

Too Poor to be Sick:

Linkages between Agriculture and Health



HIV/AIDS Programme

Preventing and Mitigating the Impacts of HIV/AIDS, Malaria and Other Diseases on Nutrition, Food Security and Rural Livelihoods through Rural Development.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS





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Linkages between Agriculture and Health

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The HIV/AIDS Programme

FAO, with the UN mandate for improving nutrition and food security, agriculture and rural development, has a unique opportunity to contribute to preventing and tackling the impacts of HIV and AIDS, and specifically the labour constraints caused by HIV and AIDS. FAO has the opportunity to identify and promote ways to raise awareness and prevent the transmission of HIV amongst rural communities, and to draw on capacities of the natural resource environment (agriculture, fisheries and forestry) to provide AIDS care and to help mitigate impact.

Since 1988, FAO has been researching the impact of HIV/AIDS on agriculture, food security, nutrition and farming systems. In recent years, FAO's role in combating AIDS has become even more critical due to the fact that the epidemic creates a significant institutional capacity gap in the affected countries, especially concerning agricultural staff and service organizations, national agricultural research organizations and institutions in higher education and training, as well as in local informal institutions.

The HIV/AIDS Programme is coordinated by the FAO Gender and Population Division. To date, 14 FAO technical divisions are involved in areas as diverse as nutrition, agro-forestry, agro-biodiversity, livestock, fisheries and emergencies.

Since 2005, FAO expanded its HIV/AIDS programme to include other diseases of poverty that interact with HIV/AIDS, such as malaria and tuberculosis.

This working paper series has been initiated as a way to disseminate interdepartmental research findings on the issues present in HIV/AIDS and rural development.

More information about the program and access to its publications can be found at:

<http://www.fao.org/hivaids>

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Abbreviations

| | |
|-------|---|
| AIDS | Acquired Immunodeficiency Syndrome |
| BSE | Bovine Spongiform Encephalopathy |
| CBPP | Contagious bovine pleuropneumonia |
| DALY | Disability-Adjusted Life Year |
| FAO | Food and Agriculture Organization of the United Nations |
| GDP | Gross Domestic Product |
| HIV | Human Immunodeficiency Virus |
| IFPRI | International Food Policy Research Institute |
| NGO | Non-governmental Organization |
| SARS | Severe Acute Respiratory Syndrome |
| TB | Tuberculosis |
| UNDP | United Nations Development Program |
| WHO | World Health Organization |

Foreword

Health is a critical concern for any form of development. Moreover, ill-health presents a major development challenge, as it has a devastating, systemic and cumulative impact on all aspects of human development. It poses an exceptionally serious threat to agriculture and rural development, particularly in poor, rural communities, because it depletes labour, disrupts livelihoods, upsets inter-generational exchange of agricultural knowledge, and increases household and community vulnerability to poverty. In an environment characterised by high incidences of ill-health, efforts made towards reaching the Millennium Development Goals (MDGs) are greatly inhibited. Diseases particularly interact with each other (e.g., malaria, HIV/AIDS and tuberculosis) and exacerbate food insecurity. The challenge of disease and hence ill-health as it relates to agriculture and rural livelihoods, while acknowledged, has not received requisite analytical attention.

For nearly two decades, FAO has been involved in analysing the socio-economic impact of HIV/AIDS particularly on food, nutrition and livelihood security. Due in large part to FAO's work, the epidemic is no longer perceived only as a health issue. It is now accepted axiomatically that all dimensions of food security – availability, stability, access to, and utilisation of food – are being adversely affected by HIV/AIDS. Despite this focus on HIV/AIDS, we know very little about the impact of other significant diseases such as tuberculosis, diarrhoeal diseases, malaria, dengue fever and other water-borne diseases on agriculture and rural livelihoods.

In 2005, FAO expanded its HIV/AIDS Programme to include other diseases of poverty, notably tuberculosis and malaria, which interact with HIV/AIDS. This working paper series is the first effort by FAO to build upon its almost twenty years of experience in research of the impact of HIV/AIDS on rural development and to widen the scope of inquiry.

The present paper is the first in the series and seeks to establish the linkages between agriculture and health, using both an extensive review of the existing literature and quantitative data from organisations, such as the World Health Organization (WHO). It argues for a better understanding of the complex cause and effect relationship between health and agriculture (in the broader sense). It highlights the linkages as evidenced from various research studies, exposes the gaps in knowledge and policy, and advocates for further investment in research and policy interventions that will address these linkages. In terms of policy, the paper argues for a strong, multi-sectoral approach to interventions that places priority on the inter-relationships between agriculture and health, so as to adequately address the multiple livelihood needs of the rural poor.

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Executive Summary

The complex linkages between agriculture and health are slowly being revealed. It is clear that addressing health challenges could unleash the potential of agriculture. Similarly, addressing problems of agricultural productivity could confer great benefits to the health of rural people. Part of the solution is to understand the linkages, how such linkages are affecting social and economic development, and to use that knowledge in developing appropriate policies and programmes.

This working paper seeks to highlight the bi-directional nature of agricultural production and the health of producers and the complex synergism between health and agriculture. Understanding the complex synergistic relationship between health and agriculture is essential for addressing issues of ill-health (ranging from disease transmission to malnutrition) as well as agricultural issues (labour productivity, food and nutrition security, rural farm incomes, etc). This is accomplished through the division of the analysis into four sections.

Section 1 provides a pragmatic rationale for looking at the linkages between agriculture and health. This background is used to establish a foundation for understanding the linkages between health and agriculture. The author exposes the concept of the global burden of disease and how it is used to measure the stock and flow of disease prevalence and their impact on society. It demonstrates that the burden of disease is different according to gender and geographic locale, among other things. The economic burden of the disease is also analysed, noting specifically how poor rural communities face the greatest burdens of ill-health and diseases.

Section 2 builds on the previous section and further explains the conceptual basis for establishing linkages between agriculture and health. It is argued that the relationship between health and agriculture is bi-directional, i.e. ill-health can lead to changes in agriculture and changes in agriculture can also lead to ill-health. The conceptual framework is therefore developed by looking at specific factors that influence the linkages. These factors include:

Environmental Modifications – such as climate change, cropping and settlement patterns due to population growth, technological innovations, and urbanisation have implications for the types of agricultural activities engaged in and the health and ability of people to engage in agriculture.

Nutritional Security – malnutrition and access to food are determined by agricultural production systems, labour supply, and affect the health of agricultural producers.

Impoverishment and Equality – long- term illness has a drastic effect on poor households making them more vulnerable to external shocks such as drought and price fluctuations for staple crops. Ill-health also makes it

more difficult for rural households to raise crops and livestock or earn incomes off-farm. Impoverished households also face difficulties in accessing health and other social services.

Rural Assets and Services – prolonged illness within a household can result in disinvestment of capital to pay medical expenses and supplement income no longer earned by working adult members. The ability of communities to preserve the basic elements of rural livelihoods and services is critical in protecting households from health losses.

Gender and Control over Resources – gender is a critical element in household health, agricultural productivity and income generation. Social inequities exacerbate risks of disease contraction and lack of control over resources can influence household productivity.

Social Conflict and Social Cohesion – the cohesiveness of families, communities and broader regions influences the linkages between agriculture and health. Strong social cohesion reinforces community health seeking behaviours and results in a greater sharing of the losses caused by droughts, epidemics or changes in market prices for commodities or labour.

In **Section 3** the narrative turns to the available literature to provide detailed descriptions of the linkages between agriculture and health. The evidence from literature offers numerous examples of the interrelationships at both the macro and micro levels. These relationships manifest in labour and productivity and ill-health, food consumption and agriculture. The impact of ill-health on specific sub-sectors of the agricultural economy are explored, such as forests and woodlands, livestock production, fisheries and agricultural institutions. Finally, the effects of specific diseases (tuberculosis, malaria and HIV/AIDS) on agriculture are explored as indicated in the literature. The examples and case studies used in this section illuminate why a single sector approach is too narrow, lacking in innovation and insights, to adequately address the multiple livelihood needs of rural (and urban) people.

Section 4 explores the challenges and opportunities for both policy and programmatic initiatives that will draw agricultural activities and health outcomes more closely together. The paper identifies knowledge gaps in the literature: 1) Analyses are limited; they are not always sophisticated or revelatory of the complex linkages. 2) The impact of ill-health has not been well documented. Nor are there many meso-level analyses about how communities, local institutions and governmental authorities deal with the impacts of diseases. 3) Little is known about the agricultural gain from good health. 4) There is a noticeable absence of practical and conceptual tools and policy to guide policy makers/practitioners in health and agriculture on how to recognise and address the linkages.

Recommendations are offered for further research to fill some of the gaps in existing knowledge in order to strengthen multi-sectoral responses. Future directions of research should seek to expand analysis to include a

broader range of illnesses and their linkages to agriculture and natural resources and to monitor changes witnessed in agriculture and rural societies over time.

Introduction

This section outlines the key arguments of the paper. It points out that:

- There exist complex interactions between health and agriculture.
- The complex synergism between health and agriculture is increasingly highlighted yet there remain critical knowledge and programmatic gaps.
- Understanding the complex synergistic relationship between health and agriculture is essential for addressing issues of ill-health (ranging from disease transmission to malnutrition) as well as agricultural issues (labour productivity, food and nutrition security, rural farm incomes, etc).

In many parts of the developing world, the closing decades of the 20th century were characterised by the emergence and re-emergence of epidemic diseases. HIV/AIDS arrived on the scene in the late 1970s/early 1980s. Endemic diseases such as malaria and tuberculosis re-emerged in more lethal and drug-resistant strains. These and other “common” infectious diseases such as schistosomiasis, filariasis, onchocerciasis, and guinea worm, as well as conditions such as malnutrition affect tens of millions of people, particularly in the rural areas of developing countries. While knowledge about the gravity of the disease problem is widespread, what has lagged behind is the analysis of linkages between agriculture and health, and how such linkages affect social and economic development.

Agricultural productivity at farm level and the health of individuals, families and societies are closely intertwined. The ability of people to work the land, to fish, to process crops and wood products is dependent upon their health, among other factors. It is widely understood that the well-being of rural households is an outcome of the ability to produce food, buy or trade it in the market place, or gather it from the wild. Families with sick members find all of these tasks more difficult to fulfil. Equally, strategies and programmes to improve agricultural productivity or expand a country's industrial base have health consequences. For example, epidemics of malaria followed construction of the Diama Dam in Senegal in 1987. Outbreaks of schistosomiasis occurred around the Volta Lake when the Akosombo dam was built in southern Ghana (McSweeney, 1996). Most recently, evidence is being developed to demonstrate how HIV/AIDS contributes to national food insecurity, with potential consequences for national nutritional well-being and donor dependency.

Increases in food production have contributed to improvements in the health of millions of people, improved food distribution mechanisms and rising incomes. Combs argues that “human health and well-being must be viewed as *explicit outcomes* of food systems” (Combs, 1999). For many people in Asia and Latin America, nutritional security has improved over the past several decades. However, changes and benefits in food production systems and nutritional security are not evenly shared within countries or globally.

Since the mid-1990s, the HIV/AIDS pandemic has brought new interest to understanding the food security and labour impacts on households, communities, businesses, the public services, and nations as a whole. However, the attention stimulated by HIV/AIDS has not been widely emulated in the study of the impacts of other health issues, such as malaria, sexually transmitted infections, and numerous other diseases. Even as evidence mounts of the potential of avian flu to mutate for cross-human transmission, there remains little attention on how or why prevailing farming systems may contribute to that process, or how farming systems will be affected if a human flu pandemic has as great an impact on producers and consumers as some suggest is possible.

Linkages between agriculture and health are becoming increasingly obvious. It is clear that addressing health challenges could unleash the potential of agriculture. Similarly, addressing problems of agricultural productivity could confer great benefits to the health of rural people. Part of the solution is to understand the linkages and to use that knowledge in developing appropriate policies and programmes.

This paper will draw upon a range of sources in the fields of agriculture, health, and rural livelihoods to illustrate some of the linkages between these fields. In essence, the paper seeks to show the bi-directional nature of agricultural production and the health of producers: agriculture affects health and health affects agriculture. On both the agriculture and health sides, the paper adopts a broad usage of the terms. The primary focus will be on rural societies, but both market and service delivery systems link rural and urban regions. The paper seeks to identify some of the changes that have occurred in recent decades as a result of the interaction between health and agriculture.

Organisation of the paper

The paper is divided into four subsequent sections. Section 1 provides a pragmatic rationale for looking at the linkages between agriculture and health. It outlines the burden of disease by looking at the geographical distribution of major killer diseases and their effects on different groups of people around the world. In addition, it describes some of the economic costs of various diseases.

Section 2 deals with the conceptual basis for the linkages between agriculture and health. The conceptual framework is developed by looking at specific factors that influence the linkages, such as nutritional well-being, impoverishment, income and gender equality, rural assets and services, and social cohesion.

In Section 3 the narrative turns to the available literature to provide detailed descriptions of the linkages between agriculture and health. Both agricultural processes and specific diseases are covered. Much of the literature focuses on micro-level relationships, but there is some discussion of macro-level connections as well.

Section 4 looks at the challenges and opportunities for both policy and programmatic initiatives that will draw agricultural activities and health outcomes more closely together. Recommendations are offered for further research to fill some of the gaps in existing knowledge in order to strengthen multi-sectoral responses.

I: Background and Rationale

This chapter provides a foundation for understanding the linkages between agriculture and health. It will:

- Describe the global burden of disease and how the concept is used to measure the stock and flow of disease prevalence and their impact on society.
- Differentiate by gender and geographic locale how the burden of disease is shared.
- Discuss the economic burden associated with ill-health and diseases.
- Note how rural communities face the greatest burdens of ill-health and diseases.

The World Health Organization (WHO) defines health “as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” Numerous factors contribute to achieving “health”, whether for individuals or for societies as a whole. Social, economic, equity, political and cultural factors all influence levels of health, or of ill-health. Ill-health takes many forms, from the absence of preventative health care to specific disease conditions. Just as with health, ill-health is influenced by numerous factors. Among these factors are agricultural and other rural development systems. In turn, the productivity of agriculture, the vitality of rural development initiatives and levels of food security influence the social levels of health. In short, healthy societies will, in general, be more productive and offer a wider range of benefits for citizens than those suffering from the effect of ill-health.

A. Burden of Disease

An individual's illness may have immediate or longer term impacts—or hardly any impact at all. Also, the nature and duration of an illness affects how an individual is able to respond and recover. A severe cold may prevent a woman from working for a day or two; untreated tuberculosis can affect her ability to work for months, with implications for the nutritional status and income of her family. The cumulative number of people suffering from the same disease or health conditions (known as prevalence) is one measure of the burden of disease. Another measure is the number of new cases of a disease or

Key Concepts

Burden of Disease: a commonly used measure for assessing the healthiness of countries and societies.

