ANIMAL AGRICULTURE ISSUES IN INTERNATIONAL AGRICULTURAL RESEARCH PROGRAMS

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SUMMARY

The major crisis facing developing countries over the next two to three decades is continued human population increase. Although there are signs of a slowdown in the rate of increase, the provision of food for current and future populations will be a major challenge. Investment in agricultural research will be a major factor in determining if the challenge can be met. Livestock commodities have made and will continue to make a major contribution to food production. It is likely that livestock will be especially important as agriculture becomes more intensified and the development of crop-livestock systems becomes more common. Two major areas of further research are nutrition and genetics. Some resources, such as village chickens are greatly underutilised and offer considerable increases in productivity.

POPULATION VERSUS PRODUCTION

The Earth Summit held recently in Rio de Janerio has focused world attention on many important issues which confront us. Regrettably very little attention was given to perhaps the most important issue of all - the rapid and continuing rise in the world population and the fact that most of the increase occurs in the developing world.

All of us are familiar with the statistics but they bear repeating. In the middle part of this century the world population stood at something like 2.5 billion. By the mid 1980s the world population had doubled to 5 billion. Current projections indicate that by 2025 the figure will have risen to 8.5 billion. Of the projected increase of 3.2 billion from current levels, less than 200 million will be in the developed countries, while at least 3 billion or 95% will be in the less developed countries.

There is hope on the horizon, as the trend is for a gradual decline in the high rate of population growth. The overall figures for developing countries show that in the 1960s the rate of expansion was 2.5% per annum; in the next decade it was 2.2% and in the 1980s it had again fallen to 2.1%. The one major exception to the general pattern is sub-Saharan Africa, where continued accelerated growth is predicted in the 1990s.

The rate of increase in human population is naturally reflected in figures for the rate of growth of food consumption. For example, in Africa in the period 1961-1985 there was a 2.5% increase in food consumption. However, in this same period there was only a 1.7% per annum increase in food production, resulting in a net trade deficit. Food needs to be imported to feed people and insufficient funds are available for resources such as fertiliser and pesticides, resulting in lower yields than would be possible. In Africa the lagging growth in production has been mostly in the area of traditional African cereals such as millet, sorghum and maize while there has been an escalation of imports of commodities such as wheat and rice. It has been estimated that a sustained increase in food production of 4% per annum is required if the basic needs of our increased human population are to be met.

INCREASED AGRICULTURAL PRODUCTION

The expansion in world food production which occurred in the sixties and seventies was largely possible because of land area expansion, increased fertiliser and pesticide use and the use of new plant varieties. The critical questions which are now being asked are:

- is it possible for world food production to continue to increase?
- if so, are the technologies already available ?
- to what extent are we reliant on new technology to achieve sustained increase in production?
- is the technology appropriate, i.e. is it sustainable?
- is it possible for resource poor farmers to adopt new technologies?

While there is considerable divergence of opinion, the overall view is that agricultural production can continue to increase with reliance on a mixture of current and new technology. As a result of experiences with programs such as the FAO Integrated Pest Management initiative in Asia, there is now on optimistic view that poor farmers can assimilate new technology to their advantage. However the key point, and one which is applicable to farmers of the developed world as much as those of the developing world, is that agricultural technology must be sustainable. There is little point in achieving short term gains with non-sustainable technology, resulting in damage to the natural environment by bad farming practices and inappropriate forms of land and water management.

However there is a danger in extrapolating directly from developing situations. For example, although the excessive use of fertilisers is known to cause environmental damage in many developed countries, there is no good reason to argue, in general, against the increased use of fertilisers in less developed countries. While over 500 kg/ha of nitrogenous fertilisers are reportedly used in Europe, many African countries only use between 0-26 kg/ha of nitrogenous and 0-10 kg/ha of phosphate fertiliser (Tribe 1991). Thus, there is considerable scope for the use of fertilisers to increase crop yields in developing countries, and in addition their use may be an important tool in combating soil erosion and deforestation. On the other hand, as with developed countries, it is important to keep pesticide use to a minimum. Research has shown that the adoption of integrated pest management and biological control programs can substantially reduce the amount of pesticide used while maintaining good crop yields.

In the past, technologies which originated in developed countries were readily made available to developing countries via international aid funding agencies. This is not to say that these technologies were appropriate or that they were readily adopted, but they were made available. However, in the biotechnology era there has been much more involvement of commercial enterprises and the new technologies are not as readily available to agriculture in either the developed or developing countries. It is interesting to note that many of the outcomes of the new biotechnology are equally applicable to developing as to developed countries. In almost all cases, the intellectual property rights reside in the developed countries, and fears have been expressed by developing country leaders that they will not be given ready access to the benefits of the new technology. There is certainly a challenge here for international aid donors to be more flexible in their funding arrangements and to respect commercial rights while ensuring that those in most need are not disadvantaged.

