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ENVIRONMENTAL HEALTH IN RURAL DEVELOPMENT AND FOOD HYGIENE

by

Eric G. Dunn

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AN OVERVIEW

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Eric G. Dunn
Adviser in Environmental Health and
Food Hygiene
South Pacific Commission
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By E.G. Dunn
Adviser in Environmental Health
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South Pacific Commission, New Caledonia

INTRODUCTION

1. The World Health Organization has defined "Environmental Health" as -

> "The control of all those factors in man's physical environment which exercise or may exercise a deleterious effect on his physical development, health and survival."

Environmental health activities are therefore directed towards controlling hazards of the environment which have an unhealthy impact on man. The environmental factors which affect man are numerous, many of them made by man himself, and the impact of many on human health is still not well understood.

2. Since man first inhabited the Earth, air, water, food and shelter have been his basic physical needs, and these are the principal factors which determine his quality of life. Environmental health activities are organized and developed around these basic requirements. Traditionally environmental health has been concerned almost solely with sanitation. Environmental sanitation activities were directed towards ensuring sanitary water supply, sanitary disposal of liquid and solid wastes, sanitary food production and preparation, and sanitary housing. The primary objective of these activities was the control of environmental factors which cause communicable diseases. However, in the last few decades, the objectives have been expanded to include the control and prevention of all environmentally related diseases, both communicable and non-communicable, as well as injuries and physical disabilities, especially in relation to occupational hazards. The philosophy has now evolved from control and prevention to the promotion of a healthy environment through an integrated environmental management effort.

3. In most countries throughout the world, the twentieth century has been marked to a greater or lesser extent by progressive urbanisation. Migration from the rural areas to the expanding industrialised centres coupled with an increasing population has resulted in a society living predominantly in cities and sprawling urban areas. This, in conjunction with rapid advances in technology, has created new environmental problems for inhabitants of these urban areas. Pollution of water courses and beaches with chemical and human wastes, the disposal of ever-increasing quantities of solid waste, the air pollution caused by motor vehicles and industries, the crowded insanitary conditions of slum areas, the contamination of food and water supplies with pesticides and other polluting agents, the screeching noise of motor vehicles, aircraft, machinery and transistor radios, all individually and cumulatively have an effect on human health and are but a few of the increasing number of environmental health hazards of the urban environment.

4. But what of the rural areas? Do the people living in the rural villages enjoy a life free from such hazards? Do they enjoy a quality of life superior to the urban dweller? The situation varies in different countries and in different climates, but it is fair to say that the rural dweller has always suffered a number of environmental health hazards even though they may be of a different nature to those of his urban neighbours. In recent decades however, the rural dweller has not been able to escape the effects of many of the hazards associated with urbanisation and industrialisation.

5. In the rural areas of tropical countries, including the Pacific Islands, there have always existed, and still exist, many serious environmental health problems. These give rise to diseases which sap the strength and vitality of the rural people, and seriously hinder development in physical and economic terms. Although the Pacific Islands are fortunately free of most of the more serious tropical diseases found in Africa and Asia, they still have many endemic diseases to be overcome. The mosquito-borne diseases of malaria, filariasis, and dengue fever, seriously affect many islands; gastroenteritis of various types; bacillary dysentery and food-borne illnesses are widespread; helminthic and protozoal diseases such as hookworm, ascariasis, giardiasis, balantidiasis, and other abdominal parasitic infections are common, especially in children; infectious hepatitis has become increasingly prevalent in recent years; typhoid fever hovers in the background, and cholera, hitherto unknown in the Pacific Islands has made its appearance in the last few years. The rural dweller is also plagued by a variety of pests, many of which are potential vectors of disease - mosquitoes, flies, cockroaches, bed bugs, fleas, ticks, etc. and rats, which also cause severe damage to crops and dwellings.