Prevalence: The cumulative number of people affected by a specific disease or health condition.

Incidence: The number of people affected by a specific disease or condition with a defined period of time (usually a month or year).

DALY: Disability-Adjusted Life Year describes the time lost due to premature death, disability and illness.

health condition with a specified period of time (known as incidence). When many people suffer from the same disease or multiple diseases, or when there is a rapid change over time, the situation becomes a social concern.

Both prevalence and incidence are widely used to understand some aspects of the burden of disease. Burden of disease is a widely used measure for expressing the healthfulness of a society. It is a concept that describes the level of disease in a society or of a social or socioeconomic sub-group.

The WHO expresses the burden of disease primarily in terms of Disability-Adjusted Life Year (DALY), although it also uses estimates of prevalence—the total number of people affected. A DALY is an indicator of time lost due to premature death, disability and illness. One DALY represents the loss of one year of equivalent full health. Both the WHO and the World Bank, among others, use DALYs to quantify disease conditions, then apply the data in economic analyses to help prioritise resource allocation decisions. Thus, the methodology is most useful for comparative purposes, either between various diseases or between countries or sub-groups. However, many analyses that rely on DALY do not include additional studies of the economic, social or political conditions that contribute to ill-health. That is, alone the measure lacks a basis for looking at linkages that may exist between ill-health and agricultural production, labour productivity, or access to health services, for example. Nor does the methodology contribute to an understanding of the impacts of diseases, on households or communities.

There is significant gender, geographic and socioeconomic status diversity in the distribution and impacts of disease. The WHO found that women experience greater losses of time than men due to ill-health related to communicable diseases, maternal and perinatal health and nutritional conditions. Men and women experienced roughly equivalent losses due to non-communicable diseases and men suffered greater losses than women due to injuries. Communicable illnesses, maternal, perinatal and nutritional conditions make up over 50 percent of all DALYs lost in India and Sub-Saharan Africa, and almost half in other parts of Asia, the Pacific Islands, and in the Middle East. Considerable regional variations are apparent, with accidents and injury accounting for nearly 25 percent of men's disease burden in the former socialist countries of Europe, in Sub-Saharan Africa, and in Latin America and the Caribbean (WHO, 2002). The emphasis on lost economic activity in the DALY methodology tends to distort the burden of disease on women and on households, given that women's on-farm and household work is often not valued or undervalued. **Table 1** outlines the losses—expressed in DALY—within one year for several conditions, using WHO's regional categories.

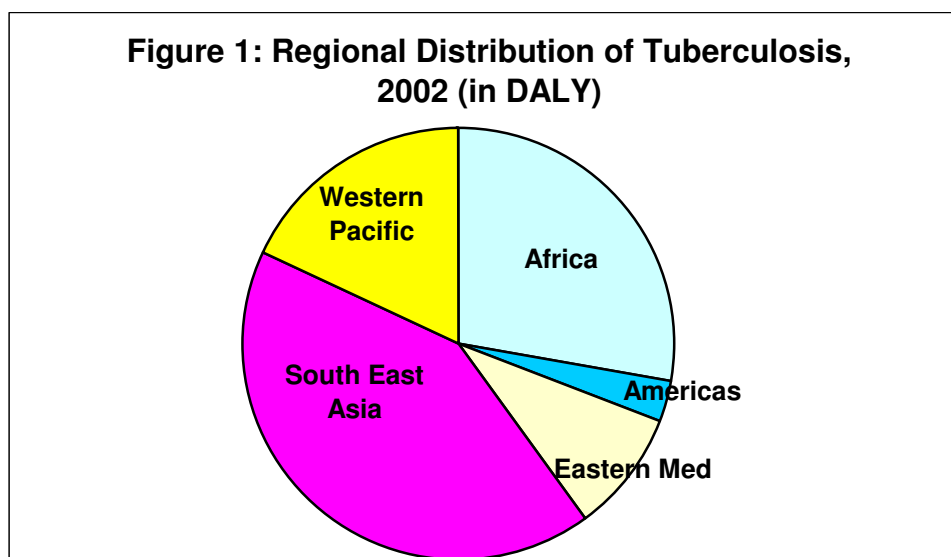
Table 1: Burden of Disease for select conditions, expressed in DALY, for WHO regions, 2002 (in '000s; may not add up due to rounding)

| | Africa | Americas | Eastern Mediterranean | Southeast Asia | Western Pacific |
|-------------------------------|-----------------|---------------|-----------------------|----------------|-----------------|
| Tuberculosis | 9,266 | 928 | 3,040 | 13,930 | 6,029 |
| Male/ Female | 6,046 / 3,221 | 569 / 358 | 1,875 / 1,165 | 8,387 / 5,543 | 3,796 / 2,233 |
| Malaria | 40,855 | 111 | 2,250 | 2,777 | 441 |
| Male/ Female | 19,314 / 21,542 | 61 / 51 | 1,052 / 1,199 | 1,488 / 1,289 | 303 / 138 |
| Schistosomiasis | 1,334 | 75 | 227 | 7 | 55 |
| Male/ Female | 788 / 546 | 39/ 35 | 142 / 85 | 4.6 / 2.6 | 44 / 11 |
| Respiratory Infections | 35,595 | 3,316 | 10,819 | 33,026 | 8,654 |
| Male/ Female | 19,376 / 16,219 | 1,780 / 1,535 | 5,441 / 5,378 | 16,174/ 16,852 | 3,536 / 5,118 |

Source: WHO, 2004*

The diversity of the burden of disease by geographic locale and gender is one of the distinguishing characteristics of ill-health and its influence on agricultural production. To further illustrate the diversity of disease, **Figure 1** describes the regional distribution of tuberculosis within the global burden of disease.

* In addition to the data provided on the WHO website, the website of Global Health Facts provides readily accessible data on HIV/AIDS, TB and malaria. The information is somewhat easier to access than that found on UN agency websites, although the data mostly derives from UN agencies. See <http://www.globalhealthfacts.org>



It is also feasible to measure the burden of disease by prevalence, the cumulative number of people suffering from a specific condition. The WHO estimates of prevalence of select health-related conditions are outlined in **Table 2** (note that the WHO does not differentiate these conditions by gender for its regions).

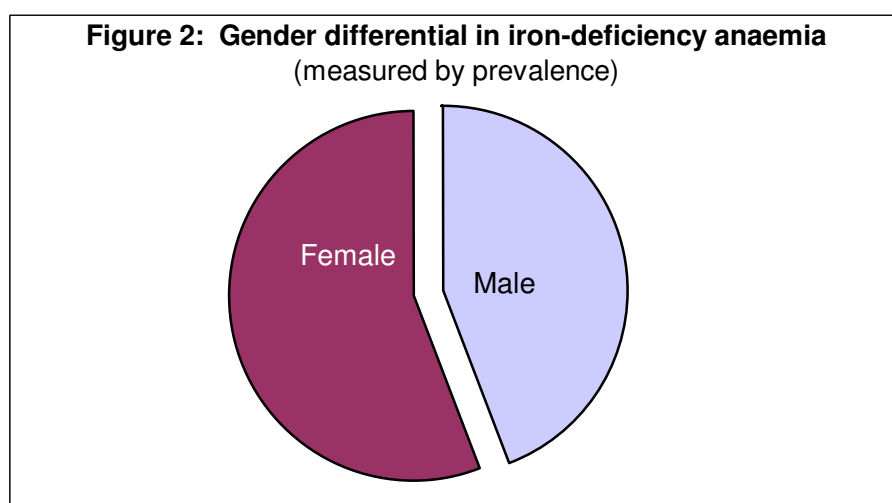
Table 2: Burden of Disease for select conditions, prevalence, for WHO regions, 2002 (in '000s; may not add up due to rounding)

| | Africa | Americas | Eastern Mediterranean | South east Asia | Western Pacific | Global M/F |
|-----------------------------|---------|----------|-----------------------|-----------------|-----------------|------------------------------|
| HIV/AIDS | 26,200 | 2,866 | 826 | 5,703 | 2,019 | 39,395 21,006/ 18,390 |
| Protein-energy Malnutrition | 54,700 | 9,375 | 25,500 | 101,500 | 35,500 | 231,798 119,553/112,245 |
| Iron-deficiency Anaemia | 157,649 | 100,696 | 108,904 | 381,365 | 208,702 | 1,049,407 462,381/587,027 |
| Vitamin A deficiency | 5,800 | 63 | 2,359 | 8,004 | 3,441 | 19,926 9,930/9,996 |

Source: WHO, 2004

As can be seen from the above tables, Africa tends to carry the heaviest burden of several diseases, followed by Southeast Asia and the Western Pacific regions. Nutritional deficiencies are a major contributor to the burden and to the longer-term health outcomes, with major impacts on women and children that can carry over from one generation to another. Childhood and maternal underweight conditions were estimated to

cause 3.4 million deaths in 2000, over half the deaths in Africa. Under-nutrition was a contributing factor in more than half of all child deaths in developing countries—concentrated in Sub-Saharan Africa and across South and Southeast Asia. In addition, “50–70% of the burden of diarrhoeal diseases, measles, malaria and lower respiratory infections in childhood is attributable to under-nutrition” (WHO, 2002: 53). Among adolescents and adult women, under-nutrition is also associated with malnutrition in their children, adverse pregnancy outcomes and reduced work capacity. Also, the ability of women to contribute to actively take part in household spending decisions has a positive effect on their own and their children’s nutritional status (Smith et al. 2003).



Disease burdens and ill-health change over time, both for individuals and for societies as a whole. The changes can be rapid or evolve slowly. The global spread of HIV/AIDS since the mid-1970s is one example of a rapid change. For example, in 1990 the prevalence of HIV/AIDS in South Africa was less than one percent of adult women; by the end of that decade, prevalence had risen to over 20 percent (Laurence, 2000).

Change can also be slow. Food insecurity, for example, has continued to be a major global problem for decades. There was little change in the number of undernourished people in the world in the decade 1990/92-2000/02, with the total estimated by FAO at around 800 million people (FAO, 2005: 6). Food insecurity is closely related to agricultural productivity, but goes beyond basic food production. Conditions of impoverishment, inequalities in access to services, distribution policies and network, and health influence people’s access to adequate food. In turn, access to food influences health conditions and disease outcomes. For example, children who are moderately to severely underweight have a five to eight times higher risk of death from infectious diseases than well-nourished children. Vitamin A deficiency increases the risk of dying from diarrhoea, measles and malaria by 20 to 24 percent (FAO, 2005: 18).

Patterns of food insecurity, poverty, wealth inequalities and ill-health closely interact. For example, about 40 percent of the people in Southern Africa are under-nourished. The sub-region also has rates of HIV/AIDS of

around 20 percent of adults and levels of poverty that encompass up to three-quarters of all rural people (FAO, 2005: 31; Chopra, 2004: 4). The FAO has observed that countries that have the highest levels of under-nutrition in their populations have achieved the least progress toward meeting health, education and other social and economic markers of the Millennium Development Goals.

One agricultural product—tobacco—contributes significantly to the burden of disease. The WHO estimates that tobacco caused nearly 5 million deaths worldwide in 2000, or 8.8 per cent of the total deaths in that year. By 2020 tobacco will be the largest single health problem, causing an estimated 10 million deaths annually, half of those in Asia. Men bear the greatest burden of tobacco-related diseases, but women and children are also affected (Esson and Leeder, 2004).

Malaria, once generally considered to have lost its devastating impacts on societies, has re-emerged as a major disease. In rural Africa, child mortality due to malaria is estimated to have doubled during the 1980s and the early 1990s (Mishra, 2005: 19). Factors contributing to the increase in malaria include: "(i) resistance of parasites to commonly used anti-malarial drugs; (ii) breakdown of control programs; (iii) complex emergencies; (iv) collapse of local primary health services; and (v) resistance of mosquito vectors to insecticides" (WHO and UNICEF, 2005: 2-13). Similar factors, plus unstable political and economic conditions, have contributed to large malaria epidemics in Azerbaijan and Tajikistan, and smaller epidemics in Armenia, Georgia, Kyrgyzstan and Turkmenistan (*ibid*, 43). The movement of settlers into forest zones of Brazil contributed to a ten-fold rise in malaria cases between 1970 and 1990 (Martens and Hall, 2000).

HIV/AIDS is having a major impact on young adult morbidity and mortality across Southern and Eastern Africa. Elsewhere in Sub-Saharan Africa the epidemic is neither as far advanced nor as intense. Across South Asia and Southeast Asia, prevalence of HIV/AIDS is growing slowly, but prevention programmes are often inadequate given the multiple risk factors that exist in the regions. The epidemic could quickly grow in China over the next five to ten years where many of the identified risk factors for individuals exist. In countries with well-established HIV/AIDS epidemics, women in the age range 18-30 tend to have higher rates of HIV/AIDS than young men, sometimes twice as high or more, with lasting demographic implications that remain poorly understood (Stanecki, 2004). It is clear, however, that the pandemic is concentrated in the most economically active groups in both rural and urban areas.

An estimated 8 million people develop active tuberculosis (TB) every year and 2 million die of the disease. The disease is one of the most common causes of death in young women. Most active cases of TB and resultant deaths occur among people 15-50 years of age (Ahlburg, 2000: 6). The highest rates of TB are in South Asia. However, the disease is one of the opportunistic infections stimulated by HIV/AIDS, and TB rates in Sub-

Saharan Africa doubled or more in the 1990s, with rates increasing into the first decade of the 21st century (Smith, 2004: 234).

Numerous other communicable and non-communicable diseases contribute to substantial levels of ill-health across the rural world. Most notable are infectious diarrhoea caused by unsafe drinking water and poor sanitation and hygiene conditions. Several forms of leishmaniasis (an infection caused by the bite of a sand fly) contribute to anaemia and skin ulcers. These diseases are related to environmental changes, especially in South and Central Asia and Brazil, such as deforestation, building of dams or new irrigation schemes, urbanisation and migration of non-immune people to endemic areas (WHO, 2002: 68).

Finally, agricultural injuries and poisonings affect several million workers annually. The United Nations (UN) estimates that there are about two million agricultural-related poisonings and 100,000 deaths every year (Horrigan, Lawrence and Walker, 2002); other sources suggest the figures are higher. One quarter of the estimated disease burden of men in the former socialist countries of Europe, in Sub-Saharan Africa, and in Latin America and the Caribbean are related to injuries and accidents (Forastieri, 1999). Agricultural poisonings are more frequent among men and are concentrated in South Asia and Latin America and areas where commercial agriculture predominates.

