *Progress in Food and Nutrition Science*, 1975, 1: 2-5.

⁶² Williams, *op. cit.*, note 2 above, ch. 6.

⁶³ *Ibid.*, p. 171.

⁶⁴ *Ibid.*, p. 169. The profits from Williams’s own patenting of thiamine synthesis went to the Williams-Waterman Fund for the Combat of Dietary Diseases; he did not himself gain financially.

radically from that of Platt and Aykroyd. While the latter had come to see deficiency diseases in terms of their social and economic context, Williams continued to see beriberi as, fundamentally, a chemical problem which could be solved by chemical means. The account of beriberi which he gives in his memoirs is written almost entirely from the chemical and pathological perspective; observations on beriberi in its cultural setting are absent. He saw the problem of beriberi as soluble simply by the addition of synthetic thiamine to the dietary staple (polished rice) of vulnerable populations. On his visits to Asia after 1945, Williams sought to discover the local incidence of beriberi and to study the local rice trades with a view to technicalities of thiamine distribution. In this sense, his views were traditional: like the old colonial administrators, he viewed beriberi as a question of polished or unpolished rice, and not as a problem of poverty.

The search for vitamin B1 and the synthesis of thiamine dominated the first half of Williams's life; a mission to eradicate beriberi dominated the second. With the development of the synthetic vitamin, it became possible to produce dietary supplements and to add synthetic vitamins to staple cereals for public health purposes. This is the process known as enrichment. For the eradication of beriberi, a "premix rice" was developed, coated with the synthetic vitamin, which was to be mixed with ordinary supplies of polished rice in due proportion. There were problems with premix rice: it was more expensive than ordinary rice, and in cultures where it was traditional to wash rice before cooking or to boil it in plenty of water, rather than effectively steaming it in a small quantity, up to thirty per cent of the added thiamine could be lost in preparation.⁶⁵ Such drawbacks weighed little with Williams: he was a tireless advocate of enrichment, whether to prevent pellagra in the southern United States or beriberi in Asia, or to improve public health anywhere.⁶⁶ The necessity of enriching rice in beriberi endemic areas was his particular passion, although he was unable to secure its adoption on any significant scale during his lifetime.

Williams's failure with rice enrichment went deep. He blamed the FAO, and in particular "British and European scientists and their pupils in Asia".⁶⁷ He thought that they viewed as suspect any commercial interests in connection with any public health measure, and that because he had patented his synthetic thiamine process both he himself and rice enrichment had been cold-shouldered by the UN's nutrition establishment. Widely honoured in America, Williams could not understand how it was that, despite his work on beriberi and his study of the rice trade in Asia, he was never invited to attend FAO or WHO conferences, and that the UN never offered any encouragement to rice enrichment programmes in Asia.⁶⁸ Williams was bitter. "My record", he felt, entitled him to involvement in the work of the international agencies, and he counted it as "the greatest disappointment of my life" that no one in the UN supported his rice enrichment policies for Asia.⁶⁹ It was not to be expected that he would recognize himself as an outsider; but the international nutrition community had effectively established itself during the 1930s, when Williams was in his lab at Bell, and it was not a community with which he had established links. Between 1915 and 1925, Williams admitted, he had no

⁶⁵ FAO Nutritional Studies No. 12, *Rice enrichment in the Philippines*, FAO, Rome, 1957, pp. 22–3.

⁶⁶ Williams, op. cit., note 2 above, pp. 176–89.

⁶⁷ *Ibid.*, p. 172.

⁶⁸ *Ibid.*, pp. 171–2; see also Meade, op. cit., note 5 above, p. 610.

⁶⁹ Williams, op. cit., note 2 above, p. 172.