SOCIAL AND ECONOMIC ASPECTS

6. The technology to eliminate or at least control and reduce these environmental health hazards exists,albeit that they are often expensive. However, as most health workers soon realise, many of these problems are not wholly technological in nature, and cannot be solved by technology alone. The cultural patterns and economic status of a community often profoundly influence the level of its health and sanitation. The raising of these standards invariably demands some adjustment in cultural patterns and may create initial economic hardship due to expense. Cultural patterns also sometimes hinder the acceptance of recognised environmental health practices. These factors often have greater significance in rural communities than in an urban society.

7. From the aforegoing it will be appreciated that environmental health and economic development are closely interrelated. Moreover, much of the technology which contributes to improvements in environmental health is essential to economic development, e.g. adequate accessible water supply, control of rats and other pests, control and re-use of organic and solid wastes, reclamation of swamps and unproductive land, animal health and husbandry, food sanitation, etc. Moreover, in the long term, a healthy community free from chronic debilitating diseases is more likely to be enterprising and productive.

PACIFIC ISLANDS CONTEXT

8. In the rural villages of the Pacific Islands, the principal environmental health problems are seen to be:-

(a) lack of adequate and accessible potable water supplies;

(b) inadequate or insanitary methods of excreta disposal;

(c) inadequate methods of solid and liquid waste disposal;

(d) the existence of arthropod vectors of disease and pests;

(e) uncontrolled rat populations;

(f) inadequate methods of animal husbandry;

(g) low housing standards;

(h) poor food hygiene;

(i) agricultural and pesticide residues;

(j) the establishment of "development" projects without due regard to environmental health impact.

APPROACH TO PROBLEMS

9. It often happens that attempts to solve environmental health problems often create other problems. This is because the problems themselves which are apparently clear-cut are considered independently, and piecemeal solutions are implemented without regard to the impact which such solutions may have on the environment as a whole. Examples could include:-

(a) the provision of reticulated water outlets without satisfactory drainage to permit the removal of waste water, thereby creating mosquito-breeding foci and swampy areas suitable for the transmission of hookworm;

(b) the provision of unscreened water storage tanks allowing the water to become polluted and a breeding place for mosquitoes;

(c) excessive extraction of groundwater causing salt-water intrusion of groundwater lens, soil subsidence and soil salinity;

(d) the chlorination and fluoridation of water which may react with minerals in solution causing harmful reaction by-products;

(e) denuding of vegetation for erection of structures, pipelines, roads, etc. causing erosion or eco-degradation;

(f) excessive extraction of water from watercauses for irrigation causing harmful ecological downstream effects;

(g) the construction of dams and reservoirs for irrigation and water supply, creating breeding grounds for dangerous disease vectors;

(h) the provision of badly constructed or unscreened septic tanks and soakaways which permit mosquito breeding;

(i) the uncontrolled use of agricultural herbicides, pesticides, fertilisers, etc., causing pollution of potable water resources;

(j) the excessive use of detergents containing phosphates and other plant nutrients causing problems at sewage works and receiving waters;

(k) spraying of houses with residual insecticides to control mosquitoes but causing a high mortality in cats with a consequent increase in rats;

(l) badly controlled refuse tips which become breeding grounds for rats, flies, and mosquitoes;

(m) badly constructed pit latrines which become breeding grounds for flies and cockroaches;

(n) the incineration of rubbish causing air pollution;

(o) the use of single-service package and food containers which increases waste management problems;

(p) the establishment of slaughterhouses for hygienic meat production, which produce large quantities of organic wastes;

(q) the pollution of groundwater through badly sited waste-stabilisation ponds;

(r) the use of insecticides to control plant pests in babai pits and pulaka pits causing pollution of groundwater in atolls;

These and many other examples can be seen in travels around the Pacific Islands.

RURAL WATER SUPPLY AND SANITATION

10. The South Pacific Commission region encompasses an area of the tropical Pacific between approximately 20°N and 30°S of the Equator and 138°E and 130°W of Greenwich. It includes 20 countries and dependent territories containing nearly 5 million people of three main ethnic groups - Melanesian, Polynesian and Micronesian, scattered over some 30 million square kilometres of the Pacific of which less than two per cent is land.

