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**CHANGING
PUBLIC AND PRIVATE ROLES
IN AGRICULTURAL SERVICE
PROVISION:
A LITERATURE SURVEY**

Diana Carney

Working Paper 81

Results of ODI research presented in preliminary form
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Working Paper 81

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Preface

This literature review is undertaken as part of a three-year Rural Resources and Poverty Research Programme funded by the British Overseas Development Administration. The programme focuses on the changing role of the state in natural resources management and the provision of supporting services. One hypothesis driving the research is that as the users of natural resources gain more control, so management of those resources and the scope for poverty alleviation improve.

The programme covers a number of subject areas: agricultural services (including research and extension), forestry, water resources and pastoralism. Individual literature reviews were prepared for all areas prior to fieldwork being undertaken. This working paper is the product of one such review. Preliminary comparative analysis already conducted has allowed us to draw conclusions which are relevant to natural resources management in general (see, for example, Carney, 1995).

The objective of the overall research programme is to derive policy guidelines about:

- how to identify those areas of management and service provision for which the state should retain responsibility
- which other potential providers are best suited to take over responsibilities ceded by governments
- how to manage the process of change
- how the role of the state must evolve so that those activities which it does still undertake are performed with the greatest effectiveness, in terms of meeting the needs of the rural poor (while not unduly compromising other valid objectives, such as increasing overall agricultural production or maintaining biodiversity).

This is the second ODI Working Paper which draws on work done under the Rural Resources and Poverty Research Programme. The first, Working Paper 80 by Hugh Turrall entitled 'Devolution of Management in Public Irrigation Systems: Cost Shedding, Empowerment and Performance' deals with water resources, and a forthcoming paper by Mary Hobley, entitled 'Institutional Change within the Forest Sector in South Asia: Centralised Decentralisation', focuses on issues relating to forest resources.

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1. Introduction

Following independence most developing countries chose to follow 'statist' models of development whereby the public sector controlled all key aspects of the economy. In the agricultural sector this included government dominating or monopolising the supply of physical inputs, credit provision, research, extension and marketing systems, either directly or through specially established agricultural parastatals. Financial crises and extremely poor progress in raising economic and social well-being in many countries have led to a fundamental rethinking of the role of government since the early 1980s (World Bank, 1981; Gros, 1994).

The concepts which now dominate the debate surrounding the role of the state in rural development are effectiveness, efficiency and accountability. All three are related as will be outlined below, but it is important at the outset to clarify the way in which each is used in this review. *Effectiveness* refers to the ability to meet goals, objectives or needs – here these are the goals, needs and objectives of the rural population. *Efficiency* refers to the way in which goals are met – it implies that this is done at as low a cost as is possible without having a negative impact. *Accountability* is institutionalised responsiveness to those who are affected by one's actions. Thus accountability contributes to effectiveness and only institutions which are effective can be classified as truly efficient. In a sense, then, efficiency subsumes the other goals.

The complication is that efficiency, as defined above, does not always coincide exactly with *economic efficiency*. In general economic or Pareto efficiency is achieved when nobody can be made better off without somebody else being made worse off. In the absence of market failures, markets are considered to be the best allocative mechanism for achieving this. However, if governments wish to service the needs of those sections of the population with inadequate purchasing power which are not served by markets, they will need to intervene in pure market allocations. This does not imply that they entirely sweep aside such allocations, but rather that they supplement them in particular areas. According to the definition above they can do so and still be efficient (so long as they adopt the least cost method of doing so), which would not necessarily be true given a narrowly economic definition of efficiency. Such efficiency might thus be thought of as '*social efficiency*'. This is not, however, an easy concept with which to work since it has no natural boundaries. To the extent that it involves meeting people's needs there must always be an additional decision taken about how far the public sector should go in doing this, given scarce resources and inevitable trade-offs between provision in different areas.

After looking at the goals of reform and laying out the framework for analysis this paper analyses each of the major categories of agricultural goods and services in turn: fertiliser supply, seed supply, agricultural research systems, agricultural extension systems, veterinary services, rural credit and agricultural produce marketing services. Examples of changes in supply or supplier are taken from the literature and the economic characteristics of the goods in question are reviewed. The effect of change upon the rural poor is particularly highlighted as are overall improvements in effectiveness in the provision of the goods in question. Lastly, general guidelines for the future are drawn out of the foregoing analysis.