Beriberi, Vitamin B1 and World Food Policy

contacts with Dutch or Japanese workers, and very little with British; he does not appear to have extended his contacts greatly between 1925 and 1935.⁷⁰ Williams's priority in publication of the synthesis of thiamine gave him little credit in the eyes of other nutrition scientists: as Jansen noted, three groups of workers "almost simultaneously" established the structural formula of thiamine: Williams and Cline in 1936; Andersag and Westphal in 1937, and Todd and Bergel also in 1937.⁷¹ Williams and Cline's achievement was not unique. Thirdly, Williams was by no means the only westerner with a knowledge of the rice trade in the Far East: both Platt and Aykroyd had studied the subject, and had had better opportunities for study at first hand than Williams's whistle-stop tours (of a few days or weeks) permitted.⁷² Finally, of course, Williams's recipe for the eradication of beriberi appeared irredeemably old-fashioned when set against the new perception that deficiency disease was only the tip of a malnutrition iceberg.

The Bataan Experiment

At the heart of Williams's disappointment with the UN agencies lay the Bataan Experiment. From October 1948, Williams, with the co-operation of Dr Juan Salcedo of the Philippine Health Department, organized the experimental distribution of enriched rice in Bataan Province, the Philippines. The initial phase of the experiment, in 1948–50, appeared to be a success both in reducing the incidence of beriberi and in creating a demand for enriched rice in neighbouring provinces.⁷³ Encouraged by this, Williams and Salcedo attempted, from 1950, to extend rice enrichment to larger areas and populations across the Philippines. The more ambitious project quickly ran into trouble, at first administrative, later political.⁷⁴ Williams had, however, already solicited a visit from an international FAO team, with a view to drawing the attention of that organization, and other Asian countries, to the rice enrichment experiment and its possibilities. Somewhat delayed by the activity of communist Huk terrorists, the FAO survey team, financed by the Williams-Waterman Fund, arrived in February 1952. By this time the rice enrichment programme was in the throes of transition from subsidized experiment to self-supporting, commercially based operation, and encountering considerable difficulties. These, Williams considered, detracted from the scheme's overall impact on the survey team. The published version of the team's report, although it praised the Philippine effort, detailed the financial and organizational difficulties and stated clearly its conviction that rice enrichment, however fully implemented, "cannot be regarded as a substitute for the general improvement of the poor rice-eaters'" diet by increasing supplies of other cereals and protective foods.⁷⁵

The details of Williams's grievances and of the FAO team's conclusions cannot be explored here; but the clash of perspectives is almost audible. Williams imputed petty motives to the survey team: they suspected his commercial involvement, and anyway disliked Americans.⁷⁶ W H Sebrell, then Director of the Institute of Nutrition Sciences at

⁷⁰ *Ibid.*, p. 107 *et seq.*

⁷¹ Jansen, *op. cit.*, note 2 above, p. 10; Chick, *op. cit.*, note 61 above, p. 4.

⁷² See for example Platt's memorandum to *Nutrition in the colonial empire*, *op. cit.*, note 52 above, Appendix 6, pp. 240–53.

⁷³ Williams, *op. cit.*, note 2 above, pp. 196–7.

⁷⁴ *Ibid.*, pp. 196–201, 203–6.

⁷⁵ FAO, *op. cit.*, note 65 above, p. 58.

⁷⁶ Williams, *op. cit.*, note 2 above, p. 202.

Columbia University, who introduced Williams's memoirs, was more tactful, and perhaps nearer the mark: he noted that the FAO's concern for education and food supply reflected long-term planning rather than immediate short-term measures, although in the meantime beriberi continued to take its toll.⁷⁷ Set in the context of the UN and FAO's stated objectives, the survey team's conclusions were indeed perfectly consistent. Although the FAO was not above involving itself in immediate measures, as the skim milk policy suggests, the Hot Springs conference had specifically noted that "the indiscriminate distribution of synthetic vitamins is not to be recommended as a public-health procedure".⁷⁸