11. The islands in the region vary greatly in their size, geological and topographical characteristics, from the rugged mountainous regions of Papua New Guinea to the small sandy coralline islets of the low atolls. There is also a wide variation in annual rainfall and intensity of rainfall.

12. Of the total population it is estimated that about 4.5 million live on the larger high islands (mainly in Melanesia, the largest being Papua New Guinea with a population of approximately 3 million), and about 400,000 on atolls and isolated low islands. Of the first group, about 800,000 live in the larger urban centres which are provided with reasonably adequate piped water supplies and sanitary facilities. Of the second group, about 120,000 are located in small townships on a few of the atolls and small islands which have very limited and unreliable water supplies and poor sanitary facilities.

13. Since, in the Pacific Islands, the majority of the population live in the rural areas, community water supply and sanitation are very much part of, and are closely related to, rural life and development, and play an essential role in overall rural development programmes.

14. According to a report submitted by the Director-General of the World Health Organization to the Twenty-ninth World Health Assembly held in Geneva in May 1976, the proportion of the rural population of the Western Pacific Region (WHO Region) having reasonable access to safe water rose from 23 per cent in 1970 to 30 per cent in 1975, and the proportion with adequate excreta disposal facilities increased from 11 per cent in 1970 to 43 per cent in 1975. These figures also probably reflect the sort of conditions which at present prevail in those countries falling within the region of the South Pacific Commission.

15. The International Conference on Primary Health Care, held at Alma-Ata, Kazakhstan, in 1978, described the essential elements of primary health care and cited foremost among these activities an adequate supply of safe water and basic sanitation. The urgency and importance of these two needs led the United Nations to arrange an International Conference at Mar del Plate, Argentina, to discuss community water supply and hygiene excreta disposal systems. On the recommendations of this conference has been launched the "International Drinking Water Supply and Sanitation Decade 1981-1990", during which every effort will be made to make safe potable water and efficient sewage disposal available to people who still lack these facilities. Many of the Pacific Islands are planning their own programmes to contribute to the successful achievement of this decade, and the South Pacific Commission's Rural Water Supply and Sanitation Programme is designed to assist countries in accomplishing their own plans.

16. There can be no doubt that the key to the improvement in conditions of sanitation generally in the rural villages is the provision of an adequate and wholesome piped water supply. Apart from the undoubted benefit to health of having a wholesome water supply available for drinking and cocking, it is a necessary prerequisite if significant improvements are to be achieved in methods of disposal of human excrement, and personal and community hygiene. As emphasised by Wagner and Lanoix[1]

> "(i) in most small towns and villages in rural areas, more health benefits can be gained from money spent on a water supply programme than in any other way;
>
> (ii) there will be little public health benefit from a water supply which does not provide water in adequate quantity and quality and in a way convenient to the population".

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[1] E.G. Wagner and J.N. Lanoix - Water Supply for Rural Areas and Small Communities. WHO Monograph Series No.42.

17. Since the provision of a piped water supply (even though it is only in the form of restricted community outlets or wells) generates a greater volume of waste water, adequate facilities must be provided in the form of soakage pits, soakaway trenches, or conduits to rivers, etc., to safely remove this waste water. If this is not done, then health hazards can arise due to the breeding of disease vectors such as mosquitoes and flies, and the spread of helminthic diseases such as ancylostomiasis and stronglyoidiasis through accumulations of stagnant water and swampy soil.

18. Associated with each rural water supply project there must also be a project aimed at the sanitary disposal of human excrement. In the rural areas and villages of the Pacific Islands, disposal of excrement is usually by one of four methods -

(i) defecation on the ground in bush areas set aside for this purpose around the perimeter of the village;

(ii) defecation on the beach (not always below high water mark);

(iii) the use of "overwater" or "overhang" latrines on the banks of rivers, lagoons, or the seashore;

(iv) the use of poorly constructed simple pit latrines.

19. All of these methods give rise to health hazards, especially the spread of intestinal parasites and other helminthic diseases, arthropod-borne diseases, and virus infections such as infectious hepatitis and viral gastroenteritis.

