Consultative Group on International Agricultural Research (CGIAR)

Document No: AGM/01/15
Distribution: General
Date : October 15, 2001

Annual General Meeting 2001
October 30 - 31
Washington DC, USA

STAKEHOLDER MEETING

Reducing Poverty by Removing Market Barriers Caused by Animal Diseases

Agenda Item: **6d – Animal Diseases, Food Safety and Trade**

This item is for: Information [ ] Discussion [X] Decision [ ]

Proposed Action: None

Background: This paper describes a challenge program proposal to "elucidate the complicated interactions among food safety concerns, animal disease control measures, international trade in livestock, fish, and foods of animal origin, and the impacts on poverty alleviation." This will be presented and discussed in Parallel Session II.

Comments:

Reducing Poverty by Removing Market Barriers
Caused by Animal Diseases

(Animal Diseases, Market Access, Food Safety and Poverty Reduction)

A Proposal for a CGIAR Challenge Program

October 25, 2001

TABLE OF CONTENTS

SUMMARY

The objective of the proposed challenge program is to improve the incomes and well-being of the poor and small-scale producers by carrying out public good research to reduce the negative effects of animal diseases[1] on trade, food security, food safety and public health.

This objective fills a critical gap in the current international research agenda. It is meeting strong demand from a majority of developing countries for more support to meet sanitary and phyto-sanitary (SPS) requirements, as shown by their submissions to World Trade Organization (WTO). It also matches one of the key commitments of the World Food Summit. It is consistent with the Consultative Group on International Agricultural Research (CGIAR) mandate to contribute to food security and poverty eradication in developing countries through research, partnerships, capacity building, and policy support.

Significant opportunities for impact lie in a better understanding of the epidemiology and economic and social impact of a wide range of animal diseases under different policy scenarios for world production and trade; the development of improved diagnostic tools to aid this process, and the better delivery of available or improved technologies. New technology and relevant policy analysis could change the way certain trans-boundary diseases are controlled (e.g. vaccination versus stamping out). This could affect greatly the ability of developing countries to control key diseases in a way that does not cut them out of the world markets. Moreover, the program would reduce the risk of transmission of animal diseases to humans (zoonosis), and improve overall food safety for better human health.

The present proposal was prepared by a multi-agency task force that includes representatives of two CGIAR institutes, International Livestock Research Institute (ILRI) and International Food Policy Research Institute (IFPRI), as well as Office International des Epizooties (OIE), Food and Agriculture Organization (FAO) and the World Bank. A third CGIAR center, International Center for Living Aquatic Research Management (ICLARM), joined at a later stage. It benefits from the findings of a recent study (*Investing in animal health research to alleviate poverty*) commissioned to ILRI by the Department for International Development (DFID) of the United Kingdom (UK). As part of the study, consultative workshops were held in Mali, Thailand, India and Kenya. It also relies on a number of informal consultations during the CGIAR Medium Term Meeting (MTM) in Durban and during the Annual Conference of OIE. It has been circulated to a large number of potential stakeholders and discussed during an open meeting at FAO on October 24; the meeting helped focus the scope of the program. it was also an opportunity for the World Health Organization (WHO) and International Fund for Agricultural Development (IFAD) to express their support and interest in participating in the follow-up.

[1] For the purposes of this paper, 'animal diseases' means diseases of livestock, including poultry, and fish.

The main international partners for this program will be three CGIAR centers (ILRI/IFPRI/ICLARM), FAO and OIE. The challenge program will use the existing national agriculture research systems (NARS) partners and networks. Additional NARS partners will be identified after consultation during the proposal development phase. Partnership with centers of excellence will be established as and when required. Because of the food safety and human health components of the program there is a unique opportunity to establish alliance between veterinary and medical institutions.

The needs addressed by the proposal are very large, but the design is highly modular. It is proposed to allocate funding to the program through two different mechanisms, complementing each other in terms of research activities, and each receiving half of the available funding:

- Direct funding arrangements dealing with a small number of strategic priorities areas (3 to 5) to be specified during the formulation of the full proposal
- A Competitive Research Grant Program for medium-size research sub-projects

It is estimated that each strategic area would cost $2-3 million per year, so that the costs of all directly funded activities would be $6-15 million per year. As it is proposed that an equal amount be allocated to the competitive grants mechanism, total annual requirements would be $12-30 million. The program would be formulated for a period of six years.

It is expected that 50% of total funding requirements would to be mobilized by the program from additional resources coming from outside the CGIAR. Several funding agencies (e.g. European Union or EU, Wellcome Trust) have identified the topics of animal diseases and food safety as key areas of interest. The potential for leveraging partnerships with the private industry is also being explored.

Allocation of financial resources to the different partners will be specified in the business plan, and will vary depending on the strategic priority areas. For the competitive grants mechanism, it is expected that 30 to 50% of funding will go to developing country partners.

The Program will be implemented by a consortium of core institutions under a formal joint venture agreement. The membership to the consortium will be negotiated as part of the development of the full proposal (see the tentative list above). The agreement will specify the member responsible to legally represent the consortium and handle legal and administrative matters, and in particular hire and manage the Program Coordinator that would be responsible for day to day handling of program management on behalf of the core parties. A Steering Committee will be responsible for the selection of the Program Coordinator and the supervision of the implementation of the joint venture agreement. The Steering Committee will consist of representatives of the core parties and of end users, institutional sponsors and other stakeholders. Specific proposals will be detailed as part of program formulation.

I. INTRODUCTION: PROBLEM, PURPOSE, AND ORIGINS OF THE PROPOSED CHALLENGE PROGRAM

The outbreaks of "Mad Cow Disease" (bovine spongiform encephalopathy or BSE) and foot-and-mouth disease (FMD) in Europe have recently focused public attention on the problems of assuring food safety and animal health in a rapidly globalizing world. Many people were surprised to learn how many perishable foods of animal origin that they consume actually come from or are fed on animal-origin products imported from the other side of the world. Producers in the North remain anxious to protect their stock from re-introduction of potent animal diseases that had previously been eradicated in their countries through very costly measures. Policymakers in developing countries, on the other hand, are acutely aware of the potential dangers to their burgeoning exports arising from the wholesale imposition of health restrictions on trade under the Agreement Sanitary and Phyto-Sanitary Measures of the Uruguay Round (SPS). They are clearly anxious to expand such exports to allow their countries to benefit from the on-going rapid expansion of world trade in animal products.

The problem is greatly complicated by the fact that three-quarters of the world's absolutely poor people live in rural areas and roughly two-thirds of them keep livestock. In relative terms, livestock and fish are more important to the incomes of the absolutely poor in the world than to the income any other group. Income from milk, meat, eggs and fish is critical to food security of the poor in most of the world. As livestock and fisheries rapidly transit from multi-purpose local activities to becoming global food activities, there is a reasonable concern as to whether small-scale producers in developing countries can continue to play a role in livestock and fisheries production. Animal disease and food safety measures generally need to be imposed broadly on all producers in a country in order to be effective. The impact on poorer segments in developing countries will depend to a great extent on how animal disease and food safety concerns are handled for exportable products. Different strategies will have very different outcomes for the poor and for all small-scale producers in developing countries attempting to find paths for sustainable intensification of their agricultural enterprise.

Thus in a increasingly globalized world acutely concerned about growing poverty, there is a tremendous need for targeted multi-disciplinary research to elucidate the complicated interactions among food safety concerns, animal disease control measures, international trade in livestock, fish, and foods of animal origin, and the impacts on poverty alleviation. This realization is currently insufficiently integrated into the mechanisms for funding policy-relevant and pro-poor research on poverty, food safety, animal product trade or animal disease control taken in isolation.

A new coordinated research activity is therefore needed to conduct multidisciplinary research on options for dealing with the new challenges to poverty alleviation and trade posed by the need to insure food safety and control animal diseases under globalization. Finding better ways to improve animal disease control and safety of foods of animal origin is an important component, but the underlying rationale of the program is to assess how these functions can best be accomplished in order to allow the potent motor of

growing world trade in foods of animal origin to contribute positively to global poverty alleviation.