The outstanding lesson of the Bataan Experiment was not apparent to Williams, although Aykroyd, and the FAO, had already taken it on board. This was that, without the co-operation of the governments concerned, it was impossible to implement complicated measures of technical assistance like rice enrichment in the poorer countries of the world.⁷⁹ In the Philippines, the planned extension of the rice enrichment programme in the 1950s failed because the central government was unwilling to enforce the measure.⁸⁰ Although Williams insisted that rice enrichment was easy to introduce, the practical record of the Philippines at this time did not bear him out, certainly not once the programme was extended beyond a relatively small area. In other countries where enrichment programmes were tried—in America, Puerto Rico, Formosa and Cuba—experience demonstrated that strong government support was a prerequisite for success.⁸¹ Williams admitted that the enrichment campaign in the Philippines lacked political influence, "and perhaps political discernment", and that this had been central to its failure. He did not draw any general conclusions from his examples, or note the inherent contradiction in his claim that enrichment was easy to introduce.⁸²

The broad context within which these various enrichment programmes were conducted had been outlined by Aykroyd as early as 1953. In an article describing the history and work of the FAO, he drew attention to the difficulties facing the organization. The FAO's central aims are set out in its constitution. They are: to raise levels of nutrition and the standard of living; to secure improvement in the efficiency of production and distribution of all food and agricultural products; and to better the condition of rural populations and thus contribute towards an expanding world economy. To this end its functions are essentially educational and advisory; but it is also empowered to furnish

⁷⁷ *Ibid.*, p. xx.

⁷⁸ *United Nations conference on food and agriculture*, op. cit., note 57 above, p. 19. The conference admitted, however, that synthetic vitamins were of "great value" in the medical treatment of deficiency diseases.

⁷⁹ Like many modern scientific disciplines, nutrition is continually re-learning the lessons of the past. Thus in 1971 Michael Latham, then Professor of International Nutrition at Cornell University, noted at an international conference: "Nutritionists, physicians and scientists in general shun politics . . . I do not believe that the nutritional problems of the world can be solved outside the political arena . . . nutritionists, physicians and others have to operate within that arena if their objective is to improve the nutritional

status of people": Michael C Latham, 'A historical perspective', in Alan Berg, Nevin S Scrimshaw and David L Call (eds), *Nutrition, national development and planning*, Cambridge, Mass., MIT Press, 1973, p. 314.

⁸⁰ Williams, op. cit., note 2 above, pp. 203–6.

⁸¹ *Ibid.*, p. 274.

⁸² *Ibid.*, p. 275. For a general discussion of the advantages and disadvantages of fortification programmes see Berg, op. cit., note 59 above, ch. 8. He notes that "the fortification of milled cereals . . . will not help people in a rural subsistence economy who grow and grind their own . . . a viable fortification project depends on large-scale central processing", p. 111.

technical and organizational assistance to governments as requested.⁸³ However, as Aykroyd noted, technical knowledge gained in economically advanced countries has to be adapted to the conditions existing in those parts of the world where the knowledge is needed: “techniques successful in Flanders or Iowa may not work well in Brazil or Iraq”.⁸⁴ International agency workers have to learn to work with local circumstances. The crux of progress, according to Aykroyd, lay not in international intervention *per se*, but in the existence of strong, socially-committed governments in developing countries. Government action alone could bridge the gap between the resources of the FAO and the apathy of poor and uneducated food producers in underdeveloped countries. Such action, he observed, “cannot be taken unless governments are stable, strong, efficient and able and ready to promote the welfare of their peoples”. And, he concluded, “these conditions are rarely fulfilled”.⁸⁵

Against this background, it is not surprising that the FAO had reservations about advocating rice enrichment on a large scale in Asia, quite apart from its commitment to raising general standards of living through education and improved food supplies. Strong and efficient governments were rare in post-war Asia, and rice enrichment, whatever Williams’s claims, was a complicated technical operation which required not only the restructuring of indigenous rice trades and either the importation of vitamins or capital investment in pharmaceutical plant, but also the creation of supervisory and enforcement machinery to ensure the distribution of enriched rice and the suppression of outlets attempting to sell unenriched rice. To implement such an undertaking across the vast reach of rice-eating Asia, with its thousands of tiny rice-mills and its various different ways of preparing rice, would demand an unimaginable investment of man-power and money, perhaps for relatively little return. By 1971, the rice enrichment programmes begun in the Philippines, Japan, and Taiwan had demonstrated the negative effect of dispersed milling facilities, and of the conflicting economic interests of millers, governments and consumers. In Papua New Guinea alone, a comprehensive enrichment programme survived.⁸⁶