B. The Economic Burden of Disease

It is not enough to simply know the burden of disease. These data provide the means to more fully assess the costs of ill-health. Poor people across the world carry the greatest risks and burdens of ill-health. The WHO argues: "there was a strong gradient of increasing child underweight with increasing absolute poverty...people living on less than \$1 per day generally being at two- to three-fold higher relative risk compared with people living on more than \$2 per day" (WHO, 2002: 50). Often impoverished people have the greatest difficulty in accessing health care and are least able to afford the fees for medical attention or medications.

The WHO makes the case that the burden of disease directly influences economic development. It is argued that the burden of disease experienced by people in Sub-Saharan Africa lowers annual gross domestic product (GDP) by one percent (WHO, 1996; WHO, 2002). Other analysts have argued the same point (Bloom and Sachs, 1998). For several reasons, many countries adopted this reasoning during the 1980s and 1990s, placing the emphasis on economic growth, with the hope that subsequent improvements in health conditions would follow. It is argued that ill-health and poverty could only be effectively addressed through national economic growth. Growth, it is argued, would provide the resources for investments in rural and agricultural development and improved social services. The theory in practice did not work in many instances. In Sub-Saharan Africa, at least, "the implications of growth for the poor depend in large part on the impact of growth on rural incomes." But rural incomes were, in fact, declining during the 1980s and 1990s. Consumption per capita in farmer households in Ghana and Tanzania, for

example, actually declined during the 1980s and 1990s (Diskin, 1995:10). Forms of promotion of economic growth did improve the lives of many people, especially those in waged employment, but left as many or more marginalised. In many cases, more equitable distribution systems—whether of income or of services—did not follow the growth-promoting policies and programmes (Rao and Loewenson, 2000). Health conditions and the ability to earn decent livings did not improve—and for tens of millions of people conditions worsened.

Whether it is malnutrition, malaria, TB, HIV/AIDS, or other debilitating illnesses, the economic costs to households and nations are substantial. For example, the economic burden of malaria on households in Sub-Saharan Africa is between \$2 and \$25 for treatment. In Kenya, the treatment cost of malaria for small farmers has been estimated to be as high as 5 percent of total household expenditure, while in Nigeria the figure was as high as 13 percent (see, for example, Mills, 1999: 94; Gallup and Sachs, 2001). In four northern districts of Bangladesh, people spent about \$130 for medicines and treatments for TB before even attending a TB clinic. The cost of this illness alone was, on average, 20 percent of the annual income of households (Ahlburg, 2000; citing Croft and Croft, 1998).

Malnutrition is a major drain on national accounts. One estimate places the cost of lost productivity due to malnutrition at 2 percent of GDP (Shrimpton, 2002). Another study compares income growth across countries in which people have experienced malaria. The study concluded that per capita income growth for the period 1965–1990 in countries where people experienced severe malaria was one-fifth of the level of countries without severe malaria (Gallup and Sachs, 2001: 87).

Ill-health has a direct impact on agricultural productivity. An assessment in Uganda found that nearly all subsistence farmers who had TB reported decreased productivity for at least nine months (Browne, 2001:11). In the Côte d'Ivoire, farmers diagnosed with malaria for more than two days within the growing season had “47% lower yields and 53% lower revenues than farmers who missed no more than two days of work. In general, families highly affected by disease of various kinds may turn from growing higher value crops to less labour demanding and yield-sensitive products – with consequences for household income and nutrition”(Tschannen, et al, 2005). In Sri Lanka, rural households that experienced illnesses lost 7 percent of working days and nearly one-quarter of annual household income, the higher percentage of income loss being due to illnesses during peak labour periods (Konradsen, et al, 1997).

C. Health and Poor Rural Communities

Just as ill-health due to communicable diseases is concentrated in lower income countries and regions (Tables 1 and 2), so too is ill-health concentrated in poorer rural communities (Lawson, 2004: 6, citing Okidi and Kempaka, 2002; Wagstaff, 2002; Gupta, 2003). There is growing appreciation of the differential impacts of economic growth and ill-health. For example, although Bangladesh has achieved substantial decreases in rural poverty, there remain large groups of very poor people and of

people highly vulnerable to health or external shocks. The former group “reported higher percentages of ill members than the rest of the population,” and were more likely to engage in poorly paid rural activities, such as forms of cultivation that did not yield a marketable surplus and agricultural wage labour (Kabeer, 2004: 30).

The differential impacts of ill-health, especially between genders, age groups, socioeconomic classes and rural-urban residence, have direct implications for national development strategies. In the era of HIV/AIDS, for example, groups already marginalised—female-headed households, severely impoverished households, regions with few or inadequate public services—are likely to become worse off than groups and areas more economically secure.*

Some people in rural Ethiopia (and very likely elsewhere) are too poor to seek adequate and timely health care. A study in rural Ethiopia showed that delays of over four weeks in seeking diagnosis and treatment for TB were “significantly associated with rural residence.” The need to raise money for transport to a health centre and eventual health care was financed through the sale of personal assets and decisions to make such sales are often delayed as long as possible. “The majority of patients cited economic or logistical barriers to health care when asked directly about causes of delay” (Cambanis, 2005; see also for the Philippines, World Bank, 2001). One NGO refers to people in such situations as being too poor to be ill (Save the Children UK, 2005). Bangladeshi refer to tuberculosis as the “king’s disease,” as only kings can afford the costs of the illness (Ahlburg, 2000; citing Croft and Croft, 1998).

The impoverishment of a major portion of rural African societies has been accompanied by deterioration in health access and quality of health services. Further, agriculture has become less of a means to sustain household livelihoods or to move out of poverty than it has been in the past. Low commodity prices, inadequate marketing systems, and high prices for inputs have all contributed to greater vulnerability and poverty in rural Africa over the past two to three decades. At the same time, the quality of rural health services has worsened. Thus, as conditions contributing to ill-health have increased, the means to access quality services has declined. This has been exacerbated by the impacts of HIV/AIDS on incomes, lost assets and losses of household labour.

* In addition to diseases, the impacts of natural disasters and economic shocks tend to fall hardest on lower income and marginalised groups.

2: Conceptual Linkages between Agriculture and Health

This chapter sets out:

- A conceptual framework for examining the linkages between agriculture and health.
- Outlines the major components of the framework, including nutritional security, rural assets, impoverishment, socioeconomic and gender equality, and social cohesion and conflict.

Conceptual Framework

Ill-health can lead to changes in agriculture. Also, changes in agricultural systems can contribute to ill-health. These linkages are often mediated through local agro-ecological conditions. Analysing these bi-directional linkages is at the core of this paper, how they manifest themselves and why the connections are important for future policy and programmatic development.

In those countries where agriculture is a major contributor to people's livelihoods, changes in land use, in crop mixes and care of livestock, in access to and use of market systems, and in labour availability will influence health. Likewise, widespread disease and ill-health conditions can lead to shortfalls in agricultural production, shifts in the use of labour for agriculture, in the availability and use of agricultural assets, and related changes. Thus, the links between agriculture and health are bi-directional, each influencing the other at various levels and at varying times. This point has been made for several disease conditions, including for the linkages between HIV/AIDS and development opportunities (Collins and Rau, 2000).

The changes, whether in agriculture or health, are not usually shared uniformly by all members of society. Depending on established policies and programmes, gender, social and economic relations, employment and income opportunities, social safety nets, changes in affecting agriculture are likely to have a differential impact across society. In some cases, for example, aggregate agricultural output may increase with new pricing policies to the benefit of farmers able to produce for the market economy. However, both rural and urban households unable to afford the higher priced food may experience greater food insecurity.

Changes in agriculture are a part of a web of subsequent effects, creating a ripple of implications that extend outward over days, months or years, and with unanticipated or ignored health implications. For example, an outbreak of Nipah virus among pigs and pig farmers in Malaysia, Singapore, Bangladesh and India is traced to "an expanding human population, poor governance, climate change, illegal land clearing, forest fires and intensive animal husbandry." This sequence of events dates at least from the mid-1990s, when decisions were taken to clear Indonesian forests in the Sumatra and Kalimantan regions in order to establish plantation. Heavy burning in 1997 and 1998 created deep clouds of smoke over large areas of land for many months, forcing the migration

of bats to Malaysia. The bats carried a virus then unknown in Malaysia which infected intensively-farmed pigs. The pigs developed a respiratory illness, and tens of thousands died or were culled. In turn, the virus was transmitted to humans, causing illness and the death of over 100 people (Chua, Chua and Wang, 2002; Phua and Lee, 2005; WHO, 2005: 19).

The web of linkages between health and agriculture can lead to significant improvements in agricultural production, and vice versa. A successful river blindness eradication programme in West Africa since the 1970s has allowed people to settle on “25 million hectares of formerly evacuated arable lands...These lands have the potential to feed an additional 17 million people per year using indigenous technologies and methods.” The success of the programme is said to have “transformed the region from aid-dependent to food-exporting. Eighteen million children born in the now-protected areas have been spared the risk of the disease” (World Bank, 2004: 177). Ever more sophisticated monitoring of food security by FAO and USAID, as well as regional organisations, have increased the ability of governments, NGOs and donor agencies to minimise the impacts of food emergencies. In Bangladesh and other Asian countries, projects to raise fish in rice fields resulted in increased crop off-take, improvements in household incomes, and readier availability of fish for home consumption or sale (World Fish Center, 2006). Studies have shown that rice fields with fish have lower and much lower concentrations of mosquito larvae than fields without fish. In Indonesia, fish were found to be more effective in controlling mosquitoes and reducing levels of malaria than pesticides (Halwart and Gupta, 2004: 53).

The prolonged ripple effect of changes in agriculture or health conditions is embodied in much of the work of FAO itself. For example, one report notes that “Poor maternal nutrition and health can be considered the hub of the vicious cycle that passes hunger from one generation to the next—from malnourished mothers to low birth weight babies who are at high risk of stunting during childhood, of reduced working and earning capacity as adults and of giving birth to low-birth weight babies themselves...” (FAO, 2005: 17). This conclusion is reaffirmed by a study of children in Zimbabwe who experienced malnutrition during periods of relatively short-term famines. The children suffered lifetime physical, educational and economic losses. They experienced “a loss of stature of 2.3 centimetres, 0.4 grades of schooling, and a delay in starting school of 3.7 months.” As the children became adults and entered the workforce, their earlier experiences resulted in a seven percent loss in lifetime earnings (Dercon and Hoddinott, 2003: 1, 5).

Since the mid-1970s, agricultural production and downstream marketing have become subject to greater global competition and corporate control. In market-oriented economies, small producers are finding it increasingly difficult to afford the inputs needed to produce substantive surpluses for the market or to obtain prices for their commodities that will bring adequate profits. Some authorities refer to these changes as the industrialisation of agriculture; others, referring specifically to Africa, describe the “deagrarianization and depeasantization” of agricultural

economies (Bryceson et al., 2004). Landlessness, low paid agricultural labour, food insecurity, and growing rural impoverishment have been some of the observed outcomes of these changes.

The ability to monitor changes related to agriculture and health is evolving. As new research is undertaken, additional indicators emerge that help to more fully understand the impacts of diseases and ill-health on agriculture. For example, it has only been in the past several years that researchers have examined and begun to understand the impacts of HIV/AIDS on national and household food security.

Both agriculture and health situations have been shaped by policies, programmes and “market forces” implemented (or not implemented) over the past few years and decades. The mechanisation of rice cultivation in northeast Thailand offers an example. Not only were vast stretches of forest cleared, but young men also assumed many of the duties of operating the equipment. Young women who had previously contributed to their families’ well-being had fewer opportunities in the mechanised system. Many women migrated to urban and tourist areas where sex work became an option. As the HIV/AIDS epidemic took hold in Thailand in the mid- and late-1980s, commercial sex workers and their clients transmitted the virus back into rural communities. Two decades later, the consequences of those seemingly unrelated processes continue to plague the country (Collins and Rau, 2000: 10).

Over the past two to three decades, policy makers and economic reformers at all levels have not shown a strong willingness or ability to understand the dynamics of rural societies, to appreciate the stresses created by some policy and programmatic reforms, or to anticipate long-term consequences of proposed policy changes. A case study of the long-term consequences of policy decisions taken in Malawi over a 40-year period begins on page 19.

The linkages between agriculture and health, the web of effects, and past processes are all factors to be considered in understanding the inter-play between what are often seen as activities of separate sectors. It is useful to break the linkages into several core components to further illustrate how agriculture and health are connected. Of course, there are numerous ways that these parts of the linkages can be constructed.

The components offered here are samples of the interrelationships that exist. As will be obvious from this sub-section and in the review of literature on agriculture-health linkages in Chapter 3, overlaps between these components exist in

Core Components of the Agriculture-Health Linkages

- Environmental Modifications
- Nutritional Security
- Impoverishment and Equality
- Rural Assets and Services
- Gender Equality and Control over Resources
- Social Conflict and Social Cohesion

multiple cases.

A. Environmental Modifications

By its very nature, agriculture alters the natural environment. Fields are ploughed, trees are cut, streams are diverted, and roads are created. All of these agricultural activities involve the application of technology and labour to the environment. Neo-classical economists argue that changes in the environment (or social sphere, for example) will induce changes in other spheres (Hayami and Ruttan, 1985). Although health outcomes are not usually discussed within this neo-classical framework, the model provides a useful perspective on induced environmental changes that may, over the short or long term, affect health.

The tremendous changes in the natural environment over the past two centuries have occurred as a result of population growth, technological innovations, and urbanisation. These changes both induced and responded to greater grain availability and expanded livestock rearing. But population growth has also contributed to widespread deforestation, with long-term implications for climate change and human health. Intensive livestock production is associated with several emerging diseases that affect both animals and humans, such as bovine spongiform encephalopathy (BSE), Severe Acute Respiratory Syndrome (SARS) and the H5N1 virus (Avian or Bird flu).

Global environmental and climate changes are likely to have significant effects on food security. Although debate and research continue, changes in access to food by the mid-21st century in Sub-Saharan Africa, South and Southeast Asia and tropical Latin America may work against low income countries and groups within these countries. Modelling exercises of potential changes due to climate change suggest that global crop production will be adequate to provide enough food for everyone. However, production changes will not be equally distributed between countries. Mid-latitude countries, such as in North America and Europe, are projected to be able to increase crop production, with a warmer climate and longer growing period. By contrast, tropical countries are likely to experience a decline in crop production. One study based on modelling argues: "While global production appears stable, regional differences in crop production are likely to grow stronger through time, leading to a significant polarisation of effects, with substantial increases in risk of hunger amongst the poorer nations..." (Parry, et al. 2004: 66). A study in the Philippines suggests that rice yields are already declining due to global warming. The International Rice Research Institute study indicates that "global rice yields could potentially fall by a catastrophic 50 percent during this century" (Pearce, 2004).

Climate change is also likely to affect health and the ability of people to engage in agriculture (McMichael, et al., 2003). Disease currently associated with tropical areas (e.g., malaria) may intensify in these areas as rainfall and temperature patterns expand the breeding period of mosquitoes. Malaria may spread into areas where it has not existed for decades.