To address these issues, a new program was proposed at the CGIAR mid-term meeting in Durban, May 21-25, 2001, as part of a series of potential new research programs in partnership with non-CGIAR organizations, called "Challenge Programs (CPs)", that would focus on global public goods.

In early 2001, as part of a study entitled 'Investing in animal health research to alleviate poverty' (Perry *et al*., 2001) commissioned to ILRI by the Department for Livestock Development (DFID), ILRI held several stakeholder consultations in Sub-Saharan Africa, and Asia with participants drawn from departments of veterinary services, non-governmental organizations (NGOs), research institutes, universities, animal health service development projects, and international organizations and farmers organizations. These consultations aimed to identify animal disease issues related poverty. This work was complemented by another study commissioned by DFID and carried out by ILRI (Thornton *et al.,* 2001) to map where significant populations of poor livestock keepers are and assess how assess how these populations are likely to change in the coming decades; enabling a more accurate analysis of the priority livestock diseases impacting the poor. Consultations on food safety and trade were discussed in Paris, France, on June 6, during an informal consultation on food safety (The meeting was a follow up to a similar consultation that was hosted by FAO on September 7, 2000. The meeting was attended by representatives of OIE, FAO, WHO, WTO, France, The Netherlands, New Zealand, United States Agency for International Development (USAID), GTZ, ILRI, Nestle and the World Bank). All those informal consultations led to the decision to develop an initial proposal (concept paper) for a CP covering the interactions among animal diseases, food safety and trade, and to proceed in two steps: (i) the present paper, prepared by a multi-agency task force that includes representatives of two CGIAR institutes, ILRI and IFPRI, as well as OIE, FAO and the World Bank, will be circulated to a list of 30 to 40 potential stakeholders, most of which were already contacted informally in Durban or Paris; and (ii) comments received were analyzed and incorporated, discussed at an open meeting held at FAO, Rome on October 24. This draft concept represents the consensus from this meeting. If the project concept gets endorsed by the CGIAR, then a stakeholders' workshop will be organized in order to agree on the follow-up process to develop the full proposal (see Section X1 below).

II. GLOBAL AND ESCALATING NATURE OF THE PROBLEM

A number of rapid structural changes are occurring in the way people produce, trade, and consume foods of animal origin under globalization: soaring demand in developing country; rapid concentration of global processing and marketing; major shifts in the size and direction of international trade flows; the rapid rise in incidence of animal diseases that threaten human health and livelihoods, and the shift of protection of national livestock and aquaculture sectors from outright import/export bans, tariffs and quotas to non-tariff barriers, many of them related to health concerns.

The rapid rise in the production, consumption and trade of animal-origin food products in developing countries

Food products of animal origin have soared in production and consumption in developing countries over the past quarter-century, in particular poultry, pork, milk and fish. From the early 1980's to the mid 1990's, the consumption of meat and milk grew on average by 5.4 and 3.1 percent per annum, respectively. Meat and milk consumption is projected to continue to grow at 2.9 and 2.7 percent per annum respectively from the late 1990's to 2020 (Delgado *et al.* 2001). World trade in livestock, milk, fish and associated products accounted for one-quarter of global trade in all food and agricultural products (including all fish) in the 1995-99 period (FAOStat). Described as 'the livestock revolution', this demand-led increase is driven by population increase (8 billion people by 2020), urbanisation, increased income, high income elasticity for meat, milk, eggs in low income groups and a move away from cereal-based diets. Worldwide expected production increase is 60 % for pig, 80 % for poultry, 50 % for beef by 2020, and developing countries will account for two-thirds of global meat consumption and more than half of global milk.

The rapid concentration of global processing and *marketing*

At the same time as soaring growth in demand, wholesale and retail marketing chains for food of animal origin are rapidly becoming more concentrated and more global, linking food businesses across sectors, countries, and across the North/South divide. Increasing concentration is manifested in the growth of very large production and marketing units in the North, and increasingly large units in the South near major cities. In particular, global markets for high-value food products of animal origin have become increasingly concentrated and vertically coordinated in recent years. A spate of mergers of multinational companies has reduced the number of global market actors, and the coordination of procurement, processing, and distribution of products within the same multinational firms has changed the environment within which would-be exporters from developing countries need to operate.

Both traditional multinational processing firms and the increasingly active multinational supermarket chains are directly procuring produce from developing countries. Similar trends of concentration and vertical integration can be observed among larger high value food companies in developing countries. Export transactions involving high value food from developing countries are increasingly under forward contracts with large corporations and are increasingly subject to stringent food safety, quality, quantity and timeliness of delivery specifications. Effectively participating in the growing global markets for high value food for developing country producers requires coming to terms with the requirements for such participation. These include access to specialized information, technology, professional knowledge, assets, institutions, infrastructure, and liquidity.

Important shifts in world trade patterns for foods of animal origin

Net exports of these items to developed countries have also grown for all high-value items. In the case of fish and poultry, this expansion of trade has rapidly outpaced even

the high rate of growth of domestic production, so that the share of trade has grown relative to production, suggesting increasingly globalized markets for these items in relative as well an absolute sense. Fish has clearly become a major net export of developing countries to the developed countries in recent years, reversing the opposite pattern observed twenty years ago and longer. Aquaculture has been cited as the fastest growing agricultural industry with growth rates in the 1990s variously reported between 18.3% (1994/1995) and 6.5 % (1998/1999 estimated). Lower income developing countries play an active part in fish trade and, at present, account for almost 20% of exports. Of the top 12 producer countries for marine and inland capture fisheries, seven are developing countries Developing countries as a whole supply nearly 50% of total fish exports in value terms. Net income to developing countries from trade in fish and fish products in the last decade increased from US$3 billion to US$ 18 billion. Developed countries account for over 80% of total imports by value, with the European Union being approximately 39%. Of particular significance to disease management related to trade of fish and fish products utilized for human consumption is that frozen products form the main items traded with increasing growth in the live, fresh and chilled markets. The aggregate value of net fisheries exports from developing to developed countries now exceeds in some years the value of net exports of the traditional beverage crops, bananas and sugar combined. Poultry is also increasingly being exported from South to North. Milk is increasingly being imported by developing countries, and for all products trade is developing among countries of the South.

Unlike fisheries, international trade in livestock products continues to be dominated by the industrialized countries, which represent about 80% of world exports of meat. However, the share of developing countries is likely to grow. Among developing regions, Latin America and the Caribbean is the largest meat exporter with about 7% of the world total. An important shift in world meat trade has been the transformation of the European Union from a net importer of about 1 to 1.5 million metric tons (MT) of meat products until the beginning of the 1980s to a net exporter of about 2 million MT in the second part of the 1990s, mostly as a consequence of the Common Agricultural Policy. In bovine meat alone the shift has been from a net import position of some 500,000 MT during the 1970s, to net exports of about the same amount during the 1990s. Lately the US has also become an important net exporter of meat products. Current WTO agricultural negotiations will also affect livestock production and trade patterns, with possibly important consequences for developing countries in their export and domestic markets.

The increasing importance of transmissible cross-boundary animal diseases

Recent epidemics of foot-and-mouth disease (FMD) and classical swine fever (CSF) in Europe have demonstrated the enormous losses that can accrue from the re-introduction of such trans-boundary animal diseases. In the field of aquatic animals, Epizootic Ulcerative Syndrome (EUS) of freshwater fish and White Spot Syndrome Virus (WSSV) disease of penaeid shrimps caused significant production losses and economic damages to many countries in Asia and Latin America. They also highlight the fact that most of these diseases still occur in developing countries, posing a continuing threat to livestock and aquaculture in the developed world and a continuing limit to productivity in areas where they remain endemic. If the opportunities of the livestock revolution are to be

realised (and the enabling mechanism that this provides for poverty reduction is to be exploited) and globalisation of trade in animals and animal products is to take place, the risks associated with the priority trans-boundary animal diseases must be addressed. High on the agenda for most developed countries are issues of food safety, public health and animal welfare. Effective progressive control of the priority animal diseases, leading to eradication where feasible or at least exclusion from large areas is a prerequisite to meet the future global demand for animal products.