Conclusions

The FAO’s failure to adopt thorough-going food fortification policies in the years 1945–1970 stemmed not only from the beliefs of the Director of the Nutrition Section and the terms of its remit, but from a recognition of the political restrictions on technical assistance. Aykroyd retired in 1966; in 1971, the joint FAO/WHO Expert Committee on Nutrition under the chairmanship of John Waterlow, reviewed the whole question of food fortification in measured terms and without much enthusiasm. The complexities of introducing fortification programmes had clearly not diminished with the years; the essential message of the review was contained in two terse sentences: “Evaluations of the

⁸³ W R Aykroyd, ‘FAO’, *Nutrition Abstracts and Reviews*, 1953, 23: 229–43, p. 234.

⁸⁴ *Ibid.*, p. 242.

⁸⁵ *Ibid.*, p. 242. See also A H Boerma, ‘The 30 years’ war against world hunger’, *Proc. Nutr. Soc.*, 1975, 34: 146–57, p. 151: “whatever ideas FAO . . . had for improving the world food situation were only

worth pursuing to the extent that they were likely to be politically acceptable to governments . . . [this] has implications that have placed serious restraints on our ability to carry on the war against hunger with real effectiveness”.

⁸⁶ Joint FAO/WHO Expert Committee on Nutrition, *Eighth report*, Rome, FAO, 1971, pp. 12–13.

costs and benefits of a fortification programme should always be conducted in the context of the special situation. Ideally each country should have well-defined short-term and long-term nutritional goals and a co-ordinated plan for achieving these goals".⁸⁷ The motivation of individual governments remained a significant factor in the achievement of improved nutrition. To suggest, as Williams and others after him have done,⁸⁸ that the UN agencies ignored rice enrichment because they disapproved of "any commercial intent" is an oversimplification. Once governments began to initiate their own enrichment programmes, UN support became available.⁸⁹

Williams's condemnation of what he perceived to be the UN's distrust of commercial involvement is not without its ironies. Williams himself had patented the synthesis of thiamine to avoid its exploitation by pharmaceutical companies; his warning that the UN agencies would never succeed in their objectives without commercial co-operation was nothing less than contradictory.⁹⁰ If indeed the British and European nutritionists of the immediate post-war period mistrusted commercial involvement, history has justified them. Between 1966 and 1970, the FAO sponsored the introduction of high-yielding rice varieties into the Philippines. To promote this "Green Revolution", the FAO accepted that necessary fertilisers and insecticides would be provided through commercial companies; this acceptance ultimately had devastating effects on the lives of Filipino farmers.⁹¹ Similarly, the role of commercial companies in providing dried skim-milk powder and formula milks as baby food at the expense of maternal breast-feeding has come under attack in recent years. The pros and cons of involving commercial companies in nutrition programmes was noted succinctly by Ben Platt in 1958, at the time when the companies were becoming interested in supplying protein foods to the developing world. Advantage lay in the companies' technical staff, who could develop local products into cheap and acceptable foods, and the machinery and technical expertise which enabled them to process food cheaply and efficiently; but, "because commercial companies must make a profit, there is always the danger that they may be led into policies of producing materials which, whilst having a ready sale, may not be of any great nutritional value". Having been approached by the companies many times for advice, however, Platt had become convinced that they could play an important part in overcoming protein malnutrition. One of his objectives, as expert adviser, was to suggest ways in which the danger of commercial exploitation could be avoided.⁹²

In the meanwhile, however, beriberi began to decline as a public health problem in Asia, and by the early 1970s morbidity and mortality from the disease had been markedly reduced. The role which rice enrichment played in this reduction seems to have been small. Michael Latham considered important factors to include public awareness of the disease as a result of nutrition education; an increase in the variety of food eaten even by the poor in Asian countries; deliberate programmes of rice treatment such as enrichment;

⁸⁷ *Ibid.*, p. 23.