1.1 New goals

Increased emphasis on economic liberalism in the donor community has spread throughout the world to the extent that there is now talk of a new policy agenda or a 'New Political Economy of Development' (Toye, 1991), although this probably gives an overly optimistic impression of the degree of consensus. It is widely held that guidelines as to the areas from which governments should retreat and those where it should maintain a role are best drawn from the market. James and Upton (forthcoming) hold that markets are both 'equitable' and 'sustainable' over the range which they serve. In general, public sector intervention in those areas of the market which do function is not considered efficient (Smith and Thomson, 1991), it should therefore be avoided whenever possible. Exceptions should only be made in areas where market failures occur or where markets do not extend.

The first step towards economic efficiency is therefore to remove any macroeconomic distortions, which will in turn reduce the incidence of market failure and thence the need for government intervention. This has been the main goal of the economic reform programmes imposed as part of structural adjustment loans (World Bank, 1981). Such programmes have, however, been criticised for their rigidity and over zealous cost-cutting which has sometimes left less well-off groups without the basic social and economic infrastructure they require. Poorer groups living in remote areas tend to be ill-served by markets, because they do not have sufficient purchasing power to be attractive to profit-oriented companies, especially given their very complex needs and the high costs associated with reaching them. It is these groups which are most likely to remain dependent upon government, or at least non-commercial suppliers, in the long term.

1.1.1 Improving institutional accountability

Accountability is very much part of the fabric of competitive markets, and increased accountability is one route to enhanced effectiveness, as noted above. In principle, when consumers pay for goods they can use their purchasing power both to express and to enforce the satisfaction of their needs (although this does assume

that consumers are almost fully informed) (Antholt, 1991; Merrill Sands and Collion, 1993).

In areas where governments continue to play a key role, however, increased accountability will have to be deliberately pursued. For the value of accountability lies not only in its contribution to effectiveness and efficiency, but also in the role it plays in strengthening civil society. Public sector cost recovery schemes can contribute to accountability. They certainly increase user ownership of and interest in systems, but unless clients have viable alternative sources of supply they can only withdraw their contributions as a last resort. In addition, at the very least, communication links between clients (the rural people) and the public sector must be open and a public sector incentive structure which evaluates and rewards individuals according to their success in meeting the needs of the client must be in place.

1.1.2 Improving effectiveness

Donors and groups (such as farmers organisations, grass roots movements, agricultural development foundations and non-governmental organisations) within developing countries have been particularly critical of governments' poor records in meeting the needs of the rural population. In some cases governments have recognised their failings independently. Impending elections, for example in Tanzania, or the fear of unrest, for example in Indonesia, have also contributed to the pressure. Whatever the cause of the new awareness, the result is the same; public sector institutions throughout the world are changing.

In the past government monopolies have been insulated from public pressure and research organisations have been isolated from their clients (Antholt, 1994; Sims and Leonard, 1990; Merrill Sands and Collion, 1993). Extension workers have 'transferred' inappropriate technologies (Okali et al., 1994; Röling, 1990; de Coninck and Tinguiri, 1992) and inputs have failed to arrive in time to fit in with the agricultural calendar (Sims and Leonard, 1990). Marketing boards are seen by donors as a particular problem. They are frequently wasteful, corrupt and unresponsive to changes in supply. They have neither provided adequate price incentives to farmers nor, in some cases, viable purchasing structures (World Bank, 1994).

However, the problem has been not simply the potential for abuse inherent in the monopoly situation, but also a fundamental lack of concern on behalf of governments, individuals within governments and donors for rural producers. At best they have been treated as ignorant and in need of modernisation and at worst they have been actively exploited by urban elites (Schiff and Valdés, 1992; Bates, 1981; Jaeger, 1992). Consequently public sector institutions in many countries have made insufficient effort to identify and service their needs, let alone incorporate

them into their own criteria for staff evaluation. The pressure for this to change and for the client (the farmer) to be placed firmly at the centre of an integrated research and extension structure has now become enormous (Kaimowitz, 1990; Röling, 1990; Röling, 1991). Although the task of identifying and serving the needs of rural people in general, and the poorest who are ill-served by markets in particular, remains daunting, new approaches are constantly being developed and tested (Antholt, 1994; Okali et al., 1994). The challenge is for government institutions to adapt as fast as the environment in which they are working. One way for them to do this is to seek more responsive institutional structures through decentralisation and deconcentration and to form partnerships with other actors who have a better record of success in this area.