Food safety for perishable products has long been a concern in developing countries, but is increasingly becoming a major trade concern as increasing shares of these products originating in developing countries are entering international trade. Bacterial food-borne diseases are of increasing concern worldwide. *Salmonella enteritidis*, enterohaemorrhagic *Escherichia coli*, and listeriosis are emerging as major food-borne disease problems in both developed and developing countries. Fish-borne trematode infections are increasing in many developing countries in Asia and has become a major human health concern. Recent estimates indicate that over two million people in South-East Asia are infected.

Reducing the risk of trans-boundary aquatic animal pathogens need to consider the policy which govern movement of animals. Research towards improving and developing appropriate policies which address the relevant international agreements and treaties is of prime importance. Research towards developing standardized diagnostic procedures and protocols, risk-based contingency plans, early warning systems and emergency response mechanisms are considered also important. Further, policy research towards implications of genetic improvement of aquatic animals for disease resistance are also required.

Animal diseases that kill livestock and fish, lower productivity, and often compromise food safety are also becoming more prevalent. Details of some of the major diseases of concern are given below.

Rinderpest (RP) is perhaps the most serious cattle plague. During the 1980s RP spread practically throughout South Asia, the Middle East and tropical Africa, affecting cattle, buffalo and wildlife. The disease has come under control again, and is currently confined to only three isolated eco-systems: southern Somalia, southern Sudan and part of southern Pakistan, but there remains a risk that RP could flare up again as it did in the1980s. Foot-and-mouth disease (FMD), is highly contagious viral disease of cloven-hoofed animals and is the animal disease with the greatest impact on international trade. Ordinarily, the OECD countries are free of this disease and it is endemic in the Least Developed Countries. However, in recent years serious epidemics of FMD have occurred outside the endemic areas and have caused major economic losses (Philippines 1994, Taiwan 1997, South Africa, United Kingdom, France, the Netherlands and Ireland in 2000 – 2001. Peste des Petits Ruminants (PPR) is the most rapidly evolving epidemic of small ruminants, extended throughout sub-Saharan Africa, the Middle East, Turkey, and in Asia. It has been responsible recently for heavy losses in small ruminants in Nepal, Pakistan, India and Bangladesh. Classical swine fever (CSF) is endemic throughout many of the swine-rearing areas of the world. It is a major and constant constraint to swine production in the countries of Eastern and South-Eastern Asia. In Europe, the most

serious, recent epidemics have been in Germany, The Netherlands, Spain and the United Kingdom.
Contagious bovine pleuropneumonia (CBPP) is a serious mycoplasmal disease of cattle. There has been a catastrophic spread of CBPP during the past few years in Africa where it now affects some 27 countries and causes estimated losses of up to US$2 billion annually. In 1995, the disease was reintroduced to Botswana for the first time in 46 years. As part of the eradication campaign, all cattle (approximately 320 000) in an area of northern Botswana had to be slaughtered — at a direct cost of $100 million; indirect losses were more than $400 million. Formerly widespread in Asia, little is now known of its occurrence there.

Newcastle Disease (ND) is one of the most important viral diseases of poultry and is regarded as endemic across almost the whole the world. Since 1991, there has been an increase in incidence of outbreaks, with a series of related outbreaks affecting poultry many European countries. Iran, India and South-East Asia were affected by the worst epidemic ever reported. In 1999, the pandemic reached the American continent.

Nipah virus, unknown before 1998, caused a serious outbreak of disease in pigs and people in Malaysia in 1998–99, leading to the destruction of more than 900 000 pigs from 896 farms and causing hundreds of cases of febrile encephalitis in people, with 100 cases proving fatal. The outbreak illustrated that the ease and speed of international travel is a concern in implementing risk-mitigating measures to safeguard human and animal health.

Rift Valley fever (RVF) was confined to Sub-Saharan Africa until 1977. It then occurred in Egypt, causing an estimated 200 000 human cases of the disease with some 600 deaths, as well as large numbers of deaths and abortions in sheep and cattle and other livestock species. A serious outbreak in east Africa in 1997–98 caused not only livestock losses and human deaths but also disrupted the valuable livestock trade to the Near East. During 2000, an extended and serious outbreak of RVF occurred in Saudi Arabia and Yemen; the first time that the disease has been recorded outside of Africa.

Bovine spongiform encephalopathy (BSE), a prion disease of cattle, was first recognized in the United Kingdom in 1986. Since then, more than 180 000 affected cattle have died or been slaughtered. The disease is associated with the feeding of contaminated meatmeal and bonemeal. Cases have now also occurred in a number of other European countries. The demonstration of a causal link between BSE and variant Creutzfeld–Jakob disease in humans in 1996 led to increased concern by the consumer and major disruptions in the world beef trade.

Epizootic Ulcerative Syndrome (EUS). This serious epizootic, first reported in Japan as mycotic granulomatosis (MG) of freshwater Ayu, in 1971 and observed in eastern Australia in 1972, is now reported to occur in most of Southeast and South Asian countries affecting over 100 fish species of wild and cultured fresh- and to a lesser extent brackishwater fish. The primary causative agent of this disease has been confirmed as a fungus of the genus *Aphanomyces*. Combined losses from EUS in several Asian countries before 1990 were more than US$10 M; losses in Thailand alone from 1983-1993 were

US$100 M. EUS continues to expand its range, the latest being into the rivers of the Indus in the Punjab of Pakistan.. Outbreaks of ulcerative disease in *Brevoortia tyrannus* in the USA are very similar to EUS in Asia.

White Spot Disease (WSD) of Shrimp . First reported in Chinese Taipei and China Mainland between 1991-1992, then in Japan in 1993 from shrimp imported from China, this major viral disease of shrimp, which appears to manifest in different forms and strains, is now affecting almost all shrimp producing countries in Asia and Americas. In Asia, WSD has been officially reported from 10 countries in the Asia-Pacific region including Bangladesh, China P.R., Korea RO, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam (NACA/FAO, 2000;). As of 1999, WSSV has been officially confirmed in at least nine countries in the Americas: Columbia, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, and USA. Losses are in the range of more than US$400 M in China in 1993, US$17.6 M in India in 1994 , US$600 M in 1997 in Thailand and to a global estimate of US$3000 M .

A number of studies document the world-wide increase in reports of aquatic diseases affecting a wide range of plant and animal taxa, linked to a variety of pathogens and involving phenomena as host–shifts. Harmful Algal Blooms (HABs) outbreaks are increasing world-wide in frequency, intensity and geographic distribution, being expressed in a number of poisoning mechanisms that directly impact human health e.g. ciguatera fish poisoning (CFP), and paralytic, diarrhetic, neurotoxic, and amnesic shellfish poisoning (PSP, DSP, NSP, and ASP) associated with shellfish consumption. In the case of aquaculture, intensive but also smallholder aquaculture producers in developing countries remain constrained by diseases. Although sporadic diseases in aquaculture have been experienced for many years, epidemic diseases were largely unknown in aquaculture until the outbreak of Epizootic Ulcerative Syndrome (or EUS) in Asia. From a relatively confined occurrence in Japan in the early 1970s it spread throughout SE Asia in the early 1980s, spreading to Bangladesh by 1988 and is now reported as affecting all countries as far west as Pakistan. In work undertaken by ICLARM and its partners, producers and consumers in six Asian carp-producing developing countries rate disease as a primary constraint to carp aquaculture. The risk and frequency of disease is increasing rather than decreasing. It has been estimated that 15 Asian countries with a total aquaculture output valued at over US$ 22.7 billion in 1990, lost US$ 1.4 billion the same year through disease.