Many of the changes in the natural environment have been influenced by changes in the policy environment, such as decisions taken to increase national food security, to create more equitable rural societies, or to expand the export of commodities. Decisions to construct dams, for instance, often include the objective to provide supplies of water for crop irrigation and human consumption and to control otherwise devastating floods. These human decisions to control the natural environment often have very mixed returns: greater and more regular supplies of some crops, but also increases in water-borne diseases.

B. Nutritional Security

Malnutrition—primarily under-nutrition—affects the lives of hundreds of millions of people. For some people, malnutrition is transitory, as with periods of hunger prior to harvest. For others, it is chronic. Nutritional security occurs “when secure access to food is coupled with a sanitary environment, adequate health services, and knowledgeable care to ensure a healthy and active life for all household members” (Benson, 2004: ix). Access to food relates to the ability of one's family or community to produce food, to earn sufficient income to purchase food on a regular basis, to utilise public or private food programmes and other services, or a combination of these conditions.

Over the years, numerous programmatic and policy fixes have been suggested and implemented to achieve nutritional security. While some have worked, many others have not achieved their stated goals. What is evident is that individual programmes or technical inputs alone cannot achieve either national food security or individual nutritional security. Further, the processes that will enhance agricultural outputs, while also influencing access to food and incomes, stretch over several decades, and the elements that affect these processes are not always evident before or while they occur. That is, we often know more about what works after the fact than before.

As the structure of rural society has changed over the past three to four decades, on-farm crop and livestock production have become but one means of acquiring income. This has been especially true of households with smaller landholdings, with fewer people contributing to the labour supply, and generally to poorer households. Diversification of income sources has become essential for survival.

C. Impoverishment and Equality

A number of recent studies have demonstrated that long-term illnesses, such as HIV/AIDS, lead many households into situations where they become poorer. An African scholar, for example, states: “One of the striking features of the economic impact of AIDS in affected families in Zambia is the rapid transition from relative wealth to relative poverty” (Namposya-Serpell, 2000). For poor and rural households, the ability to cope with external shocks, such as drought or increases in the prices of staple products, will be further reduced in the wake of illness.

The vulnerability of households to impoverished conditions applies mostly to already poor families, but even those that had been relatively secure, but lost income and labour because of illness and death of a household adult, can fall into poverty. A study conducted in Uganda concluded: “we find that ill health and long term sickness, such as that associated with HIV/AIDS, is particularly associated with households moving into poverty” (Lawson, 2004: 2). Further evidence comes from KwaZulu-Natal province of South Africa. There, households that had experienced a death in the previous 12 months (not only from HIV/AIDS, it needs to be pointed out), had a mean monthly income equal to only 64 percent of households that had not experienced a death (Desmond and Gow 2001). The National AIDS Authority in Cambodia notes: “Health services are one of the main causes of poverty and indebtedness in Cambodia. A recent study found that 44% of landlessness was as a result of settling debts related to health expenditures. The costs incurred to families affected with HIV/AIDS will be large, and maybe too large for a family to cope,” strongly implying that impoverishment will deepen in the country as the effects of the epidemic are more widely felt (Men, 2005: 7).

Thus, ill-health has direct links to conditions of poverty and to agriculture. Ill-health makes it more difficult for rural households to raise crops and livestock or earn incomes off-farm. Savings are invested in medical care or used to make up for income losses when household members cannot work. Labour is diverted from agricultural tasks to caregiving or off-farm work. The processes that undermine individual, household or community security also contribute to asset losses and ill-health.

Impoverishment often results in undernourishment. In turn, malnourished bodies are more susceptible to a whole range of infectious diseases and illnesses, including those that are sexually transmitted, thus perpetuating the vicious cycle of impoverishment – malnutrition – disease infection (Collins and Rau, 2000: 6-7). An analysis of data from Malawi shows an increase in child malnutrition as national HIV/AIDS prevalence increases (UNFPA, 2003: 45).

Difficulty accessing health and other social services is a reality for impoverished households. A study in 2001 in Sangli district, one of the more economically productive districts of Maharashtra state in India, found that children in households where an adult death due to HIV/AIDS had occurred had less access to health care services and school. To cope with an HIV/AIDS-related death, already poor households were more likely to forego use of health services than non-poor households, with the implication that socioeconomic inequalities grew (Verma et al., 2002). A study in Bangladesh identified numerous consequences of an adult death: women having to take a job at the expense of childcare; a higher likelihood that children in households experiencing an adult death would not receive any education compared to children in households without an adult death; a likelihood that female children would move out of the household for work or marriage; and greater child mortality following the death of a mother (Roy, et al., 2000).

Case study:**Contemporary Consequences of Past Policy Decisions: The Case of Malawi**

The long-term implications of the inter-play between policy decisions and changes in livelihood are exemplified in Malawi. In Malawi, most people live in rural areas, and agriculture is the basis of livelihoods of most rural people. For nearly 40 years, both national and international authorities have pushed policies that have affected rural livelihoods (the following sequence of policy actions and livelihoods outcomes is based primarily on Frankenberger, et al., 2003). Today, childhood malnutrition rates are around 50 percent and a quarter of children die before the age of five. The country's Poverty Reduction Strategy update for 2002/03 noted that as of the 1990s nearly two-thirds of the population lived below the poverty line (Malawi, 2005). "Overlaying this chronic poverty and malnutrition is an HIV/AIDS infection rate of more than 20%, contributing to a further decline in rural livelihoods" (Frankenberger, et al., 2003: 1).

The policy actions involved in reaching the current status include:

- Within a few years after Independence in 1964, government policy favoured the tobacco estate sector which provided much of the country's foreign exchange. A number of smallholder farmers found their land turned over to expand estates, with the result that "a poor landless tenant class" began to emerge and less land was available for food production.
- During the 1970s, estates continued to be favoured over smallholder production. Government controlled marketing and prices of smallholder crops, making it difficult for all but the most wealthy small farmers to grow. An educated middle class began to participate in running the government and the agricultural estates. Wages for agricultural workers were officially controlled in order to protect export prices.
- A Land Requisition Act adopted in 1971 strengthened the ability of estates to acquire land. During the 1980s, the number of estates (some obviously relatively small) increased ten-fold. The land available to smallholders decreased by 20 percent. "In general, households were becoming poorer due to this bias towards the estate sector. The war in Mozambique put added pressure on limited resources because of the large influx of Mozambican refugees into the Southern region. Overall, livelihood systems were beginning to deteriorate because of agricultural and marketing policy biases" (Frankenberger, et al., 2003: 7).
- The country was one of the first in the world to experience a structural adjustment programme (SAP). In addition to stabilising the economy and diversifying exports, the structural changes sought to influence crop production by promoting hybrid maize. Prices favoured maize production and many smallholders responded by raising and selling hybrid maize. Significant overall agricultural production increases did not follow, however, because of land and input price constraints. Wages for agricultural workers continued to

fall in value in real terms and against consumer costs. However, the number of people who sought work in the sector increased, indicating growing impoverishment among low income and food insecure households.

- Early in the 1990s, the government changed agricultural policy, allowing smallholders to produce burley tobacco. As with hybrid maize, farmers responded to the new income opportunities; production tripled within six years. Demand for day and piece work labourers increased. Growing differentiation was evident between households able to derive a living from agriculture and those that could not. Food insecurity, especially among female-headed households (estimated to be between a quarter and a third of all smallholder households), became more conspicuous. Stunting rates of under-5 children was around 50 percent.
- In the mid-1990s, a new government came to power. It sought to increase smallholder agricultural production and rural services. Reforms included removal of restrictions on commercial crops and liberalisation of input and output markets. However, oversupply occurred, prices dropped for major crops and many farmers were unable to compete in the market environment.
- In 1998, the national currency was devalued by nearly two-thirds. The price of many basic commodities rapidly escalated. Studies found 65 percent of Malawians lived below the national poverty line and were chronically food insecure. Over one-third of the country's rural households were considered among the poorest households. They were landless or had too little land to feed themselves or earn an income. They relied on agricultural piecework, were sick a great deal, and ate just one meal a day. "The next strata of poor households were not much better off, and represented 51% of the populations in the villages. They often had less than one hectare of land and also relied upon ganyu [piece work and day] labour and selling firewood. They relied on two meals a day when income was in short supply" (Frankenberger, et al., 2003: 29).
- By the late 1990s, illnesses and deaths due to HIV/AIDS were becoming evident across the country. The epidemic exacerbated prevailing impoverishment, taking advantage of the conditions and fractures in society created by earlier policy and programme actions. A series of droughts in 2001 through 2005 deepened the difficult conditions for at least half of the population.
- One consequence of the epidemic is that land and agricultural assets may be becoming more concentrated. There are studies that show impoverished households renting or even selling land to raise income, thereby contributing to greater socio-economic inequalities in rural societies. What is not known is how that land is being used. If it is being used by households unaffected by HIV/AIDS losses or better able to absorb those losses, then the land is likely to be used to expand production of marketable crops. Aggregate production or sales figures for a region or country are unlikely to reflect local differentiation in land control and production changes.

D. Rural Assets and Services

Prolonged illness in a household can result in disinvestment of capital to pay for medical costs and supplement income no longer earned by working adult members. In rural Uganda, households cope with ill health by renting their land, allowing it to lie fallow and selling off livestock and other farm assets (Lawson, 2004: 2). Numerous reports refer to distress sales of farm equipment and household goods by households in need of quick cash. Labour may be diverted from agricultural and marketing pursuits towards taking care of sick relatives. Children—especially girls—may be withdrawn or withheld from school to provide care, thereby freeing up time for an adult to work (Rau, 2002: 6).

The nature of specific agricultural systems, the gender mix of households and the levels of wealth within communities and countries all influence how land and agricultural assets are used during periods of illness or an adult death. In mixed farming households in Uganda, nearly one-third (32 percent) had reportedly sold animals to pay for medical care and other household expenses (Uganda, 2002: 16). In Namibia, livestock and grain sales are common ways to raise money to meet illness-related expenses or to replace lost income. In widow-headed households, distress sales and the dispossession of property increase as the family copes with the loss of adult male labour and income (FAO, 2003: 1).

Not all households experience sustained losses. Some households gain in labour availability, as relatives are called back to homesteads following the long-term illness or death of an adult. In other instances, such as in some societies in Kenya, households that experienced a prime-age adult death could even gain cattle through dowry, as daughters are married off as a way to restore assets (Yamano and Jayne, 2002: 25).

The death of a male or female adult makes a difference in subsequent agricultural activities. In Kenya, for example, “only households in the lower half of the income distribution (that were predominantly female headed)...suffered as a result of the death of either male head of-household or the spouse. These households incurred a 1.2 acre decline in cereal crop cultivation compared to non-afflicted neighbour households...” (Yamano and Jayne, 2002).

Availability of and access to rural services is a critical factor in sustaining rural households and communities during periods of health shocks. In the largest economies of Southeast Asia (Malaysia, Thailand, Indonesia and the Philippines), agriculture has been a factor in the overall reduction of poverty. However, “Growth of services output has been a more important contributor to reductions of rural poverty than the growth of agricultural output” (Warr, 2002: 10). In addition, while industrialisation has contributed to poverty reduction in these countries, the “pattern of industrialization...does not advance the welfare of poor people because it contributes insufficiently to expanding the demand for the principal resource which they own— unskilled labour” (ibid: 15). An overview of changes in poverty in Bangladesh points to improvements in rural infrastructure as one of several factors in reducing rural poverty levels in

recent decades. In addition, the “public sector has been extremely active in the promotion of a number of social services such as child immunisation, family planning, drinking water provision and education, all areas in which Bangladesh has made considerable progress” (Kabeer, 2004: 5-6). A study of resettlement areas in Burkina Faso found that settlers “have shown a strong tendency to reinvest in social infrastructure. The Solenzo area, which is one of the top cotton producing areas in the country, also boasts one of the highest rates of agriculturalist investment of *ristournes* (returns) from farmer managed cotton markets into village schools and health facilities” (McMillan, Nana and Savadogo, 1993: 58).

The ability of communities and countries to preserve the basic elements of rural livelihoods is critical in protecting households from health losses. It is not only the existence of hard infrastructure. The presence and functions of local organisations, such as women’s groups, and credit and peasant associations, to meet specific interests and needs, along with adequate and appropriate social and production services, are important elements in sustaining rural livelihoods (Tontisirin and Gillespie, 1999: 45).

E. Gender and Control over Resources

Gender issues are critical for household health, agricultural productivity and income generation. As pointed out in Section 1, women suffer more from most communicable diseases than do men. Further, they tend to have less access to health services (because of time, income or socio-cultural factors) and less control than men over reproductive health decisions within the family. Young women in particular, who are also of low socio-economic status, are at greater risk of sexual coercion, pregnancy and sexually transmitted infections, including HIV/AIDS, than middle and upper income peers (Hallman, 2004).

UNDP argues that poverty aggravates other factors that heighten the susceptibility of women to reproductive health conditions:

A lack of control [by poor women] over the circumstances in which the intercourse occurs may increase the frequency of intercourse and lower the age at which sexual activity begins. A lack of access to acceptable health services may leave infections and lesions untreated. Malnutrition not only inhibits the production of mucus but also slows the healing process and depresses the immune system (Reid and Bailey, 1992: 4).

It is well documented that women put in more time on on-farm and household work than men. Both low-income men and women hire out their labour to larger or wealthier farming households for cash or in-kind payments, but at the expense of their own production. In Vietnam, as elsewhere, women who farm tend to have smaller areas of land and lower incomes than men engaged in farming. On the other hand, women have greater control over livestock and incomes from the sale of livestock (Kobayashi, 2003). FAO characterised the changing nature of agriculture and rural societies as the “feminization of agriculture.” The term refers to

the growing disproportion of women in rural areas, the out-migration of men (and increasingly more women) in search of work, and the rise in or continuation of high levels of women-headed households.

In Mozambique, the division of labour on farms is such that women are the holders of knowledge about seed selection and conservation; whereas, men tend to focus on manual labour and field preparation (McEwan, 2004: 13; citing Waterhouse, 2003). Thus, changes in household responsibilities resulting from illness or death can disrupt the entire production cycle. Larger households can spread both the knowledge and tasks, but smaller, younger households, and those headed by women are far less able to cope with chronic ill-health or an adult death.

Such changes stimulate other changes. The tenuous nature of much of agriculture in Sub-Saharan Africa has resulted in both women and men assuming tasks once considered the role of the other. Women are taking a greater role in livestock raising, men in food production. Off-farm employment is now common for both women and men and all are engaged in a variety of income-generating activities aimed at diversifying livelihood security (Booth, 2000).