The most pressing need is to continue urgent efforts to reduce the rate of increase of human population growth in all areas of the world. There are signs that this is happening in most parts of the world but Africa has been especially slow in developing birth control strategies and there is an urgent need to address this

problem. Another important aspect of the human population problem is the disturbing tendency for people to leave the land in search of opportunities in the large cities. This has created enormous problems in the cities but it has also left the countryside devoid of the labour required if increased food production targets are to be met.

FUTURE RESEARCH

Increased food production will not occur without certain inputs such as land, labour and capital. It is increasingly recognised that another input, knowledge, is also essential (Tribe, 1990). Knowledge should be a reflection of a two-way process, with inputs from research balanced against information from end users.

In the past, agriculture has been a highly technologically driven activity and there is no indication that this situation will change. Since it is likely that increased food production will only occur from technological advances, research activities should be a major target for aid funding. Many studies have shown that investment in agricultural research can result in internal rates of return of 30-70% in perpetuity; this accounts for all agricultural research activities, even those which are deemed unsuccessful (CGIAR 1988; ISNAR 1991; Tribe 1991). For developing countries, agriculture is the foundation of economic growth, since that is where the bulk of their resources lie. In addition, these resources are generally characterised by low levels of productivity and there is considerable potential for very large increases in production.

In spite of this evidence, agricultural research in both developed and less developed countries is almost always underfunded. The problem is to convince governments and the aid bureaucracy that investment in research will provide more lasting benefits than something which is more tangible such as a building or some equipment. There is some hope that this situation will improve as organisations such as CGIAR and ACIAR provide increasing evidence of the benefits.

Research needs to be undertaken at several different levels. The need for basic, applied and adaptive research is widely recognised. Equally important but much less well recognised is the need for research on the factors which govern the uptake of technology by the end user. This has been the subject of recent research carried out by the International Service for National Agricultural Research (ISNAR 1991) but there is much more that needs to be done in this most important aspect of technology transfer.

The results of research will be much more readily adopted in countries which have a well developed research infrastructure. The development of capability by national agricultural research systems is vital. One of the reasons for optimism about the ling-term future of many developing countries is the obvious improvement in research capacity which has occurred sine the mid 1960s. To maintain and to promote this capacity, governments and aid donors will need a long-term commitment to institution building. There also needs to be continued improvement in planning and policy capabilities. Another most important aspect is investment in training of nationals in all phases of agricultural activity. This includes research scientists and technicians and it should also include extension workers and others who will be involved in delivering technology packages to farmers. Research activities should not conclude at the institute level. As part of the overall adoption of technology, research should continue down to the farmer level with highly trained staff experienced in field work (ISNAR 1991).

Australia has a major role to play in all these activities. Through organisations such as AIDAB, the opportunity exists to provide assistance in areas where we have special skills. Examples are building of institute capacity and training of scientists, technicians and extension workers. Through organisations such

as ACIAR the opportunity exists to advance new technologies by carrying out collaborative research projects with scientists in developing countries.

ROLE OF ANIMAL AGRICULTURE IN INCREASED FOOD PRODUCTION

Livestock commodities already make a substantial contribution to the economies of many less developed countries. It has been estimated that meat, milk, eggs, wool, hides and skin contribute somewhere between 25-35% of Agricultural GDP which in turn accounts for about 30% of total GDP. Livestock also make other contributions such as traction and manure which are more difficult to quantify. Livestock may also act as living banks of capital, providing financial reserves for times of economic stress as well as a source of food in times of crop failure. In situations where crops are raised for subsistence, animals may provide the only source of cash income.

Continued population growth and increased urban settlement have resulted in an increased demand for meat and milk in many developing countries. This demand cannot be entirely met by increased imports and increased animal production is therefore a high priority. As there is a finite amount of land available it is likely that increased production will only occur through increased intensification and increased adoption of technology.

Two important areas of technology are improved nutrition and improved genetics. In almost all countries, current forage production is inadequate to sustain an increased animal population. While in arid regions the objective should be to maintain the current forage base without land degradation, in less arid areas, there is considerable potential for increased livestock production. This is particularly relevant in more intensive agricultural systems such as those which involve crop-livestock farming systems. Farmers in these areas are also generally more likely to adopt technology which will result in improved production.

Improvements in nutrition need to be matched with improvements in genotype so that full advantage can be made of potential production. In the past, many attempts to provide animals with superior genotype have not taken account of the need for environmental adaption or disease resistance. Examples are the introduction of Holstein cattle into wet tropics where they suffer from heat stress and tick borne diseases and the introduction of woolly European breeds of sheep into Asia where they do not cycle because of invariant day length and where they also suffer from bluetongue and other diseases. Fortunately there are also a number of examples of excellent breeding programs. Fiji have developed their own breeds of sheep and goats; Malaysia and Indonesia are using indigenous breeds of sheep in breeding programs and India is using cross bred animals for improved milk production. Village chickens are a largely underutilised source of increased animal production for both meat and eggs. Relatively small changes in husbandry could result in substantial increases in production with only modest increases in input.

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