Trade constraints in world livestock markets related to animal disease issues are important, but those markets remain highly distorted by traditional trade barriers

There is evidence that as traditional trade barriers begin to come down, there is increased pressure to substitute measures under SPS to protect domestic markets under the guise of animal disease and food safety concerns. Yet as argued above, the rising genuine food safety and animal disease risks of expanded trade are substantial, and it may be increasingly difficult to distinguish legitimate health control measures from non-tariff trade protection. In this context, research on effective ways to increase food safety in a globalizing world that does not discriminate against poor producers in developing countries becomes especially important.

In the case of fisheries, a number of developing countries in Asia, Africa, and Latin America have had their fish trade disrupted by export bans linked to disease outbreaks e.g. a cholera outbreak in Peru led to losses of over US$ 700 million due to rejected exports of fish and fish products; a 1997 ban of exports of frozen shrimp, due to claims of *Salmonella* infection, from Bangladesh to the European Union resulted in a net loss of US$ 14.7 million to exporters, including a loss of the total EU market equivalent to US$ 65 million. Bans on exports of fish and fish products have been placed on Tanzania, Mozambique, and Uganda, based on health considerations causing severe economic and societal disruptions. In 1997 and 1999 restrictions were placed by the European Union on exports from Kenya of fish and fish products from Lake Victoria due to *Salmonella* and cholera outbreaks.

At the same time, the impact of controlling animal diseases on trade flows, market structure and poverty in developing countries—the fundamental rationale of this program--depends on the broad world trade environment for livestock and aquatic animal products, including elements outside the health sector per se. As one barrier is lifted, another may become binding.

World livestock and fish trade is subject to a wide variety of trade distortions. These include the three levels discussed during the Uruguay Round, which are being considered again under the agricultural negotiations begun in March 2000 at the WTO: Market Access, Domestic Support, and Export Subsidies. For instance, the levels of subsidies for livestock calculated by the OECD as Producer Subsidy Equivalents (covering market protection, price support and direct subsidies) amounted to more than 33,000 million US dollars per year for the EU, USA, Canada and Japan. The amount of subsidies exceeds 75,000 million US dollars if both meat and dairy products are considered. Most of the protection comes from tariffs and quotas (market protection) rather than budgetary subsidies (although direct payments are important in the EU and Canada).

With regard to market access issues affecting trade in meat, there are 247 tariff-rate quotas (TRQs) affecting meat products over a total of 1371 TRQs for all agricultural products declared under the Uruguay Round (whose administration is a contentious issue), and tariffs outside the quota are very high in different industrialized countries. poultry. Considering domestic support, one of the main programs is the payments per head of the EU under the Blue Box (direct payments partially but not completely de-linked from production). In the current negotiations several countries have requested the elimination of this box, while those countries utilizing those semi-linked payments are resisting its abolition. A third group of policy instruments disciplined under the UR are export subsidies. The total amount of export subsidies during the last years has been about 6,000-7,000 million US dollars, with the EU accounting for over 90% of that total. Exports subsidies have been utilized in about 15% of the total quantity of beef traded internationally, in 17% of pork, and 6% of poultry products.

The high levels of tariff protection and producer subsidies in the livestock sector in particular suggest that addressing animal diseases of trade in the absence of more

traditional forms of trade liberalization for animal products may only have limited impact on the direction and level of world trade in meat and dairy products. Yet there is strong evidence that traditional tariff and subsidy protection to livestock sectors will be reduced in the near future as the larger stakes of overall multilateral trade liberalization dictate the policy agenda.

III. IMPLICATIONS OF THESE TRENDS FOR THE POOR AND SMALL-SCALE PRODUCERS IN DEVELOPING COUNTRIES

Implications for livelihoods of the poor

About 75% of the poor live in rural areas in the developing world and 66% of these people keep livestock. The livestock revolution provides a significant opportunity for livestock farmers in the poorer regions to partake in economic activity and provides a way for them to escape the poverty trap. However, for this to occur there is a need for an increase in the quantity and quality of animal products for trade at a local level and for a significant improvement in the globalisation of trade in animals and animal products. At both the local and international levels, the presence of animal diseases will have a significant negative impact on opportunities for trade.

The increased intensification of livestock production and the increased concentration and vertical integration of input supply, production, and processing are potentially a serious threat to small-scale producers. This is compounded by the fact that under inappropriate policies SPS controls would favor large size production units. Although there is a good possibility that productivity gains resulting from improved animal (and plant) disease control may benefit the rural poor, at the same time, however, strategies that set high certification standards without promoting vertical coordination of small-scale production might contribute to the crowding out of small producers.

In contrast to terrestrial farming systems where the bulk of global production is based on a limited number of animal and plant species, over 200 different farmed aquatic animal and plant species were reported in 1999 (FAO, 2001), including 125 finfish species, 48 mollusc species, 27 crustacean species, and 7 plant species. The large number of species cultivated reflects the wide number of potential candidate species available within the different countries and regions of the world, and wide variety of production systems employed by farmers, most of which are small-scale.

Inland freshwater species continue to dominate global finfish aquaculture production in 1999 (18.59 mmt or 86.6% of total finfish production), followed by diadromous species (2.03 mmt or 9.5%) and marine species (0.84 mmt or 3.9%; FAO, 2001a). Aquaculture currently provides 74.0%, of total global landings of freshwater finfish species. Of particular note was the fact that the top five cultivated species were cyprinids and represented over half of total global finfish aquaculture production in 1999.

Approximately 90.3% and 82.5% of total aquaculture production in 1999 was produced within developing countries (38.61 mmt) and in particular within Low-Income Food Deficit Countries or LIFDCs (35.27 mmt) in 1999. Of particular significance is the fact

that the growth of aquaculture production within developing countries and LIFDCs has been steadily increasing, and in the last decade has been growing over 6-times faster than the aquaculture sector within developed countries (total production 4.16 mmt in 1999) over the same period.

At a more general level, the impact of controlling diseases of trade on the welfare of small producers and the poor will also depend on the dynamics of the world trade environment for meat and meat products, dominated by the policies of industrialized countries and subject to different trade restrictions. Different scenarios of trade and agricultural policy changes, linked for instance to the current WTO negotiations, will have different implications for poverty reduction and smallholders production. While there is not necessarily a direct link between expanded livestock and fisheries exports from developing countries and poverty alleviation in those countries, it is probable that the link is positive. This issue in itself needs to be better documented by research. Furthermore, it seems almost certain both that such exports will continue to expand and that the means employed to facilitate livestock and fisheries exports from developing countries will be critical to the poverty alleviation impact of those exports. This is especially true in the health/food safety field, where one option is to build highly capital-intensive enclave operations for exports that require elimination of disease risks from small-scale local operations through imposition of standards and regulatory requirements that independent small-scale operators cannot meet.

The current trend to meet the demand for aquatic products through expansion, intensification, and diversification, will continue to provoke the emergence and recurrence of disease challenges. Development of aquaculture at both subsistence and commercials levels necessitates the movement (introduction and transfer) of aquatic animals. While many introductions have been beneficial to local food production, the increasing movement of aquatic species pose a whole range of specific issues, a major issue being that of the risk of disease transmission.

Implications for public health

There is another insidious threat of livestock diseases to the livelihoods of poor people, and that is human disease acquired from animals. Many diseases are associated with poor sanitation, poor housing and poor nutrition but zoonotic infections derived from livestock and other animals also take a toll. Some zoonotic infections, such as rabies, are well known, but many are chronic and debilitating and their impact neither always recognized nor easy to measure. Gastro-intestinal parasites, for example, directly compete for the food we eat and in situations where under-nourishment is widespread, children fail to thrive and their growth is severely impaired. These infections also adversely affect cognitive development that in later years is reflected in poor performance at school and consequently a reduced ability to obtain good jobs and greater income. The very nature of smallholder farming in developing countries poses a high risk to zoonotic and opportunist infections, particularly to farmers and laborers most intimately associated with livestock.