F. Social Conflict and Social Cohesion

The cohesiveness of families, communities and broader regions influences the linkages between agriculture and health. Strong social cohesion reinforces community health seeking behaviours and results in a greater sharing of the losses caused by droughts, epidemics or changes in market prices for commodities or labour. In rural central Malawi, which has experienced heavy human losses to HIV/AIDS and a series of famines in the 1990s and 2000s, "...the number of distressed households has increased [and] village community interaction has suffered. Theft has become a major problem and interhousehold relations are strained when loan repayment is outstanding..." (Bryceson, Fonseca and Kadzandira, 2004: viii).

Social cohesion in relationship to rural livelihoods can be expressed in many ways. For example, it can include a sense of hope or security about the future outcomes of one's life. It can occur in the form of trust that family and community members will be available to assist in times of need. It can come from knowledge that services are available to minimise ill-health or expand income opportunities. Extensive evidence illustrates that socioeconomic and gender inequalities in societies can undermine social cohesion and contribute to ill-health (Wilkinson, 1997). Richards adds another dimension. He suggests that much of the conflict in West Africa is a form of "agrarian revolt", especially by young men who have been displaced and marginalised by their national governments and elite. "Development", as promised in the aftermath of national independence, has failed to occur. Rather, what is often called development has contributed to growing inequalities and social conflict (Richards, 1996). In several of the Central Asia republics, rural inequalities have increased since the breakup of the Soviet Union. Within inequalities has come

increased rural poverty, usually tied to access to the benefits of land and agricultural reforms of the 1990s (Spoor 2004: 39-40).

Further evidence from Africa indicates that young people without hope for jobs or improved lives are more likely to engage in risky sexual behaviours than peers with greater self-satisfaction for the future (Awusabo-Asare, Kofi, et al., 1999; Richards, 1999). A study from Kenya found that young women from disrupted families were more likely to engage in risky sexual behaviour than women from stable families (Iragu and Zabin, 1993).

Social support systems are a central part of cohesive societies. As these support systems bend under the pressure of market or weather changes or wide-spread ill-health, the ability of the support networks to serve people weakens. This has been especially evident in Southern and Eastern Africa as the HIV/AIDS epidemic stretches extended family and community structures beyond their ability to offer adequate assistance to infected individuals and affected families. The financial crisis in Thailand in the late 1990s resulted in a pattern of poor parents “selling their daughters to brothel owners as well as of growth in prostitution by young boys...” (UNDP, 1999: 142-43).

3: Evidence from Literature

This chapter reviews available literature on the linkages between agriculture and health. The chapter will:

- Offer numerous examples of the interrelationship between agriculture and health.
- Review the impacts of specific diseases or health conditions on agricultural activities.
- Examine the role of livestock health in agriculture.
- Discuss how ill-health affects the functioning of agricultural institutions.

A good portion of the literature on health either relates to disease burdens or provision of and/or access to health services. For example, it is common for analyses to note what percentage of a population has access to health clinics. Other analyses deal with the real or assumed costs of running or using health services. Within the health sector, these analyses are important. However, to learn more about the implications of ill-health for agriculture—and people engaged in agriculture—much of the information within the health sector is not particularly useful. Some of that derives from the recognition by authors, perhaps too quickly, of the multiple coping strategies used by rural people to deal with persistent difficult conditions and shorter-term shocks. These coping mechanisms are important for survival and continuity, but often come at a cost (Rugalema, 2000). The trade-offs experienced by rural households and communities as they expend energy, time and wealth to deal with ill-health are little understood or discussed.

To be sure, there are exceptions to the paucity of evidence of the links between agriculture and health. These exceptions provide important insights into how agriculture and health interact with one another. At the international level, the World Health Organization and the International Food Policy Research Institute (IFPRI) have played critical roles in making such connections. Several individual researchers and teams have added much needed evidence (for example, Audibert, Mathonna and Henry, 2003; Jayne, et al., 2004; Yamano and Jayne, 2002; Mouchet and Brengues, 1990; Barnett and Whiteside, 2002).

As the references listed at the end of this paper show, there are numerous reports, studies, articles and books that have appeared since the mid-1980s that describe aspects of the linkages between agricultural and health in developing countries. If one were to add documents relating to developed countries, the list would be far longer. What is striking about the documents is how many deal with specific sectors or conditions. Most do not guide readers to look at the interrelationships between the specific topic and other aspects of agriculture or health.

This section will focus on various health problems or diseases to document their impacts on agriculture. The section provides evidence of the close links between agriculture and health. Sub-sections are organised around

agriculture and specific diseases, animal and human health and the functioning of agricultural institutions.

As will be evident in the sub-sections that follow, much of the literature is focused on household and local level impacts of ill-health and disease on agriculture and of agriculture on health. Less analysis has been offered on macro level impacts and linkages that affect nations and sub-regions. We will start with what has been written about macro-level impacts.

A. Macro-level Relationships

Directly and indirectly, health problems related to agriculture are costly. Nutritional problems are a major cause or underlying cause of children being brought to health facilities. In Ghana, about half of all health facility admissions are for children with nutrition and nutrition-related health conditions. Malnutrition is the cause of over half of all child deaths (Ghana, National Development Planning Commission, 2005: 18, 21). India shows nearly identical child mortality figures from malnutrition (National Commission on Macroeconomics and Health, 2005: 94).

Ill-health has a direct effect on labour availability, with implications for agricultural and business productivity and national food security and national revenues. By 2020, countries in southern Africa are projected to lose between 20 and 30 percent of their labour force to HIV/AIDS (**Table 3**). FAO estimates that by the year 2000, AIDS killed seven million agricultural workers since 1985 in the 25 most-affected African countries. The epidemic could kill 16 million more before 2020 (FAO, 2003a). With the heavy burden of HIV/AIDS on women, both in terms of infection and caregiving, and the large role of women in food production, significant nutritional decline may occur. Also, with agriculture remaining a core part of African economies, potential labour losses will have impacts on productivity and the contributions of agriculture as a whole to national economic growth and foreign exchange earnings.

Table 3: Projected Labour Force Losses to HIV/AIDS by 2020

| COUNTRY | % PROJECTED LOSS |
|--------------|------------------|
| Botswana | 34.9 |
| Lesotho | 31.6 |
| Malawi | 18.9 |
| Mozambique | 17.7 |
| Namibia | 19.2 |
| South Africa | 32.6 |
| Swaziland | 30.2 |
| Zambia | 19.9 |
| Zimbabwe | 28.9 |

Source: ILO, 2004

Ill-health reduces a country's ability to invest in agriculture, infrastructure and other economic and social sectors. Although the evidence remains incomplete, studies on the macro economic impacts of malaria and

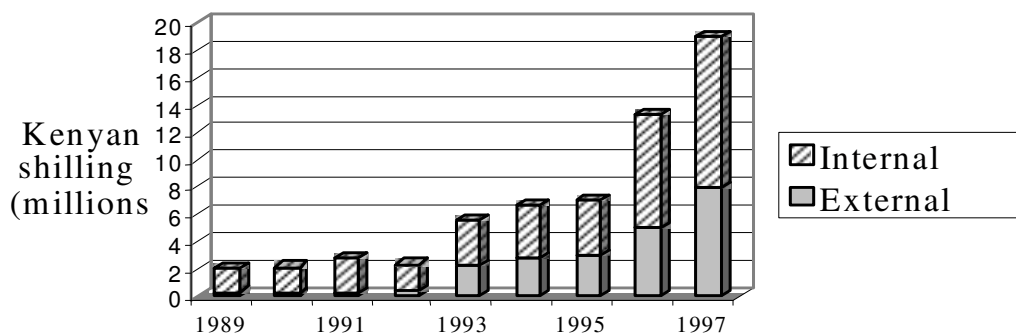
HIV/AIDS do suggest the extent of the costs of disease. It is estimated that the cost of malaria to African countries in lost productivity, household out-of-pocket expenses and utilisation of health services is around \$12 billion. Other estimates are that malaria slows economic growth in Africa by 1.3 percent per year (WHO, 2003). Research showed that a malaria epidemic in one district of Zimbabwe in 1996/97 “escalated spending by the Ministry of Health by nearly \$300,000 above normal spending” (Worrall, Rietveld and Delacollette, 2004: 138).

The HIV/AIDS epidemic appears to be having a growing impact on national wealth, and studies continue to be refined to better understand the epidemic’s macro impacts. The impacts are cumulative, and in the absence of effective prevention programs, they will extend well into the middle of the 21st century. One suggestion is that “When the rate of HIV in a population reaches 5 percent, per capita GDP can be expected to decline by 0.4 percent a year. And when HIV reaches 15 percent, a country can expect an annual drop in GDP of more than 1 percent” (Piot and Pinstруп-Andersen, 2002: 14).

National goals to improve rural areas and to reduce inequalities in society are likely to face greater challenges as the full impact of HIV/AIDS is felt. Not only will national resources likely fall, but demand for health services will rise, straining budgets. Experienced personnel are being lost, either leaving gaps in the public service or causing governments to increase spending on recruitment and training (Rau, 2004).

Other national goals to expand employment opportunities, enhance national revenues and decrease dependency on donor funding are constrained by ill-health. For example, as businesses cope with the costs of HIV/AIDS in the workforce, their productivity and profitability decline—and their tax payments to national treasuries also fall. An agro-estate in Kenya saw a dramatic jump in its medical expenses as HIV/AIDS emerged in the workforce in the mid-1990s. After holding steady for a number of years, medical costs handled on the estate (internal costs) and in facilities off the estate (external costs) began to rise in 1993 and very rapidly after 1995 as HIV/AIDS-related illnesses affected employees (**Figure 3**).

Figure 3: Medical Costs at a Kenyan Agro-Estate



Source: Rugalema, 1999

Businesses that rely on either skilled or unskilled labour, or both, can find their operations disrupted by illness. An “AIDS tax” on businesses (expenses imposed by the increased costs of labour) is estimated to range from 1 to 10 percent (Rosen, et al. 2002). As the cost of labour increases—costs associated with new hiring and training, more costly benefits—firms are less willing to hire as quickly or hire as many workers as in the past. In the agriculture sector, there is evidence to suggest that some farmers are substituting capital equipment for tasks formerly done by hired labour in order to smooth the production process and lower operating costs. On the other hand, constraints on profits may make it more difficult for farmers to make capital equipment purchases. They will either have to impose wage limitations or risk curtailing productivity.

While HIV/AIDS is the best-studied disease with macro economic consequences, other emerging diseases have raised concerns among national leaders. Although quickly contained at the time, the SARS outbreak in Asia in 2003 became a subject of concern because of its potential impact on tourism (a major source of employment and revenue for many Asian countries) and regional finance (Macan-Markar, 2003). It is useful to note the contrast in the time it took to analyse the economic impacts of HIV/AIDS and of SARS. The first real attention to the macro economic consequences of HIV/AIDS came a decade after the epidemic became known. In the case of SARS, the timeframe was less than six months. As of April 2005, FAO estimated that gross domestic product losses from avian flu amounted to \$10-15 billion, concentrated mostly in Southeast Asia (FAO, 2005a).

B. Micro-level relationships

Labour and Production

Ill-health has numerous impacts on agricultural production, marketing and subsequently on individual and household well-being and livelihoods. The most common association is that ill-health removes people's labour from their agricultural pursuits and undermines their productivity. The lengths of an illness, degree of disability caused by a disease, who is infected and who is affected, are factors that influence the severity of the impact of ill-health. A cold may keep a person from work for a day or two; chronic tuberculosis is likely to undermine productivity for months or years.

Chronic illnesses are likely to lead to loss of labour for agricultural activities or off-farm income activities. Similarly, time devoted to care for sick family members, whether children or adults, also results in loss of labour for productive activities. Illness often results in increased household spending for health care, transport and food. Some households cope with these situations, while others struggle to maintain their cohesiveness. Some households are driven into impoverishment. Others fracture, at least temporally, if an adult leaves to find work. In extreme cases, the household may dissolve following the death of an adult member (O'Donnell, 2004: 5).

One outcome of illness in farm households is a growing socioeconomic differentiation within rural societies and between rural and urban societies. Female-headed households, households with limited assets and households unable to fully recover from disease, death, drought or famine shocks are among the large number of rural groups unable to easily adopt new production techniques or crops that could improve output and incomes. In turn, governments feel less interest in or pressure to invest in new agricultural projects or rural infrastructure for these groups, or in areas where production is low and poverty is high. Larger households and those with adequate resources are in stronger positions to adopt new crops, take advantage of agricultural services, and utilise markets for their further advantage.

Long-term illness contributes to changes in agricultural production or incomes from agricultural work. In Sanpatony District, Thailand, households that experienced labour loss due to illness grew less labour-intensive crops. The area planted in wet rice fell by 30 percent, half of that decline ascribed to labour lost due to HIV/AIDS (Thangpet, 2001). In Uganda, in the late 1980s, households affected by HIV/AIDS reduced work on coffee in favour of staple products, such as bananas. As labour became even more scarce, affected households abandoned bananas, cut down trees and planted cassava (Barnett and Whiteside, 2002). Other studies have shown that sugarcane workers in Tanzania and irrigated rice farmers in Cameroon who suffered from schistosomiasis had lower productivity than uninfected workers. Expected productivity returned after successful treatment (Fenwick and Figenschou, 1972; Audibert, 1986). Farm households in Benue State, Nigeria, in which members experienced heavy concentrations of schistosomiasis, lost 25 percent more days to disease than families with low infection rates. These households spent less time on land preparation, resulting in lower productivity (Umeha, Amali and Umeh, 2001: 298).

Ill-health, Food Consumption and Agriculture

Ill-health produces a “shock” for rural and urban households. This shock may be short-lived or have much longer effects. A study of one village in Tanzania found that “illness is the most frequently mentioned shock”, resulting in reductions in food consumption. Many of the households were already living on the cusp of food insecurity. A period of illness to one or more household members made it even more difficult to avoid food insecurity. In this Tanzanian study, respondents stated that a “specific spell of illness had at least some effect on their daily consumption, with well over half saying that that they were forced to cut back consumption severely” (Dercon and De Weerd, 2002).

The precarious situation of rural households in terms of vulnerability to illness and other “shocks” has been highlighted by several studies. For example, very low income people in Zambia who also experienced severe or lengthy periods of ill-health were likely to lose productive assets, have less food to consume, be unable to afford school fees or seek timely

health care. “For many very vulnerable people, therefore, the first strategy is to avoid exposure to risk.” Among the risks to be avoided are changes in agricultural production, even when prospects are offered for longer-term improvements in income and security. The Zambia example continues: “...many poor rural farmers mistrust new horticultural cultigens and prefer to continue planting the familiar staple crop, maize, supplemented by low-value traditional crops such as cassava, millet and sorghum. This strategy is likely to trap them at a bare subsistence level. In comparison with households in the highest income quintiles, households in the poorest quintile are more likely to grow both cassava and millet but less likely to grow cash crops such as cotton, tobacco and sunflowers. Growing high-value and marketable crops such as cotton or vegetables is potentially profitable, but risky for a number of reasons” (Kozel, et al., 2005: 147).