20. For villages and small communities in rural areas of the Pacific Islands the most acceptable form of family toilet is the simple pit latrine, due mainly to its low cost and ease of construction. These vary considerably in their effectiveness, depending upon a number of factors, but can never be considered completely satisfactory.

21. However, the pit latrine can be made very much more effective by the use of a concrete cover incorporating a water-seal bowl. The pit latrine is thereby converted to a "hand-flush" or "pour-flush" pit privy requiring only a minimum quantity of water for flushing and sealing (about 2 litres).

22. This type of "pour-flush" water-seal pit privy was introduced into the Pacific region around 1965 and is now used extensively in most of the Pacific islands. Originally made of cement plaster, which has many disadvantages in construction and use, the water-seal bowl is now being made of a high density white polythene by a firm of plastic specialists in New Zealand. Both "squatting" type and "pedestal" type bowls are produced which can be set in a concrete slab or riser. These plastic bowls are available for shipment from New Zealand to the Pacific Islands at a very reasonable cost.

23. An essential part of any sanitation programme should be the provision of one water-seal hand-flushed pit privy to each family unit.

ECONOMIC BENEFITS OF SANITATION

24. There can be no doubt that economic development and community and environmental health are closely related, because in the long term -

(a) a healthy community free from chronic diseases is more likely to be enterprising and productive;

(b) the costs of providing basic sanitary facilities are more than offset by the gains of lower expenditures for drugs, less health worker time, fewer hospital beds for sanitation-related illnesses, etc;

(c) much of the technology which contributes to improvements in environmental sanitation is also essential to economic development.

25. In the case of water supply, it is uncommon that the women in rural villages have to spend several hours a day fetching water. With remote water sources, the inclination is to fetch just the minimum quantity required for drinking and cooking. The tendency also is to use the closest source, which is often contaminated. The provision of nearby water outlets results in a saving of time and energy which the women can put to more productive work in the village and home. A better and safer quality water supply results in less sickness, especially among young children, and enables people to work more effectively and to be more productive.

26. In those islands where there is an adequate source available, such as a river, lake or upland spring from which water can be gravity fed to the community, the provision of a piped water supply also has direct economic implications in that water may be used for irrigating crops, watering cattle, pigs and chickens, operating small abattoirs and animal by-products plants, biogas waste digesters, etc., and the establishment of small cottage industries such as non-alcoholic beverages, soap and starch manufacture, etc.

27. In some instances, the provision of a piped water supply has encouraged rural people in the larger islands to cultivate previously undeveloped but productive land, and to move their villages and build roads into the area. Even in the atolls and low islands where fresh water resources are scarce, and reliance has to be placed on the extraction of groundwater and the collection of rainwater, schemes to develop groundwater resources and improve rainwater catchment and storage often have significant economic benefits. For example, in the atolls where people experience difficulties in obtaining fresh drinking water, a very large number of young green coconuts are consumed for drinking which lowers the surplus of mature nuts for copra production.

28. In the Pacific Islands, because of the gradual post-war development of small urban areas, mainly as a result of the establishment of government centres, seaports and airports, governments in the region have tended to concentrate on providing piped water supply and sanitary facilities only to the higher density urban areas. The rural villages have on the whole been left to carry on in their old traditional ways, although some countries with established local government councils have made some progress in catering for the village people through their own locally promoted schemes.

29. In practice, the main constraints on the rapid provision of sanitary facilities in the rural areas are:

(a) difficulty in raising the necessary capital funds, especially in present times of rapidly escalating costs of imported materials;

(b) lack of local technical expertise to design, plan and cost schemes, and a lack of local artisans and tradesmen on site to implement the schemes and subsequently maintain them;

(c) difficulty in procuring the appropriate tools, materials and equipment, much of which usually has to be imported directly from overseas. Only a few countries possess central government stores or private retailers who can supply most of the items from stock;

(d) the logistical problems of transporting equipment and materials from the main centres to the work sites. Lack of shipping and/or road transport, lack of piers and jetties, lack of suitable roads, etc., all contribute to a time-consuming exercise resulting in considerable delays and often a wastage of materials and equipment.