With predicted growth in the consumption of livestock products and the intensification of production systems in many areas, food-borne infections and antibiotic and other chemical residues, will be increasingly important. These risks are already evident in many industrialized livestock systems and are likely to disproportionately impact on the poor, both from their purchase of lower value products and their reliance on older and cheaper antibiotics, more susceptible to resistance induced by their use in livestock. Large numbers of people become sick and many die every year as a result of eating unsafe food. Many of these foods are of animal origin. However, the extent and nature of these risks for the poor have not been determined in detail again, because their true social and economic worth have not been recognized. These various factors represent multiple threats to the livelihoods of resource-poor livestock producers in developing countries, and new animal disease control strategies directed at smallholder use are needed.

Food-borne trematodes and other zoootic diseases require further investigation as they cause severe health concerns in many developing countries. Human health concerns of aquatic animal products, such as bacterial conditions, dysentery and other health condition are also of importance.

Implications for pro-poor policy initiatives in developing countries

The key issue for such initiatives is to find non-distorting policy and technology options that support the participation of the small-scale sector in the growing bonanza offered by the development of world and domestic markets for safe animal products. The issue is to provide sustainable opportunities for the mass of small-scale producers to remain involved with the system. Without pro-active and pro-poor coordinated policy and technology development and implementation, the industry in developing countries becomes bifurcated, with the industrial livestock and fish sector occupying the expanding export market, and a static smallholder sector competing for the low end of the domestic market. Key issues for keeping poor and small-scale operators involved are:

(a) market reform policies to encourage smallholder investment in disease control and access to reliable and safe marketing chains;
(b) institutional developments that help small-scale operators meet global quality, food safety, and timeliness standards; and
(c) public goods on the research, extension, and infrastructure side necessary to support this policy priority.

Policy development and technology extension in the animal health and food safety sectors are critically linked.

IV. THE NEED FOR MORE RESEARCH

The case for more research

Research is needed on many fronts, but to be effective in the present context requires exploring the interactions of one set of interventions (such as in the policy or disease-control areas) on the impact of interventions in other areas. A flavor of research requirements and issues are given below.

On the animal disease control side: traditional methods in developed countries (e.g. application of quarantine, movement restrictions, and slaughter and destruction of infected animals) for controlling outbreaks of animal diseases have been successfully applied due to the ability to underpin controls through strong regulatory support. Such support may provide incentives for those affected by control or eradication measures (e.g. compensation for affected producers) or disincentives for not adhering to prescribed controls (e.g. penalties for breaching movement restrictions). However, in developing countries it is often not feasible to promulgate and enforce such regulatory measures due to a lack of financial and logistical resources. Moreover, in eliminating the major epidemic diseases in developed countries, movement control has been critical.

However, it is abundantly clear that even given sufficient financial resources livestock movement control is often not possible in many developing country regions (e.g. pastoralist systems in sub-Saharan Africa). Thus, alternative approaches must be sought to control and eradicate priority diseases in these regions. In recent years, rapid advances in sciences such as epidemiology, informatics, genomics and biotechnology have led to a range of new technologies that can be applied for more effective control and eradication of animal diseases. A number of these new technologies are on the threshold of being able to provide effective new tools for animal disease control such as significantly improved diagnostic tests and vaccines. Investment is required in applied research to complete the development of these for key priority diseases where the current lack of such technology is a limiting factor in regional or global control and eradication.

Thus although animal disease control in developed countries has relied primarily on regulatory and legislative processes, animal disease control in developing countries will have to be driven by science and technology. A striking example of the value of enabling technology is that of the FAO Global Rinderpest Eradication Programme (GREP). Two essential tools have underpinned this programme. The first is the availability of a vaccine that protects an animal for life following a single inoculation. The second is the availability of diagnostic tests that can facilitate surveillance, monitor vaccination and verify freedom from infection. Development of new technology to provide a rapid pen-side diagnostic test has added to the range of tests available and greatly facilitated recognition of rinderpest (RP) in the field. These tools have created a scenario in which the global eradication of RP is realistically expected to be achievable within a few more years. However, although the availability of such tools, developed through research, is a necessary prerequisite and can be emulated for other diseases, they alone are not sufficient for improving disease control. Another prerequisite for success is the creation of an appropriate and enabling policy environment.

On the trade and food safety policy side: The cost benefit analysis and welfare implications of the control of animal diseases will change under different scenarios for trade liberalization in livestock and fisheries product markets in the current WTO negotiations and in different regional trade agreements. The latter include the Free Trade Area of the Americas, APEC, and the expansion of the European Union. Of particular importance are the policies followed by the European Union, USA, and Japan related to market access, domestic support and export subsidies, in the context of those different

multilateral and regional trade negotiations. Additionally, domestic and international meat and livestock markets are evolving, as discussed above, as part of the larger changes in the food chains linked to the dynamics of supermarkets and agroprocessors. This evolution is increasingly constraining the options developing countries face in their animal disease control and food safety strategies for livestock and fisheries products. Different forms of industrial organization create different disease problems and mandate different solutions; conversely different solutions in this area have different poverty alleviation outcomes. The evolution and integration of world markets for animal food products places a high premium on developing new institutions and regulatory frameworks that can bring the world's poor producers into the new marketplace.

On the poverty alleviation side: better knowledge of the impacts of different animal disease control, food safety, and trade policy approaches are urgently needed with respect to their implications for smallholder use of the control measures, and the interventions and policies that promote their active participation in markets for wholesome animal products. Absence of attention to this set of issues is contributing to the rapid increase in the minimum viable size of production and marketing operations for livestock and fisheries products in developing countries. Benign neglect of the potentially negative implications of structural shifts in world markets can have disastrous consequences for the poor. Targeted multidisciplinary research can identify options for minimizing damage and maximizing benefits.

In order to address the need for effective animal disease control strategies that improve food safety, promote trade, and allow smallholder use, research must address several key issues:

- What will be the impact of the interaction between different scenarios of trade reform (mainly but not necessarily linked to the current WTO negotiations) and possible advances in the control of animal diseases, with respect to the patterns of animal product production, consumption and trade?

- What are the trade-offs between poor and rich countries brought about by regulations for disease control and food safety of livestock and fish product trade, and their globalisation?

- Which technologies and policies can be viably introduced and adopted that protects public and animal health; yet do not disadvantage smallholder producers?

- What are the diseases that most impinge on livestock production and human health of resource-poor farmers, fishers and aquaculture producers?

- What existing technologies can be more effectively deployed to control diseases?

- What new technologies, including diagnostics and vaccines, must be developed to improve control of animal and human diseases?

- By what mechanisms can answers to the above be best implemented so as to focus their benefits on resource-poor producers and consumers?

V. THE POTENTIAL RESEARCH PROGRAM AND OUTPUTS

The objective is to address the critical issue of the livestock and fisheries sectors of developing countries growing rapidly and becoming increasingly concentrated, increasingly vertically integrated, and increasingly integrated with world markets through expanded trade, thus creating a major risk for small scale producers of being crowded out.

The Program is modular and will result in three categories of outputs: policy recommendations, disease control technologies and strategies; and tools and improved methods for disease surveillance. Beyond the current research efforts, there are limited opportunities for development of strategies and technologies for disease control for aquatic animals and thus the research focus for fish will be restricted to policy recommendations. Activities to address each of these outputs include:

1. Policy Recommendations – Policy research to address the following five sets of questions:

   1.1 Who are the stakeholders in the global animal disease control/animal food product safety area and how are they affected by current and possible future changes in policies?

   - How does the current system of global animal disease control measures and food safety regulations distribute production and trade among countries?
   - How do the impacts of more stringent food safety regulations impact on the poor in developing countries? On producers in developing countries generally? Will the use of the precautionary principle within the SPS agreement be expanded in the light of the new food safety issues currently being debated? How will changes in the system impact different stakeholders?
   - What is the likely result of policy reform in other more traditional trade issues, such as export subsidies, domestic support, and market access? What are the implications of changes in all three areas for different types of developing countries? Should the developing countries seek to extend special and differential treatment in the next round, or will they benefit more from Most Favored Nation market access at lower rates? Specific analyses may investigate different formulae for tariff reduction, duty free access for 'essentially all' products for LDCs, and the issue of tariff peaks and tariff escalation.