⁸⁸ For example, Meade, *op. cit.*, note 5 above, p. 610.

⁸⁹ *Ibid.*

⁹⁰ Williams, *op. cit.*, note 2 above, p. 172: "The FAO will never make any real progress on its tremendous world task until it gets over this prejudice and freely invites many commercial interests into its

councils. Its job is to redirect world food supply and that of necessity involves large business interests".

⁹¹ FAO, *Introduction and effects of high-yielding varieties of rice in the Philippines*, Rome, FAO, 1971, pp. 11–12; Leonard Davis, *The Philippines: people, poverty and politics*, London, Macmillan, 1987, pp. 90–3.

⁹² LSHTM, *Annual report, 1957–58*, pp. 60–1.

and public health measures such as the prophylactic consumption of thiamine tablets and early treatment of cases of the disease. "Technology allied with science", he observed, "with economic development, and with public health measures has led to its decline".⁹³ A combination of structural and technical developments, in other words, brought about this much-to-be desired result. While on the one hand the great reduction in beriberi may be in part due to the United Nations' policy of encouraging the provision and consumption of as wide a variety of foodstuffs as possible as a first step towards improving nutritional levels, an approach which, they noted in 1943, might be especially important in eastern and tropical countries where a considerable proportion of the population did not get enough to eat,⁹⁴ there has probably been considerable variation in importance between factors at local level. The story of beriberi in China, for example, demonstrates the power of strong government, and, incidentally, how this removes any need for more complicated measures: after 1949, the Chinese government imposed regulations controlling the degree of extraction permitted in machine-milled rice, and residents of the southern cities affected by the disease were encouraged to eat only lightly milled (92 per cent extraction) rice and under-milled (81 per cent extraction) wheat-flour, with the result that beriberi disappeared.⁹⁵

In the final event, the importance of beriberi for public health nutrition transcended the contentious issue of enrichment and fortification.⁹⁶ Research on beriberi convinced key nutrition workers that deficiency disease was the extreme manifestation of general malnutrition, and in this sense beriberi helped to determine the FAO's brief for a general improvement in living standards, for a world food policy aimed at long-term improvement across the nutritional spectrum rather than at short-term, piecemeal attacks on specific deficiency diseases. The increasing complexity of the post-war development field, the involvement of WHO, and the growing obsession of the international nutrition community with protein-energy malnutrition, are all likely to have contributed to the favouring of single-sector interventions in the 1950s and 1960s. The beriberi story testifies, however, to the existence of competing technical and structural solutions to nutritional problems from the earliest emergence of applied nutrition as a discipline in the 1920s, as well as to the subsequent continuing play between the two approaches in the wider fields of applied nutrition and development planning.

⁹³ Latham, *op. cit.*, note 79 above, p. 324. By the 1990s, beriberi had become rare: David Grigg, *The world food problem*, 2nd ed., Oxford, Blackwells, 1993, p. 9.

⁹⁴ *United Nations conference on food and agriculture*, *op. cit.*, note 57 above, pp. 12–13. This policy may have been especially significant for beriberi, since thiamine is present in a wide range of foodstuffs.

⁹⁵ Chen Xue-Cun, *et al.*, 'Studies on beriberi and its prevention', *J. appl. Nutr.*, 1984, 16: 20–6, p. 21.

⁹⁶ It was not just rice enrichment, but the entire issue of food fortification that was contentious: see B S Platt, 'Human nutrition and the sophistication of foods and feeding habits', *Br. med. J.*, 1955, i: 179–85, p. 181.