Nearly 80 percent of rural Zambian households reduced food consumption in order to cope with shocks, including ill-health of an adult. Nearly half took on piece work on the farms of other, more secure households, a short-term coping strategy with longer-term implications for own-farm production and food security (Kozel, et al., 2005: 161).

It is clear that lower income and less productive households face greater nutritional insecurity and less likelihood of moving out of poverty through agriculture than do more productive and financially secure households. The conclusion is not new, although it had been largely forgotten or ignored as economic reform agendas held sway in the 1980s and much of the 1990s. By the early 2000s, the conclusion was being re-asserted, as new evidence presented inequalities, and rural livelihoods again began to receive some attention from researchers and aid agencies.

C. Linkages between Specific Diseases and Agriculture

Malaria

The widespread prevalence of malaria in Africa and Asia has a significant impact on agricultural production. Illness at key times can disrupt the production cycle, affecting efficiency and harvests. Evidence in the literature is persuasive that malaria, like other diseases, has significant impacts on rural societies and national agricultural production.

In northern Côte d'Ivoire, malaria is “hyper-endemic”, with over 60 percent of adults experiencing a period of illness due to malaria every year. In this area, it is the intensity of the malaria attack, not simply having a malaria attack, which influences the ability of farm families to work. In addition, the number of working family members who become ill with malaria, especially at key times in the production cycle, affects the efficiency of production. The authors conclude that malaria does have an adverse impact on the efficiency of cotton production (Audibert, Mathonna and Henry, 2003: 1713). Another study of vegetable producers in Côte d'Ivoire found that 4 out of 10 farmers stopped production

because of inadequate income from their efforts. The researchers found that farmers who were sick for two or more days obtained yields just above half of those obtained by farmers who had been sick for less than two days. They concluded that low incomes were “tightly linked to high morbidity (50-75% due to malaria)” (Tschannen, Girardin and Utzinger, 2005).

Water storage and irrigation projects often provide habitat for malarial mosquitoes to breed. Four large irrigation projects in Sri Lanka, with two involving population re-settlement, resulted in increased malaria among the settlers (Fernando, 2002: 31). The clearing of land for the projects put the settlers in closer contact with malarial mosquitoes. Many of the settlers came from non-malarious parts of the country. Irrigation channels became breeding sites for mosquitoes, and settlements were set up in close proximity to these breeding sites (ibid: 35). The water storage systems need not be large, however, to result in high intensity levels of malaria. Children (and presumably adults) living near small water storage dams in the Tigray region of Ethiopia have higher rates of malaria than those further from the dams (Ghebreyesus, et al., 1999). Malaria can have adverse nutritional impacts on children, and can require the time of parents to provide care. It is estimated that malaria costs rural households 5-8 percent of annual income in lost time on fields or non-farm income activities (Gallup and Sachs, 2001).

Tuberculosis

Tuberculosis has similar impacts as malaria on agricultural production and income earning. However, while malaria may fluctuate by season, with greater or lesser impacts on the timing of agricultural or marketing pursuits, tuberculosis is a chronic condition. In the absence of treatment, the ability to carry on a productive life, including in agriculture, is seriously compromised.

In western Uganda, 80 percent of waged workers had to stop working because they lacked the fitness to work with tuberculosis. Nearly all small-scale subsistence farmers who had tuberculosis had given up cultivation because they lacked the strength and stamina to consistently work. The average time off from work was over 9 months, although studies elsewhere indicate time lost at one-half to one-third of that in Uganda. In any event, the losses in income or time devoted to agriculture are substantial, with repercussions likely to extend well beyond the time lost to work (Ahlburg, 2000; citing Saunderson, 1995: 1207). Such extensive periods of being unable to work, especially for the rural poor, can contribute to new or deeper impoverishment.

In Tamil Nadu, India, for example, female tuberculosis patients reported a 50 percent reduction in time available for household work, and only one-third reported that they were able to attend adequately to the needs of their children. Increases in household debt often resulted (Ahlburg, 2000; citing Ramachandran *et al.* 1997). In turn, this can have ripple effects on

child care, market activities, and possible household nutrition and income potential.

Other studies have shown that tuberculosis carries extensive costs, especially in terms of household income and productive assets. In Bangladesh, Pryer (1989) found that the initial response of households to large medical expenses is the sale of assets, followed by taking out loans to maintain household consumption. These loans have very high interest rate and short repayment periods, which make the economic recovery of the household difficult. Nearly 40 percent of households in northern Bangladesh sold livestock or land to pay for the medical treatment of tuberculosis, and to supplement income lost when an adult was unable to work (Ahlburg, 2000; citing Croft and Croft, 1998). A study conducted in Thailand found that 16 percent of poor households where a person had tuberculosis sold assets, primarily land; by contrast, 7 percent of non-poor sold assets to cope with the costs of the disease (Ahlburg, 2000; citing Karnolratanakul, et al., 1999). Thus, some diseases are more costly to rural households than others, a finding that has been well documented in the case of HIV/AIDS.

HIV and AIDS

The impacts of the HIV/AIDS epidemic have received extensive attention by researchers for over a decade. A number of studies, mostly from Africa, but also including parts of Southeast Asia, have documented the effects of HIV/AIDS on household level agricultural production. Given the relative expansiveness of the literature, compared to malaria or tuberculosis, for example, this section will describe in detail some of the noted impacts of HIV/AIDS. HIV/AIDS has its own unique characteristics that are relevant for agriculture. AIDS is a long-term illness, with periods of disability lasting months. Death from HIV/AIDS, rather than treatment and recovery, remains the norm, especially in rural areas, despite the existence of antiretroviral drugs.

General conclusions from several comprehensive reviews (Haddad & Gillespie, 2001; de Waal & Whiteside, 2003) of the impacts of the HIV/AIDS epidemic on the agricultural sector include:

- Increases in rural inequalities and deepening levels of poverty result from the disproportionately severe effects of HIV/AIDS on relatively poor households;
- Reductions in household assets and wealth due to HIV/AIDS lead to less capital-intensive cropping systems for severely affected communities and households;
- Deaths of rural women and men to HIV/AIDS undermine the transfer of knowledge of crop and livestock husbandry and marketing to subsequent generations of farmers;
- HIV/AIDS undermines nutritional status and health as diets worsen because of decreased food security, and also because of shifts to less nutritious but easier to cultivate crops, such as cassava.

Some of the details of these findings are outlined below.

By 2005 few rural communities in Sub-Saharan Africa had been spared the impacts of the disease. The agricultural base of rural societies—and most African nations—is affected, as are the livelihoods of many rural people. Already weak agricultural services have become more tenuous. Evidence is mounting that deep food insecurity in some parts of southern Africa are partially caused by decreased agricultural productivity and production because labour and productive assets are lost to HIV/AIDS. Rural livelihoods in households and communities heavily affected by HIV/AIDS are under significant strain. People already impoverished face even more desperate situations as HIV/AIDS depletes already limited labour supplies and assets.

In summarising its research on the impact of HIV/AIDS on land and production in Eastern and Southern Africa, the FAO concludes: "...HIV/AIDS will seriously impact on a range of land issues and livelihood strategies. These issues include different forms of land use, various types of land tenure and land reform projects that are most appropriate, the functioning of land administration systems, the land rights of women and orphans as well of the poor generally, and inheritance practices and norms" (Drimie, 2002: 2). By 2020, the nine most severely hit Sub-Saharan African countries may lose between 13 and 26 percent of their agricultural labour force to HIV/AIDS (Topouzis, 2004; Tumushabe, 2004).

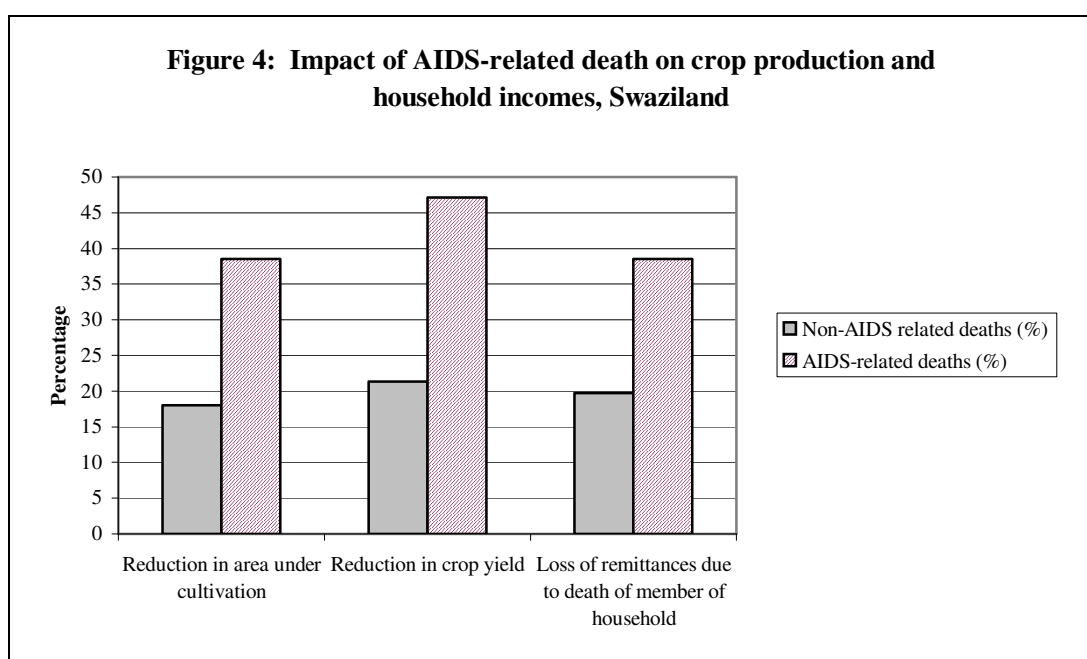
It is important to note that the impacts of HIV/AIDS on rural societies are not uniform. Findings from a rural area of eastern Zimbabwe indicate that "the key differentiating factor between HIV/AIDS-affected households and others within a particular category is that their capacity to cope with any shock is severely compromised by not having additional labour of their own to rely on" (Save the Children UK, 2002: 6). Thus, the size of a household, who is ill/dies, the level of household assets, and the ability to call in additional labour (with cash, in-kind or social arrangements) all play a pivotal role in determining how households will manage an AIDS-related death and the time it takes to adjust to the loss.

HIV/AIDS affects rural livelihoods at several levels. It means a loss of labour for food and income production. People are too weak to work or are caring for family members who are ill. A survey in rural Zambia found that heads of households who were chronically ill reduced the area of land they cultivated by half, resulting in reduced crop production and lower food availability. In rural Zimbabwe, maize output by households that experienced a death due to AIDS declined by nearly half, and in some households more (Kwaramba, 1997). The changes are outlined in **Table 4**. The Government of Swaziland reported a 54-per-cent drop in agricultural production in AIDS-affected households (see **Figure 4**) (Muwanga, 2002: 17). Households in northern Thailand in which a death had occurred due to HIV/AIDS reported reduced consumption of food and other areas of expenditure. Households where a woman had died had larger consumption losses (Janjaroen, 1996).

Table 4: Reduction of output in a household with an AIDS death, Zimbabwe

| Crops | Reduction in output |
|------------|---------------------|
| Maize | 61% |
| Cotton | 49% |
| Vegetables | 37% |
| Cattle | 29% |

Source: Kwaramba, 1997.



Source: Muwanga, 2002: 17.

Lowered production due to loss of household labour often carries over from one year to the next. Some households, especially those already short on household labour, may never recover to previous levels of production. Changes in agricultural production are dependent on which household member dies. The death of a female head-of-household or female spouse results in a decline in cereal and tuber area cultivated, while cash crops such as coffee, tea, and sugarcane are most adversely affected in households incurring the death of a prime-age male head (Yamano and Jayne, 2002).

Even before a person dies of AIDS, illness curtails the work that can be done and the income earned. Case studies in Tanzania and Zambia estimate that households lose around two years of labour by the time of death of an adult. Decline in production and time for off-farm work leave households with a chronically ill member with, on average, reductions of 30 to 35 percent in annual income (Rugalema, 1999; Mutangadura and Webb, 1999).

The costs of HIV/AIDS extend to large commercial agricultural businesses as well. A study in Kenya (Rugalema, 1999: 25-26) at the end of the 1990s found that productivity and profitability were affected by a combination of HIV/AIDS-related costs. These included:

- illness-related absenteeism
- funeral-related absenteeism
- medical expenses
- funeral expenses
- death-related loss of labour
- psychological stress
- loss of skills and experience
- compromised manpower planning.
- a decline in quantity and quality of processed products and
- increased costs of production

Combined, these costs placed added competitive pressures on companies and increased pressures to control workers' wages and benefits.

Illnesses and deaths due to HIV/AIDS—and likely other diseases—often result in households cutting back on or postponing investments in agricultural equipment, livestock or hiring labour. In Benue State, Nigeria "...all households experiencing illness and death of adults told that plans for the expansion of fields and agricultural operations, trades or enterprises and plans to send children to secondary education or to improve housing conditions were postponed or abandoned. Replacement of durables is delayed and there is no money for what people would call 'luxuries', such as a new dress"(Hilhorst, van Liere and de Koning, 2004: 87). Food consumption is likely to decline as either production or income (or both) decrease and medical expenditures increase. In fact, the inability to produce adequate food supplies leave households affected by HIV/AIDS with insufficient food for twice as long as unaffected households (FAO, 2004: 49). Withdrawing children—especially girls—from school or postponing entrance into school is another way that households cope with the costs and caring responsibilities of HIV/AIDS, but at the long-term disadvantage of further schooling and income. At the same time, knowledge of seeds, soils, livestock care, storage and appropriate farm construction techniques are not being passed along to younger generations as experienced farmers—women and men—die.

Farming methods are changing as rural societies seek to cope with the loss of labour. In northern Zambia, many small-scale producers are returning to a traditional form of slash-and-burn land preparation—an agricultural method that both the colonial and post-independence governments sought to ban (FAO, 2004: 36-37). Changes in crop mixes, with a definite trend toward cultivating less labour intensive crops, has been noted in several areas of Sub-Saharan Africa. However, the extent of these changes is not well known.

In some instances, gender roles are changing. Women are learning to care for large livestock and men are learning to cook (Tumushabe, 2005: 4). Changes were also observed in rural Nigerian households in which an adult male was ill from urinary schistosomiasis. Female household members assumed a greater role in some of the heavy land cultivation in order to sustain farm activities. The authors suggest that the re-ordering of labour roles of on-farm work “infuses some elements of inefficiency as novices continue to get increasingly involved in land use activities” (Umeha, Amali and Umeh, 2001: 300, 302). It can be speculated, however, that the re-ordering of gender roles could lead to new income and social opportunities for women.