1.2 What is the congruence between the magnitude of specific problems for poverty in the animal disease/food safety area and current investments to address these issues?

- What is the impact of animal and zoonotic disease and related food safety concerns on the poor in different parts of the world? As producers, as consumers? What relative impact? Through which animals and products?
- How are the conditions that produce animal disease control and food safety problems for the poor changing and why?
- What are the pathways of impact of animal disease and food safety problems on the poor (directly on human health, through processed food products purchased, on local income, on export income)?
- How are these pathways changing overt time (due to intensification, increased commercialization, globalization, etc.)?
- How does this profile mesh with existing disease research (public, private, national, international) in terms of diseases, locations and products? How does the profile mesh with current food safety regulations and enforcement?

1.3 Trade-offs between poverty and growth with respect to different interventions in the animal disease/food safety sector within developing countries

- Will changes in the scale of production and marketing operations continue and what does this portend for animal disease incidence? For control measures? For regulatory enforcement?
- Is there a trade-off in animal disease control and increased food safety intervention between promoting increased exports and serving the poor?
- What are the dynamics of different animal health and food safety options for scales of operation (e.g. will FMD control, for example, lead to the rapid displacement of the poor from the sector, as happened in list-A free parts of Brazil, for example, or what happens to small-scale milk producers in East Africa if pasteurization is required for milk sold to urban markets)?
- What are the options for dealing with any negative impacts of increased animal disease control or food safety regulation on the poor?

1.4 Institutional and technological needs and options for animal disease control and food safety that keep the poor involved in the livestock and fisheries sector

- What are the product characteristics needed for continued market involvement, and how can smallholders realistically achieve them?
- Which technologies are most appropriate for the poor in this area?
- What has been the overall impact of existing interventions?
- What regulations are required and how can they be enforced?

- How can the right symbiosis be achieved between enforcement of regulations and adoption of technologies for disease control and food safety?
- What can policy do to facilitate the growth of appropriate pro-poor producer institutions in the animal disease/food safety area?

1.5 Assessment of the full costs and benefits of different options

- How to account for uncaptured externalities in the animal disease control/food safety area?
- What are the full costs of different options for disease control and improving food safety of animal products?
- Who implements each option, and who bears the costs? Who gains? Who loses (producers--large/small, processors, traders--large/small, consumers)?

2. Disease control technologies and strategies

- epidemiology and impact assessment for targeted disease control, in particular to obtain detailed epidemiological data pertaining to livestock and zoonotic diseases in different smallholder farming systems, and development of appropriate and pro-poor disease control and risk management policy and strategy to improve animal and human health and increase market access.
- technology development (vaccines, diagnosis tests, therapeutics, genetic resistance) with emphasis on the "new sciences" of bio-informatics, genomics and functional genomics.
- Strategic field testing and evaluation of new vaccines, diagnostics and therapeutics, i.e. field evaluation for efficacy and acceptability under the conditions of it proposed use, in particular for smallholders production systems.
- impact of large outbreaks of trans-boundary diseases (economic, social, ethical and animal welfare)
- feasibility (technical, economical, financial and social) of improved large scale control or eradication campaigns

3. Methods and tools for disease surveillance

- risk assessment and risk management (e.g. adapting hazard analysis and critical control point or HACCP to local conditions)
- decision support tools to deal with outbreaks
- utilize and develop further innovative spatial information systems, modeling and ecosystem tools, e.g. FishBase, LarvalBase, ECOPATH (to identify the distribution, spread of disease organisms, pathogen and related toxin concentrations in aquatic food chains and ecosystem effects that have adverse economic impacts in fisheries and welfare of producers), and to use such methodologies in pro-active development of aquaculture planning for new enterprises

Current Capacity and Synergies of proposed research

The research programme outlined will require a multidisciplinary approach utilizing a range of modern technologies and methodologies that are complementary in addressing the complex problems of poverty in smallholder farming communities caused by animal diseases and potentially compounded by trends in globalization and international trade. The proposed challenge programme will provide a unique opportunity to deploy specific skills and expertise of different CGIAR centers, international research organizations, advanced research institution, NARS and private sector in a synergistic way to generate and deliver the major outputs of research. The main international partners for this programme will be three CGIAR centers (ILRI/IFPRI/ICLARM), FAO and OIE. The challenge programme will use the existing NARS partners and networks. Additional NARS partners will be identified after consultation during the proposal development phase. Partnership with centers of excellence will be established as and when required. Because of the food safety and human health components of the programme there is a unique opportunity to establish alliance between veterinary and medical institutions.

In the case of fisheries, ICLARM's comparative advantage in working in this field relates to its mandate for research, its multidisciplinary expertise in the biophysical and socio-economic fields and its close partnerships with the developing aquaculture industries of Asia and Africa through its INGA (International Network on Genetics in Aquaculture) network. Within the Code of Conduct for Responsible Fisheries, and in collaboration with developments by FAO and OIE in quarantine and disease management (e.g. the Aquatic Animal Pathogen and Quarantine Information System -- AAPQIS developed by FAO; and other legislative frameworks developed by such global agencies), ICLARM can facilitate collaborative research and capacity building with developing country partners and upstream providers of disease expertise.

VI. DELIVERY MECHANISMS AND POTENTIAL OUTCOMES

By addressing the complex interplay of trade, disease and food safety, this program has remarkable opportunities to impact the livelihoods of the ultimate beneficiaries - poor smallholder producers and consumers in developing countries; the Program has the potential for multiple avenues for alleviating poverty, improving food security and natural resource management. The immediate beneficiaries of policy and market institutions will be policy makers and planners, and national agriculture systems will be the target of improved animal health control programs and technologies. Research outputs will be delivered by the development and implementation of mechanisms for the sustained delivery and dissemination of the policy and institutional options, strategies and technologies developed. .

Delivery mechanisms

Key international and regional partners for the dissemination and promotion of policy options, strategies and technologies will be identified and involved in the research and development plan from Program outset. With key partners, develop a pragmatic and targeted plan for the dissemination and promotion of program outputs. Components are likely to include: consultation and informing other stakeholders and policy-makers in the animal disease and food safety arena during research program implementation; and,

developing specific mechanisms for output delivery, including partnerships, public fora, advocacy arrangements, and media materials.

The promotion, delivery, adoption and impact of a technological options for control of animal diseases will require the participation of both public and private sectors. The manufacture and delivery of vaccines are expected to fall within the private sector and there is ample evidence that commercial manufacture of vaccines and other animal health technologies is feasible and sustainable. Thus it is expected that commercial sector will play a significant role in production, development, licensing, marketing and customer service of animal health technologies such as vaccines and diagnostics.

NARS and other public sector actors will have an important role in developing and testing best-bet control practices. NARS will also play a central role, with backstopping from the CGIAR centers and international organizations, in disease monitoring and epidemiological studies. Lessons learned would be used to inform policy makers and to develop dissemination messages to be delivered by public sector extension channels, NGOs and private sector delivery pathways. These messages and how they are delivered will vary across the key production-consumption systems.

Enabling policies for integrated disease control will emerge from field studies on best-bet control options for disease control in various farming systems. Critical in the implementation of policy recommendations will be partners such as FAO and OIE. Regional institutions such as the Organization of African Unity/Inter-bureau of Agricultural Research (OAU/IBAR) will also be important players in facilitating the implementation of appropriate policies for integrated control of diseases

The Program will also provide for leveraging of other sources of funding from the development-support community for the long-term delivery of outputs beyond the end of the Program.

Potential outcomes

Significant opportunities lie in a better understanding of the epidemiology and economic and social impact of a wide range of animal diseases under different policy scenarios for world production and trade; the development of improved diagnostic tools to aid this process, and the better delivery of available or improved technologies. New technology and relevant policy analysis could change the way certain trans-boundary diseases are controlled (e.g. vaccination versus stamping out). This could affect greatly the ability of developing countries to control key diseases in a way that does not cut them out of the domestic and world markets.