RELATION TO RURAL PRODUCTION AND TECHNOLOGY

30. Rural water supply and waste disposal are very much related to rural production, and may truly be considered the basis of rural development. They may be a prerequisite to, or an essential support factor of this sector, and may even result in the spin-off of valuable assets.

31. An essential component of any rural water supply programme is the training of village mechanics in the use of hand tools, basic plumbing techniques, repair of simple hand pumps, the construction of various types of water tanks, the erection of tank stands, etc., and also the maintenance of small petrol and diesel engine pumps and windmill pumps. Since such work is not a full-time occupation, these mechanics should be trained so as to be capable of other general repair work in the village such as outboard motors, motorcycles, vehicles, agricultural machinery and basic building. By integrating their skill with the other needs of the community, they will be more likely to remain in the village after they finish their training.

32. Human and animal excrement and agricultural wastes can be used advantageously to produce additional protein and sources of energy, but water is an essential ingredient. For many years the Commission has been pursuing a project termed the "Integrated Farming System" which involves the production of animal feed (algae and fish), fuel (methane gas) and fertiliser (stabilised organic effluent) through the biological treatment of animal wastes by means of a biogas waste digester. Essential prerequisites are an adequate and reliable source of fresh water and someone with technical interest and knowledge on site to maintain the system. Many of these projects have failed due to lack or breakdown of these two components.

33. The production of biogas by the anaerobic digestion of organic wastes is now well known and well documented, and can provide an important alternate energy source to kerosene for cooking and lighting in the rural villages of the Pacific Islands. The recycling of animal, human and agricultural wastes through biogas digesters not only helps to prevent pollution of the environment but also provides clean fuel and fertiliser. An adequate water supply however is essential.

WATER CONSERVATION

34. The use of water throughout the world is increasing rapidly with a growing population. Already there are acute shortages of both surface and underground waters in many countries. Excessive extraction of groundwater has in some cases caused a subsidence of land and intrusion of salt water along the coastal areas. Careless pollution of rivers, lakes, and underground sources has also impaired the quality of water available.

35. The Pacific Island countries have in many ways been fortunate so far in maintaining the quantity and quality of water available to them. This has been due to their relative isolation, low population pressures and lack of industrial development and domestic consumer needs. However, the picture is now changing, and the demand for fresh water is increasing each year. It is therefore of utmost importance for the future of the Pacific Islands that good water conservation and sanitary measures to prevent pollution be practised by everyone.

36. Whatever may be the most convenient source under varying circumstances and situations, it must be realised that the ultimate source of freshwater is rainfall. Groundwater accumulates over a long period of time and, if it is removed faster than rainfall can replace it, the supply will eventually be depleted. Impervious paved areas draining water to the sea and even rainwater catchment reduces the amount of rain finding its way to the underground aquifers. There are two ways in which depletion can be prevented:-

(i) to use less water, and
(ii) to provide the best means of replenishing the supply.

37. The following suggestions to save water would be helpful in the Pacific Islands -

(a) Prevent all water leaks, including dripping taps, stopcocks, leaky joints, fractured pipes, leaking storage tanks, etc.

(b) Do not let water run continuously when taking shower, and reduce shower time.

(c) Do not wash clothes under running taps.

(d) Wash dishes and do laundry only when there are full loads.

(e) Turn off hose pipes when not actually using them.

(f) Use water-saving (minimum flush) toilets.

(g) Do not leave grass sprinklers running all night.

(h) Do not use "fill and empty" swimming pools.

38. For replenishing the groundwater and surface water supplies, the following points should be borne in mind:-

(a) Reafforestation of deforested and barren areas.

(b) Less paving of surface areas.

(c) Control of soil erosion to prevent run-off.

(d) Less drainage of wet lands.

(e) Construction of dams and reservoirs.

(f) The establishment and protection of recharge areas.

(g) Conservation of surface water run-off from airfields, roads, etc.

39. The economic use of water also means less polluted water to be disposed of, which assists in the maintenance of water quality.