However, the epidemic illuminates and exacerbates the gender inequalities in rural societies. Women may be infected by their husbands. When he dies, she may lose all of the household belongings, and also lose access to the family land, equipment and livestock. Increases in female-headed households have been noted in many studies (see Topouzis, 1994: para 2.3.1).

Two extreme outcomes of HIV/AIDS on household structure can be noted, with implications for nutritional well-being and longer-term involvement in agriculture. The first is the rising number of child-headed households in which an older sibling assumes responsibility for younger children after the death of the parents. This is occurring in Southern and Eastern Africa, especially. The other trend is the total dissolution of households, which may occur after the death of an adult male household head or of both adult heads. The social cohesion of rural communities that provided a buffer against extreme deprivation and inequalities in most instances is being undermined by the epidemic.

One consequence of the epidemic is that land and agricultural assets may be becoming more concentrated. There are instances of impoverished households renting or even selling land to raise income. What is not known is how that land is being used. If it is being used by households unaffected by HIV/AIDS losses or better able to absorb these losses, then the land is likely being used to expand production of marketable crops. Aggregate production or sales figures for a region or country are unlikely to reflect local differentiation that is reflected in land control and production changes.

We do know that significant changes are occurring in rural communities. Many of these changes will have immediate and long-term implications for farm households and for national agricultural and social policies and programmes. **Table 5** summarises some of the changes that are occurring.

Table 5: Impacts of HIV/AIDS on Farming Communities

| Immediate Impacts | Agriculture-related responses by households | Longer-term consequences for agriculture and related activities |
|---|--|--|
| Loss of labour—due to illness and death and caring | Decreases in area cultivated and changes in crop mix; less attention to care of livestock and soil or water | Potential decreases in overall food production |
| Cutbacks in food availability and consumption | Decreased energy for farm or market tasks | Increased child and adult malnutrition |
| Loss of income and increased medical and funeral expenses | Disinvestment of assets, including sale of livestock and equipment; renting of land; piece work on other farms | Increased socioeconomic inequalities and new or deeper impoverishment for some |
| Increased dependency, with women and older adults assuming greater household responsibilities | Less time spent on farm production or marketing | Growing gender and age inequalities |
| Loss of knowledge and skills essential for agriculture | Traditional transfer of knowledge somehow maintained | Loss of efficiency; greater stress on natural resource base |
| Loss of access to land and equipment/livestock by widows and children | Female and child-headed households become dependent on non-farm employment and/or begging | Deepening impoverishment for affected household members |

Source: Modified from Slater and Wiggins, 2005.

D. How does ill-health affect different sub-sectors of the agricultural economy?

Forests and Woodlands

Chronic and widely prevalent illnesses undermine available labour forces, causing shifts in how labour is used. Households tend to shift to less labour intensive ways to preserve their livelihoods. Research in Southern Africa points to a greater use of forest products by families that are adversely affected by HIV/AIDS. The result is increased deforestation, and greater use and loss of medicinal plants because of increased demand for traditional medicines to treat opportunistic infections, provide palliative care or in hopes of curing HIV/AIDS (Sitoe, et al., 2004; Ternström, nd: 2-3). Food gathered from woodlands supplements what cannot be grown by labour-short households, a situation especially relevant for women-headed households.

Food insecurity, resulting from low soil fertility or too little land, pushes people into woodlands and forests, especially in Southeast Asia and Latin America (Geist and Lambin, 2001: 26). In Brazil, forest clearing is primarily followed by the creation of large cattle estates. The trees and brush cleared from the land is burned during the mid-year dry season and the resulting smoke has been closely associated with increases in respiratory infections across vast sections of Brazil, Bolivia and Paraguay (Gilbert, 1997). In Southeast Asia, deforestation has contributed to increased soil erosion, with implications for soil fertility and land availability for food security.

There are instances, however, where forest clearing has reduced the habitat for disease-bearing insects, with improved health outcomes for humans. An example is the eradication of loiasis, a disease once transmitted by horseflies in West Africa. Deforestation destroyed the breeding habitats of the horseflies, and both the horseflies and disease vanished. In Tanzania, deforestation removed the habitat of blackflies, responsible for transmitting onchocerciasis (river blindness), leading to a healthier environment for humans. On the other hand, however, deforestation has widened the habitat of some insects which carry diseases that effect humans. The movement of people into cleared areas of the Amazonian forests of Latin America is associated with increases in malaria (Taylor, 1997).

Livestock Production

Some of the most common and devastating diseases for humans have crossed over from domesticated livestock. Measles, tuberculosis and influenza made the transition long ago. More recently, Bovine Spongiform Encephalopathy (BSE), Nipah virus, and Severe Acute Respiratory Syndrome (SARS) have affected humans after existing in domesticated animals. Avian influenza has shown that it crosses over from poultry to humans (WHO, 2005: 19). Tuberculosis continues to be spread from cattle

and other livestock to humans. Ebola and perhaps HIV/AIDS are cross-over viruses from killed bush meat. One authority argues that three-quarters of major human disease outbreaks since the 1970s have been zoonotic—passed from animals to humans (Nolen, 2005).

The World Health Organization argues that newer human illnesses acquired from livestock are a result of market changes in the 20th and 21st centuries. It points to the increasing use of intensive production systems, notably for chickens and pigs in Asia. BSE is associated with industrial forms of cattle raising in Europe and North America (WHO, 2005: 19). In order to reduce disease and promote growth in industrially-raised livestock, antibiotics are put into animal feed. Human consumers of these animal products may, in turn, experience lowered resistance to infections or less effect from antibiotics they receive for various ailments. "The use of growth-promoting antibiotics in animal agriculture is thought to be one of the factors driving the increase in antibiotic resistance in humans. In addition, the most prevalent foodborne pathogens [such as *E. coli*] are overwhelmingly associated with animal products, most of which come from factory farms and high-speed processing facilities" (Horrigan, Lawrence and Walker, 2002). To be sure, there is not total agreement on the values and risks of concentrated animal production. Some authorities argue that large-scale livestock operations provide greater safety against disease outbreaks in animals than small-scale, family raising of livestock and small-scale marketing of livestock.

Millions of farmers raise livestock or fish as a part of their livelihoods. Livestock diseases can also put farmers' livelihoods at risk. Contagious bovine pleuropneumonia (CBPP) is one example. CBPP was recently found in cattle in East and Southern Africa, in areas where it had not previously occurred. Cattle movements occasioned by drought and war seem to have brought infected animals into contact with uninfected ones. Reduced vaccinations and low levels of control because of cost constraints further provided opportunities for the disease to spread. The estimated cost to African producers was \$2 billion per year in the late 1990s (Thompson, 2003).

Fisheries

The vulnerability and insecurity of impoverished people or the greed of the wealthy can create conditions where diseases become more prevalent or livelihoods more difficult to sustain. For example, over-fishing in Lake Malawi lead to a dramatic increase in lakeshore snails, that had previously been eaten by the fish. Following this ecological imbalance, there was a rapid increase in schistosomiasis among fisherfolk and other lakeside inhabitants (Patz, et al., 2004). Wars in Congo and the closure of copper mines in Zambia in the 1990s and early 21st century pushed people into large fishing communities around Lake Mweru, in Zambia. Large, spontaneous settlements sprang up. Just as quickly, the lake was overfished, creating quick profits for some, but leaving most settlers with little more than day-to-day incomes. The expectation of quick money combined with the social conditions of the temporary settlements

provided a means for the rapid spread of HIV/AIDS. Studies in the Lake Mweru fishing settlements found a quarter of adults to be infected with the virus. Some people will have been infected before they arrived, but many others were infected while living in the area (Vidal, 2006).

It is common that many fisherfolk live in temporary settlements that lack basic services. Thus, fisherfolk, their families and people involved in the processing and marketing of fish are exposed to a wide range of waterborne and sanitation-related diseases, including onchocerciasis, typhoid, and diarrhoeal disease. Malaria and lymphatic filariasis—spread by mosquitoes that thrive in areas of poor environmental sanitation—are common. Each of these diseases affects the productivity and income of small-scale fisherfolk.

In South and Southeast Asia and, to a lesser extent, in Central America and Mexico, shrimp farming offered small-scale producers a way to improve their livelihoods—at least for a time. For consumers, mostly in Europe and North America, a food once considered a luxury became more affordable and readily available. For a time, demand and supply worked well for most people. In the mid-1990s, small-scale producers in coastal areas of Bangladesh established about 100,000 ha of ponds to raise shrimp. Shrimp farming was more profitable than rice growing. One authority noted: “Whereas previously, many small-scale farmers had to starve through half of the year, they now have plenty of money to buy food and provisions. Even the landless farmers in the shrimp farming areas have bank accounts and deposit money every month” (Begum and Alam, 2002). In 1995, a disease that killed or affected the growth of shrimp reached the Bangladesh ponds from other areas of Southeast Asia. The disease was not easily controlled and, in 1997, the European Union banned imports of shrimp from Bangladesh. The quick profits—in direct shrimp farming or leasing of land for ponds—vanished for many small-scale producers and farm workers.

Since the late 1990s, shrimp farming has continued, but with a greater concentration of holdings by landowners or leaseholders with sufficient capital, pushing out many of the small-scale operators who cannot afford the inputs. Elsewhere in the region, half or more of shrimp ponds have been abandoned, the returns being too short-lived for most small farmers (this paragraph is based largely on Lawrence, 2003). Further, many farmers and governments have recognised that shrimp farming has other negative effects on livelihoods. One is the destruction of mangrove forests along the coasts. The forests support their own wealth of fish and other wildlife and protect nearby fishery areas. “When the mangroves are destroyed, local fishermen find that their catches of other fish collapse” (Lawrence, 2003). Eventual salination of the fish ponds makes it difficult to revert to rice production, leaving some farmers without the means to produce adequate food or incomes.

Case Study: Fishing communities and ill-health

Lake Mweru is tucked up against DRC, in northern Zambia. The lake once offered a rich fishing environment that dates to the 1920s, although subsistence fishing pre-dates the commercial use of the lake. However, poor roads kept the area relatively isolated from markets on Zambia's Copperbelt and the Congo's Katanga mines. In 1955, some 2,000 people fished the lake, with a catch of between 6,000 and 9,000 tonnes a year. Following Zambia's independence in 1964, demand for fish grew. Permanent fishing settlements grew up on the lake's shores. In addition, new immigrants created temporary fishing camps around the lake. In 1986, about 7,700 fishermen operated 6,600 boats on the lake. Government efforts to regulate fishing seasons and off-take were not very effective.

Economic reforms undertaken in the late 1970s and 1980s made the lake's fish all the more valuable. The reforms pushed many people into difficult economic circumstances, made small-scale farming more precarious, and caused substantial job loss. Closure of several mining operations in the late 1990s added to the unemployment woes of thousands of people. Lake Mweru's fish offered a chance at work and income. By 1992, almost 10,000 fishermen and their 16,000 employees worked the lake: by 2000, the estimated fishing population was 30,000. As many as ten times that number of people are involved in processing, marketing and providing services to the fishermen.

Given the intense use of the lake, fish yields declined. As of the late 1980s, most fishermen noticed a decline in fish levels. The competition for fish led people to use smaller-mesh nets, including mosquito bed nets in some cases. By the 1990s, daily yields were but a fraction of what they had been ten to twenty years earlier.

Both women and men are involved in the fishing industry. The men do almost all of the fishing, although some wealthy women also own boats. Women account for at least half of the people involved in drying and processing the daily catch and are heavily involved in trading the processed fish.

Living conditions in the fishing settlements, especially the temporary settlements, are often difficult. Sanitation is limited and health facilities are scattered and typically without adequate staff or commodities. Drinking water is usually untreated. In 2003, an outbreak of cholera occurred in one of the districts bordering Lake Mweru. A report noted that "health authorities have begun to disperse all people who have settled in the fishing camps along Lake Mweru in order to limit the transmission of the disease" (WHO, 2003b). In doing so, however, the authorities also dispersed population groups with high rates of HIV/AIDS. In addition, the war in the Democratic Republic of Congo contributed to extensive population movements into the Mweru area, adding to population pressures and the risk of HIV/AIDS transmission.

A report published in early 2006 cited lakeside residents as saying that “these days it is easier to catch HIV/AIDS on Lake Mweru than fish” (Vidal, 2006). An estimated 25 percent of adults around the lake are HIV positive. The links between Lake Mweru’s fishing industry and HIV/AIDS are associated with the risks in the socioeconomic environment. Many young men moved into the area in search of work, and income from fishing provided some of the men with the means to acquire sexual partners. The depletion of fish, however, made it more difficult for both men and women to earn a living, which increased the likelihood that sex would become a commodity. Finally, health facilities, including intensive HIV/AIDS services, remain generally lacking.

Impact of Ill-health on Agricultural Institutions

Ill-health and death make it difficult for the staff of some agricultural institutions to fulfil their mandates of planning, advising and providing other services to farm, forest and fishing communities. Many countries in Southern and Eastern Africa are finding it difficult to maintain an effective cadre of research, extension and administrative staff. Ill-health and death are a part of the reasons offered, along with retirements and movement of staff to other jobs. Public sector recruitment in Uganda, Tanzania and Malawi faced difficulties in maintaining staff levels in the latter 1990s, in part because of the growing number of deaths and early retirements due to HIV/AIDS (Rau, 2004: 23). Many vacancies caused by HIV/AIDS deaths and retirements and other reasons were not filled. As of the late 1990s, evidence from Kenya indicates that over half of the deaths of Ministry of Agriculture staff were AIDS-related. At roughly the same time, it was estimated that about 16 percent of the staff in Malawi’s Ministry of Agriculture and Irrigation were living with HIV/AIDS, a situation where prolonged absences and staff deaths could be anticipated in future years (Rau, 2004: 26; citing GTZ, 1999; Bota, Malindi and Nyekanyeka, 1998). Also in Malawi, “fisheries field staff [were] absent to attend funerals half or three quarters of the working days per month” (Hemrich, 1997).*

The ability to serve the needs of rural producers is being undermined by HIV/AIDS. Few governments have created policies or prevention and

* The health sector itself faces major staffing shortfalls in a number of countries. This will effect access and quality of care available to employees in other public sectors as well as the general public.

treatment programmes specifically aimed at minimising risks for their employees. Even fewer government ministries have planned for potential losses, costs and replacement needs arising from the epidemic (Topouzis, 2003).