Achieving impact on poverty alleviation through research requires both finding effective disease control options, and assessing the differential impacts of these options on poor and small-scale producers in developing countries. Specific information relating to disease risk in different smallholder farming systems and the availability of appropriate technology (e.g. cheap, rapid, sensitive and specific pen-side diagnostic tests; thermostable vaccines, vaccines inducing longer immunity or vaccines easier to

administer by unskilled personnel) would make it feasible to design effective disease control and food safety strategies for different farming systems. Improved policies that promote the growth of appropriate institutions serving smallholders can facilitate the uptake of improved practices and disease control technologies. They can also better link small-scale and poor producers with safe food supply chains capable of participating in the new world marketplace for animal products.

Control of animal and zoonotic diseases will significantly improve health of farmers, their families and farm-workers, enhancing their capabilities to contribute positively to increased productivity at all levels of farming. Better control of these diseases will also reduce microbial and parasitic infections resulting in overall reduction in food contamination and significant improvement in food quality and safety. This would facilitate trade in food products, particularly in developing countries, and enhance their capacity to compete favorably in foreign markets. Similarly, the development of standards for non-traditional export products would facilitate the sale of these products locally as well as in foreign markets.

VII. ISSUES TO BE ADDRESSED DURING PROGRAM FORMULATION

Scope of the program

Food safety and trade concerns apply broadly to many agricultural products. Meat, dairy products, eggs, and fish are especially perishable, are capable of transmitting disease *in vivo* and *in vitro*, can lead to severe human and animal health hazards, are linked on the production side through fish meal and soy markets, and on the output side as good substitutes in human consumption. Furthermore, animal products are traditionally a major commercial activity of the poor in developing countries. It is logical to treat these commodities together in the present program of research.

Public versus private goods, and issues of intellectual property rights

Products generated from this research will be for public good. However, it is becoming increasingly apparent that some of these products, such as diagnostics, vaccines and therapeutics cannot be successfully manufactured, marketed and delivered by the public sector. Thus participation of the private sector is becoming increasingly important. To ensure that the poor farmers are protected and benefit from the research outputs of this proposal, intellectual property issues such as copyrights, registration, patents and licensing will be addressed through independent professional advise and strategic partnerships with commercial companies.

VIII. PROPOSED MODE OF OPERATION OF THE PROGRAM

Caveat: the ideas presented below would need to be reviewed and adapted once the CGIAR decides on the rules and procedures that would govern all challenge programs. The recommendations of the task force on Challenge Programs are available on the CGIAR web site.

Some basic principles

- need to meet general priorities of donors, i.e. to have an impact on poverty alleviation in developing countries
- need to develop capacity of LDCs
- need to promote partnership with other public research entities and with the private industry
- need for participatory and transparent mechanisms / processes to select priorities

It is proposed to allocate funding to the program through two different mechanisms, complementing each other in terms of research activities, and each receiving half of the available funding:

- Direct funding arrangements dealing with a small number (3 to 5) of strategic priorities areas to be specified during the formulation of the full proposal
- A competitive research grant for medium-size research sub-projects that complement the strategic priority area.

The research proposed here will be divided into 3-5 Strategic Priority Areas. Additional sub-projects will also be formulated to complement research in these priority areas.

- Key components of **Strategic Priority Areas** dealing with a small number a research areas (3 to 5) will be defined during the formulation of the full proposal – likely candidates for discussion include:
  - assessment of the impact of disease control strategies, food safety regulations, and other trade measures (including market access, domestic support and export subsidies) on the structure of the livestock and aquatic animal production and processing sectors in developing countries, including impacts on minimum viable scales of production under different policy and institutional scenarios
  - policy for delivery of animal health services to the poor
  - application of genomics and bio-informatics to develop new diagnostics and vaccines for animal diseases.

- Criteria for consideration for a **Competitive Research Grant** for medium-size research proposals will be:
  - within priority areas, complementing the activities of the Strategic Research Area
  - research feasibility, scientific merit and potential outcomes assessed by peer reviewers and by the set of criteria defined before hand, such as the need for LDC partners (see basic principles above)
  - limit to the amount per year (approximately $0.5 million), 3 years, renewable based on outcome / peer review

The formulation of the full proposal for the Strategic Research Area would determine (i) the list of research areas; (ii) the list of main research themes; (iii) a proposed Lead Agency and Strategic Partners for each research areas; and (iv) a set of criteria to be met for deciding on budget allocation.

The formulation of the full proposal for the Competitive Research Grant would determine: (i) the criteria / list of institutions eligible for submitting proposals (should there be a specific role for OIE-Reference Laboratories and Collaborating Centers; (ii) the list of eligible priority areas, and required linkages with the Strategic Research Area (iii) the requirements in terms of partnership; (iv) the requirements in terms of leveraging of other funds; (v) the requirements in terms of training and capacity building; (vi) the requirements in terms of geographic coverage (e.g. the need to be at least regional in scope and to involve at least three developing countries); and (vii) the institutional arrangements (permanent program management unit, composition of the grant selection panel, procedures).

Selection of priority diseases

Three major processes would supply information that would help take informed decisions on priorities, at the time of selecting the priority areas and the core programs, as well as the eligibility criteria for the grant program:

1. 'Investing in animal health research to alleviate poverty', the ILRI report mentioned in the introductory section, concludes that on a global basis, the 20 highest ranked conditions with impact on the poor comprise three syndromes (neo-natal mortality, reproductive disorders and nutritional/micronutrient deficiencies, which all rank in the top ten), four general disease categories (gastro-intestinal helminths, ectoparasites, respiratory complex and mastitis, the first two of which rank in the top ten), and thirteen specific diseases (in the order: foot and mouth disease, liver fluke, Newcastle disease, anthrax, *Toxocara vitulorum* infection, followed by haemorrhagic septicaemia, Peste des petits ruminants, *Brucella abortus* infection, haemonchosis, African trypanosomosis, coccidiosis, *Trypanasoma evansi* infection and rinderpest).

2. The Standards Commission of OIE has been mandated by the International Committee to draw a list of research priorities on animal diseases. Such a list will be global, i.e. based on the full membership of OIE. It is has been suggested to the Commission to qualify the priorities - to the extend possible - regarding their specific relevance and priority for developing countries and their possible impact on poverty alleviation, in order to produce information that could form the basis for priority setting for the CP.

3. The program itself would potentially include activities that would help identify priorities (e.g. epidemiology and impact assessment of animal diseases in different smallholder farming systems), so that there should be a mechanism that would allow taking the results into account and if need be adapting the eligibility criteria.

Governance Arrangements

Governance and management arrangements will be detailed by the business plan and will be flexible and adapted to the needs of the program.

The program would be accountable to the CGIAR through the CGIAR Executive Council and for non-CGIAR funding to the respective investors. The Executive Council would provide general oversight in the implementation of the Program.

The Program would be implemented by a consortium of core institutions, under a formal joint venture agreement. The membership to the consortium would be negotiated as part of the development of the full proposal. The agreement would specify the responsibilities and liabilities of each member. It would identify the one responsible to legally represent the consortium and handle legal and administrative matters, and in particular hire and manage the Program Coordinator. It would also include provisions on intellectual property rights.

A Steering Committee would be responsible for the selection of the Program Coordinator and the supervision of the implementation of the joint venture agreement. The Steering Committee would consist of representatives of the core parties and of end users and other stakeholders. The functions of the committee would generally include: (i) oversight on the impact of the CP (on development goals); (ii) supervising the budgetary and financial matters identified in the Agreement; (iii) ensuring that the resources are used effectively to produce the agreed outputs; (iv) setting general policies to bring about increased program integration and efficiency in the implementation; and, (v) mediating in case of conflicts between parties to the consortium. Specific composition, functions, and powers of the SG would be specified in the Agreement among the core parties and in the Business Plan.

Management

A Program Coordinator would be responsible for day to day handling of program management on behalf of the core parties, under terms of reference approved by the Steering Committee. The Coordinator would report to the Steering Committee. Recruitment would be open and competitive and the selection of the Coordinator would be made jointly by the core parties.

Monitoring and evaluation of the program to assure research quality and accountability will be provided through an annual review, commissioned by the CGIAR Science Council.

Legal and Administrative Matters

Legal and administrative matters including financial administration and accounting would be the responsibility of one of the CGIAR centers . Funds would be disbursed based on detailed work-plans, reports, achievements and external evaluation.

One of the CGIAR centers would provide administrative support to the program coordinator. Each of the core parties would be responsible for handling administrative matters related to their own participation in the program.

Professional advice will be sought on the issues of intellectual property.

IX. PROGRAM COSTS AND FINANCING

The needs addressed by the proposal are very large, but the design is highly modular. It is proposed to allocate funding to the program through two different mechanisms, complementing each other in terms of research activities, and each receiving half of the available funding:

- Direct funding arrangements dealing with a small number of strategic priorities areas (3 to 5) to be specified during the formulation of the full proposal
- A Competitive Research Grant Program for medium-size research sub-projects

It is estimated that each strategic area would cost $2-3 million per year, so that the costs of all directly funded activities would be $6-15 million per year. As it is proposed that an equal amount be allocated to the competitive grants mechanism, total annual requirements would be $12-30 million. The program would be formulated for a period of six years.

It is expected that 50% of total funding requirements would to be mobilized by the program from additional resources coming from outside the CGIAR. Several funding agencies (e.g. European Union, Welcome Trust) have identified the topics of animal diseases and food safety as key areas of interest. The potential for leveraging partnerships with the private industry is also being explored. Further detail on opportunities for new funding is presented below.

Allocation of the financial resources to the different partners will be specified in the business plan. Allocation will vary depending on the strategic priority areas. For the competitive grants mechanism, it is expected that 30 to 50% of funding would go to developing country partners.

Opportunities to mobilize significant new and additional funding

The activities to be funded may be broadly categorized as research, demonstration and production through to delivery. Sources of funding for each will vary. It is likely that strategic, applied and adaptive research components would be funded by bilateral and conventional CG investors. Given the market focus of this Program, the private sector is also likely to fund applied and adaptive research components as well as demonstration of technology and policy related research and the ultimate production and delivery of research outputs. Foundations are strong candidates to fund the complete spectrum, of course of focus of individual foundations will be specific. Bilateral and multilateral investors would provide loans and grants to countries to also support demonstration and delivery. One of the most novel new opportunities for access to funds is afforded by the coalescence of veterinary and human health research to tackle food safety and zoonotic diseases. Table 1 provides an illustration. Details of the financing strategy would be detailed in the business plan. Examples for each are discussed below –

Table 1 – Sources of funding for key Program elements

	Conventional CG members	Foundations & Trusts	Private Sector	Bilateral & Multilateral	Public Science
Activity					
Research					
Strategic	XX	XX			XX
Applied	XX	XX	XX	XX	
Adaptive		XX	XX	XX	
Demonstration		XX	XX	XX	
Scaling up/ production/ delivery		XX	XX	XX	
Capacity building	XX	XX		XX	

Conventional investors – The EU Commission is viewed as a likely investor for regional focused activities. UK-DFID is leading the initiative for prioritization of disease and through poverty mapping, research targeting. This initiative has the potential to orchestrate investment in disease research amongst the current CGIAR investors, in particular bringing to the forefront where targeting is needed. UK-DFID's Pro-Poor initiative provides another example funding source for policy-related research. Alliance with advanced research organizations, such as The Institute for Genomic Research, bringing new science to bear on formerly intractable problems related to technology development has enabled ILRI to attract significant new funding from UK-DFID to support development of a vaccine for East Coast fever. This model is likely to attract additional Program funding. There are several examples of creative capacity building for disease research and development applying information and communication technology targeting human disease.

Foundations and Trusts – Wellcome Trust is the one of the largest investors in tropical medical and veterinary research globally. Through collaboration with advanced research institutes, ILRI is benefiting from funding for epidemiological and research focused on genetics of disease resistance. Given the zoonotic and food safety components of the Program, there is strong possibility for significant additional funding. Another source of funding is the Gates Foundation. The Gates Foundation, and its annual budget of $1billion, has become the largest investor of research on diseases of the poor such as malaria, tuberculosis, sleeping sickness, and meningitis. The Foundation has also supports large scale initiatives to distribute drugs to the poor. The Gates Foundation is a strong candidate for supporting this Program, not only because of the disease focus but also the focus on child nutrition; one of the ultimate outcomes of this Program.

Private Sector – The market focus of this Program makes investment by the private sector more attractive. ILRI has success building alliance with the private sector for

production and delivery of productions. As an incentive to encourage investment in diseases of the poor, some countries are introducing tax breaks for private sector to carry out research and development of drugs and vaccines and to increase donations of drugs by making them tax deductible. There are a growing list of companies which are becoming active in this area, currently largely for tropical human health diseases, and ubiquitous such as HIV; examples include Aventis Pharma, Merck, GlaxoSmithKline, to name a few.

Bilateral and multilateral – Country level development activities will benefit from access to grants and loans. Key will be investments from the World Bank and regional development banks. Drastic actions such as debt cancellation to shift funds from debt servicing into addressing for example, public health to include control of zoonoses, and improve food safety presents another option. Other organizations with particular commodity focus, including the Common Fund for Commodities, particularly for policy related research and development activities from which ILRI has successfully leveraged funds, provides another option.

Public Funding for Science – the National Institutes of Health (NIH) is the largest source of funding for human disease-related research in the world. Alliance with advanced research organizations and the zoonotic and food safety components of this Program, make this a plausible reality to support upstream research addressing these problems. ILRI has received funding through NIH through its alliance with universities in the US.

X. PROCESS TO BE FOLLOWED TO GO FROM THE DRAFT CONCEPT PAPER TO A FULL PROPOSAL

- Initial draft (the present paper) produced by World Band from contributions of OIE, FAO, ILRI, IFPRI, ICLARM.
- Draft circulated by WB to other four, comments received, draft amended
- Joint draft circulated to list of stakeholders : donor agencies, regional research organizations (e.g. ASARECA), regional NGOs (e.g. FORAGRO), national research institutions (e.g. EMBRAPA, CIRAD)
- Comments incorporated to the extend possible
- Open meeting to discuss the draft to be hosted by FAO on October 24
- Concept Paper available at the time of Centers Week (end-October 2001)
- Formal submission of Concept Paper to CGIAR once such papers can be received
- If Concept accepted and seed funding granted, then proceed as follows:
  - Convey an initial workshop for all interested stakeholders, to (i) appoint a proposal formulation task force; and (ii) agree on follow-up process
  - Task force develops proposal, in interaction with stakeholders
  - Convey a final workshop to finalize proposal

XI. REFERENCES

Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., and Courbois, C. 1999. Livestock to 2020: The next food revolution. International Food Policy Research Institute, Food and Agriculture Organization of the United Nations, and International Livestock Research Institute. IFPPI Food, Agriculture and the Environment Discussion paper 28, Washington, D. C., 72 pp

FAO, 2001. Review of the state of the world aquaculture. Rev. 2. FAO Fisheries Circular 886. Rev. 2. FAO, Rome, (in press).

NACA/FAO. 2000. *Quarterly aquatic animal disease report (Asia-Pacific Region), 2000/1. January to March 2000.* FAO Project TCP/RAS/6714, Bangkok, 57 pp.

OIE. 2000. International Aquatic Animal Health Code. 3rd edn. Office International des Epizooties, Paris, 153 p.

Perry, B. D., McDermott, J. J., Randolph, T. F., Sones, K. R. and Thornton, P. K. (2001). Investing in Animal Health Research to Alleviate Poverty. International Livestock Research Institute (ILRI), Nairobi, Kenya.

Thornton, P. K., Kruska, R. L., Henninger, N., Kristjanson, P. M., Reid, R. S., Atieno, F., Adero, A., and Ndegwa, T. (2001) *Poverty and Livestock Mapping: Final Report to the Department for International Development*. International Livestock Research Institute (ILRI), Nairobi, Kenya