There have been suggestions that ministry of agriculture extension staff should add HIV/AIDS prevention to their duties. Pilot training programmes have been held. However, the existing workload and responsibilities of most extension staff and their supervisors make it unreasonable for them to add new duties. The counter argument is that extension staff should strive to fulfil their mandates rather than take on responsibilities totally outside of their areas of expertise. Agriculture extension staff can respond to the HIV/AIDS epidemic most effectively by monitoring changes in land use, labour inputs, and production among their clients. These are activities extension agents are already trained to do. The information they provide can be used to identify patterns that will contribute to the design of appropriate interventions to deal with the changes, such as making available labour-saving services or technologies to households and communities adversely affected by illness and death.

Markets, whether regulated or informal, and marketing provide an interface between agriculture and health. For example, markets may be local trade centres where small-scale producers and consumers regularly meet. In Malawi, local markets are recognised as sites of social and sexual contacts (Ngwira, Bota and Loevinsohn, 2001: 12). Or, at an international level, diseases that affect either humans or animals often pass through the marketing chain.

It is becoming increasingly evident that many urban-based households also maintain frequent links with rural communities. Much of the connection is around agriculture. On the one hand, as urban poverty has spread, a greater number of families have used their ties with rural communities to cultivate basic foodstuffs for themselves and for the market, as a supplement to their urban incomes (Owuor, 2003). On the other hand, wealthier urban dwellers have purchased land and hired managers and workers to run their farms. These "telephone farmers", as they are called in Kenya, are a little-studied group within rural societies.

4: Challenges and Opportunities

This chapter will:

- Outline the gaps that exist in the literature on the linkages between agriculture and health.
- Suggest analytical tools for better understanding the relationships that exist between agriculture and health.
- Set out recommendations for further research and analysis.

A. Knowledge Gaps

Major advances have been made in disease control that directly or indirectly affect people's health and livelihoods. Rinderpest is one example, protecting cattle-holding communities, mostly in Africa, but also in countries that may import cattle from Africa. Major strides have been made in controlling guinea worm disease and river blindness in Africa, with implications for greater agricultural activities. Nutritional improvements have been widespread, although uneven, across Asia over the past three decades. These achievements have been well documented in the technical literature. However, translating specific technical outcomes into wider programme and policy initiatives remains a gap in the literature. It is not well understood what factors—and how they were linked—contributed (or could contribute in the future) to the formulation and implementation of policies and programmes to improve outcomes to both human health and agricultural activities.

One of the biggest gaps in the literature are fuller syntheses of technical literature that describe linkages between agriculture and health and offer overviews and guidelines that are clear and accessible to policy makers, advocates and programme planners. The bibliography in this paper indicates the richness of the literature (and more is available), and potential for creating further overview analyses.

We do not know nearly enough about the labour and economic impacts on both rural households and national programmes of malaria, TB and other diseases with resulting implications for agriculture. Little attention has been given to how malaria and other diseases affect fishing communities, natural resource utilisation, or crop production on estates and commercial smallholder operations. HIV/AIDS has received good attention in terms of impacts on crop production and nutritional status of infected individuals and affected families. However, the evidence is scattered and has not adequately found its way into effective policy and programmatic responses to protect rural societies and food security.

More attention is needed, as part of our evolving knowledge, of how diseases and ill-health interact. Some initial micro-level indicators exist (such as changes in household income), and these can be further expanded. Moving beyond household level impacts, we know very little about how communities, local institutions and governmental authorities deal with the impacts of diseases, particularly for the agriculture sector.

This meso level of analysis remains a critical area for further study, especially given the rhetorical emphasis on engaging communities and local organisations in development planning. Macro-level analysis is only slightly better served. Some studies have reviewed the likely impacts of HIV/AIDS on Gross National Product. However, few studies have examined the effects of ill-health on national revenues and budgets.

Little has been reported on the changes in agricultural activities or production or gender roles due, in part, to ill-health or improvements in health. There is too little information in the published literature on why changes have occurred and who has benefited or not benefited from these changes. The literature is not good at describing the dynamics of agricultural change in relationship to health and vice versa. We do know that some households affected by HIV/AIDS leave land fallow for lack of labour or rent or sell land to pay medical expenses and survive. In this context, a large gap exists in knowing who benefits from the ill-health of individuals and affected families.* In order to better understand the dynamics of agricultural change, it remains to be known who is taking up and using land that is leased, rented or sold by households affected by HIV/AIDS.

There is a pressing need to more fully understand how agricultural institutions are affected by diseases and the ill-health of staff, including the effects of long absences due to illness or death on clients and the internal functioning of agencies. A handful of studies have been done, but more are needed in order to effectively plan. Such labour analyses are critical for government budgeting and training of new cadre of staff and the re-training of existing staff.

The underlying factors that influence agricultural production and health outcomes—such as poverty, nutritional status, situation of women and wider gender relations—have received increasing attention in recent years. The HIV/AIDS pandemic has placed gender relations in the centre of many analyses. That has occurred far less frequently in the case of malaria, TB and other illnesses. A basic gap in the literature is an understanding of what changes in gender roles, if any, in agricultural activities have occurred and are occurring because of ill-health and caregiving within households.

* Logic suggests that some service providers have benefited from the ill-health of others (e.g., doctors and other health providers, coffin makers and funeral homes, and international consultants and experts).

Poverty is frequently noted as a factor related to health. However, the term has become so commonplace that it lacks clarity and relevance as an explanatory factor. This paper has preferred the term “impoverishment”, insofar as it conveys more of the analytical and dynamic nature of factors that push or keep people in conditions of poverty or assist people to move out of poverty. If, as many studies argue, poverty is related to ill-health, we remain to be adequately informed about why agriculture—as one of the major economic activities of people around the world—has not contributed more to improvements in health conditions and improved livelihoods. What has held back the ability of hundreds of millions of people to earn decent livings from crop and animal production and at the same time improve their nutritional status and reduce risks to diseases?

There have been significant changes in levels and degrees of poverty in Sub-Saharan Africa and much of Asia since the 1970s. A number of countries saw agricultural infrastructure and support services change—some improved, some grew notably worse. These changes influenced rural land use, crop production, incomes and health. More needs to be known about the interrelationships between rural and peri-urban services, poverty alleviation and health as they exist in the 21st century. In particular, what combination of policy, programmatic and socioeconomic factors in agriculture (or rural development, or health, or education) have led to improvements in the health status of rural household members?

Where notable improvements in health and agriculture have occurred, as in Bangladesh, comparative literature is weak in explaining the factors that contributed to these outcomes. There is a need for tangible examples of processes, policies and programmes—with positive and negative outcomes—that analyse initiatives that have built links between agriculture and health. Such analyses will move beyond the bland “best practices” examples that are increasingly common. Multi-factor analyses can look at either small or large initiatives, but they will have to look at processes and outcomes that stretch over a realistic timeframe of several years of an initiative’s lifetime.

B. Methodological Approaches and Analytical Tools

One of the most comprehensive approaches to understanding and developing linkages between agriculture and health is “livelihoods.” Several UN and bilateral agencies have adopted livelihoods approaches or strategies to their analysis and programming. Livelihoods refers to those factors that can enhance the lives of individuals, families and communities, and which are affected by national policies, business decisions, or market forces, as well as by household well-being and individual capabilities and initiatives.

A livelihoods approach that incorporates agriculture, rural welfare and health outcomes includes the following elements:

Capabilities include acquired skills, health, self-confidence and self-esteem, and decision-making ability. *Capabilities*

exist within individuals and groups and are fully realised when policies, social services, food availability and access, and other factors are widely available.

Resources or Assets include physical assets (such as housing, land and infrastructure), social assets (such as social ties, networks, and trusting relationships), and, when appropriate, financial assets (such as loans and savings).

Activities to Expand Opportunities to generate income or invest in assets. Activities may include self-employment, wage employment, home-based work, domestic production, and maintaining social and community relations that build social capital. The lack of opportunity to fulfil one's aspirations leads to loss of hope and disillusionment.

In addition to FAO's own analytical tools, a variety of other analytical tools exist to more fully understand linkages between agriculture and health. Some that can be useful in more fully investigating multi-sectoral interactions and outcomes have been developed by the International Food Policy Research Institute (IFPRI). The Futures Group has developed a computer model for assessing the impact of HIV/AIDS on societies. The model can be adapted for use with other health conditions and with a focus on agriculture.

These tools suggest that opportunities exist for greater collaboration at local, national and international levels on agriculture and health-related issues. Some of the best analytical approaches exist within individual countries. Examples include university-based research centres, such as the Health Economics and HIV/AIDS Research Division at the University of Natal in South Africa and the Institute for Population and Social Research at Mahidol University in Thailand. The Association of Agricultural Medicine and Rural Health has national branches that focus on linkages (http://www.iaamrh.org/ic_profile.html).

Among international NGOs working on health and agriculture issues are CARE and Save the Children UK. CARE has developed and used an analytical framework for assessing the multiple factors related to livelihoods, and has developed programme responses based on this model.

Working on links between malaria and agriculture are the System-wide Initiative on Malaria and Agriculture (SIMA) and the International Water Management Institute. Future Harvest (www.futureharvest.org) is an initiative of 15 food and environmental research centres in Africa, Asia and Latin America, which collaborate on research related to rural livelihoods.

A WHO-UNEP partnership, Health and Environment Linkages Initiative, is one effort to more effectively build holistic approaches to linkage factors.

The website includes tools, examples, and case studies for integrating programmes

(<http://www.who.int/heli/economics/valmethods/en/index2.html>).

C. Future Directions

The following recommendations for future directions for strengthening our understanding of the links between agriculture and health cover a spectrum of issues. The list is meant to be suggestive, with no expectation that all of the recommendations will be taken up at once. The list does indicate the extent of opportunities that exist for understanding the linkages between agriculture and health more completely.

Although often stated, it bears reminding that surveys of rural societies must differentiate by gender, age and socioeconomic indicators. Most social science research considers these factors; however, it is important to recognise at the beginning that both agriculture and health are shaped by gender and class differentials.

Among the future directions are:

- The types of analyses that have been conducted on HIV/AIDS, rural livelihoods and agriculture need to be applied to other health conditions. A number of widespread diseases have not received sufficient attention outside of specialised studies. These include schistosomiasis, trypanosomiasis and dengue fever. Researchers have given far more attention to emerging diseases and their potential public health threats than to these endemic diseases that continue to plague the health and productivity of (mostly) lower income groups of people.
- FAO has been a leader in documenting the impacts of HIV/AIDS on agricultural communities. This research must be continued, including using longitudinal studies to improve the knowledge base of changes in farming, cattle-holding and fishing communities.
- More research is needed on linkages between productivity of livestock raising and health of small-scale producers.
- The linkages between natural resources, including managed forests and water systems, and health of users and managers of those resources deserve far more attention than has been the case.
- Households and communities experience trade-offs as they cope with ill-health. A deeper understanding is needed of what is lost and what is gained as a result of these decisions, and also of how and when these decisions are made. Such research should describe the productive activities within households that are being displaced or done less thoroughly because of illness or care for ill and affected people.

- National policy makers need evidence of what households and communities coping with ill-health means, in aggregate terms, for human well-being, as well as national-level productivity, wealth, and the functioning of public and private institutions that serve agriculture.
- Establish several baseline studies to monitor changes in agriculture and rural societies in India or China in order to prepare for a fuller understanding of the degree and form of changes occasioned as HIV/AIDS is increasingly felt in these countries.
- Engage ministries of agriculture, forestry, natural resources and fisheries in conducting labour force surveys, including how staff are affected by ill-health, in order to better understand current trends and future needs of staff and for managing budgets. The surveys should build in key indicators for monitoring changes over specific periods of time.
- Agriculture, forestry, fishery and natural resources staff training programmes should include specific methods to monitor labour use, production, land management and other changes as a way to better understand the impacts of ill-health on agriculture and rural societies.
- A fuller understanding of community support mechanisms for households in distress because of illness or other shocks remain to be adequately studied in the context of rural livelihoods.

D. The Necessity of a Multi-disciplinary Approach

All of these opportunities for addressing the links between agriculture and health can achieve the greatest benefits by utilising multi-disciplinary teams or multi-sectoral approaches for study and analysis. Despite the rhetoric given to multi-disciplinary studies, bureaucratic realities concerning budgets, lines of responsibility and opportunities for staff advancement are often obstacles to organising and coordinating such initiatives. There are no ready answers for overcoming these obstacles. For multi-disciplinary teams to work well, they must have supportive management, well-defined tasks and established timeframes, flexibility to pursue promising leads, and a realistic operating budget. Internally, team members must be able to communicate with one another, which requires time in order to feel comfortable with a common vocabulary and work style. A decision maker/manager is critical to keep tasks focused and within budget and agreed timeframes. The manager should also be able to understand the various parts of the project and recognise linkages and patterns as they emerge.

Conclusion

The spread of the H5N1 virus is closely monitored across the world. Daily updates of affected livestock in various parts of the world are readily available. Little is reported, however, about how the disease is affecting people whose lives are based on agriculture. One study estimates that in Vietnam alone the disease has already affected 36,000 people living on the edge of poverty, and 88,000 who were already poor (FAO, 2005a).

The linkages between agriculture and health outlined in this paper illustrate the multi-dimensional impacts that changes in one sector can have on other sectors. There remains a pressing need to improve agricultural productivity and to assure that farmers are able to earn a living from their labours. Across much of Africa and parts of Asia, rural livelihoods have suffered from policy choices that have favoured investment in other sectors. In turn, the health of rural people has shown little improvement since the 1980s. For many people, health conditions have worsened.

The linkages between food security and nutritional health are clearly illustrated as the HIV/AIDS epidemic deepens in southern Africa. The poverty experienced by the majority of rural people in the region becomes even more desperate if a family member becomes too ill to work or if another shock hits. Forest and fish resources face increasingly destabilising pressures as people exploit natural resources to make a living that is otherwise unavailable from crop production or urban employment.

This paper has sought to encourage discussion about the need for looking at agriculture and health as interlinked sectors. At the centre of this discussion has been the situation of the rural poor, especially the opportunities and constraints they face in expanding their livelihood options. The many examples in the paper of the inter-relationships between agriculture and health provide a foundation for expanding our understanding of the role of each sector. Likewise, the examples illuminate why a single sector approach is too narrow, lacking in innovation and insights, to adequately address the multiple livelihood needs of rural (and urban) people.

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The present paper is the first in the HIV/AIDS Programme Working Paper Series and seeks to establish the linkages between agriculture (in the broader sense) and health, using both an extensive review of the existing literature and quantitative data from organizations such as the World Health Organization (WHO). It argues for a better understanding of the complex cause and effect relationship between health and agriculture. It highlights the linkages as evidence from various research studies, exposes the gaps in knowledge and policy, and advocates for further investment in research and policy interventions that will address these linkages. In terms of policy, the paper argues for a strong, multi-sectoral approach to interventions that places priority on the inter-relationships between agriculture and health, so to adequately address the multiple livelihood needs of the rural poor.

Further Information

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