For in many areas private sector institutions, be they private companies, non-profit organisations or groups of individuals with a direct stake in the good in question (e.g. farmers' organisations) will be the most effective providers of goods and services. Their links with consumers, either through market mechanisms or their use of participatory planning techniques, tend to be stronger. If the public sector focuses on identifying the core areas which are not serviced by such actors it can then concentrate its remaining resources and efforts on a smaller number of issues. Although there is no guarantee that it will be more effective in these remaining core areas, its chances of being so should be enhanced.

1.1.3 Improving efficiency

For governments there are two main aspects to improving efficiency. The first relates to their role as 'manager' of the markets which contribute to overall system efficiency. The public sector must withdraw from areas where markets function and instead invest in the infrastructure which makes markets possible and extends them to poorer areas. This may be either physical, for example roads, or more institutional, for example regulatory mechanisms to reduce consumer risk, well-enforced contract law and better channels for information dissemination.

The second relates to governments' own operations in areas of legitimate involvement and the need to cut costs. Many reforms originated from an absolute need to reduce the financial burden on the state. Donors highlighted many areas of very wasteful expenditure which have been the first targets for reform. In particular, pressure to cut public sector staff numbers has been great since salaries have accounted for an enormous proportion of domestic spending (Antholt, 1994; Nunberg and Nellis, 1990; World Bank, 1994a).

However, it is also becoming increasingly apparent that indiscriminate cost cutting, without regard to the effectiveness of services, is counter-productive in the long term. A more profitable approach is to look for cheaper ways of doing things, for example through: forming alliances with other non-profit organisations in areas

where the private sector does not reach; increasing the use of mass media in extension and putting in place cost recovery schemes in areas which can bear part, but not all, of the cost of provision of goods and services. The sections relating to individual resources highlight efforts made to date.

1.2 Framework for analysis

There has been much analysis of the impacts of structural adjustment and reform programmes upon macroeconomic indicators, such as growth, and social indicators, such as life expectancy and infant mortality. There have been far fewer accounts, however, of the day-to-day effects of changes in terms of access by the agricultural population to goods and services. Most commentators have looked at farmers' responses to price incentives and the reduction of subsidies rather than the mechanics of how the new supply systems function and whom they serve. Neither has there been much attention given to the ways in which governments' activities have changed rather than simply diminished – possibly because this has not yet happened.

The most developed area in the literature is that which deals with the economic characteristics of the goods and services in question (Smith and Thomson, 1991; Umali, Feder and de Haan, 1992; Umali and Schwartz, 1994; Schwartz, 1994; World Bank, 1993). The classification of goods according to the principles of traditional welfare economics and the analysis of market imperfections help to indicate where continuing government involvement is likely to be necessary.

The common framework is to classify goods according to the degree to which they exhibit the two key properties of excludability (those who have not paid for a good are excluded from consuming it) and subtractability (one person's consumption of the goods reduces its availability to others). In general only those goods which are both highly excludable and highly subtractable (private goods) are candidates for private supply (see Table 1). If the supply of other types of goods is left entirely to market mechanisms, the result will be undersupply and a loss of economic

Table 1: Economic Characteristics

<i>Type of good</i>	<i>Subtractability</i>	<i>Excludability</i>
Private good	✓	✓
Public good	X	X
Toll good	X	✓
Common pool good	✓	X

efficiency. Since the marginal social cost of adding a new user is zero it does not make to sense to set prices which will exclude anyone. If, conversely, private goods are subsidised then they tend to be used at levels higher than the economic optimum. Costs will exceed benefits and other criteria for limiting supply will have to be introduced; experience has shown that these are often arbitrarily defined.

The concepts are common to all the literature although the terminology varies slightly. Characterisations are as shown in Table 1 (after Umali and Schwartz, 1994). It should, however, be noted that characterisations based upon welfare economics do not generate immutable laws about supply, as will become apparent in the sections relating to particular goods and services. Under certain circumstances private commercial companies may chose to supply public, toll or common pool goods. The point is that they generally will not.

Government (or other) intervention is also required in the presence of market failures, including: externalities (either positive or negative) when one individual's consumption of goods automatically affects others; risk and imperfect markets; imperfect information (including incidences of adverse selection or moral hazard when buyers and sellers have differential access to information); and increasing returns to scale (Smith and Thomson, 1991).

Both Smith and Thomson (1991) and Umali and Schwartz (1994) disaggregate the flow of goods and services into provision, financing and regulation as well as consumption. This increases the sophistication of their analysis under conditions of market failure. Both sets of authors argue that while government or another collectivity may be required to intervene in any particular sub-sector, the intervention may be selective, limited to one or more of these four activities. Thus, instead of choosing physically to supply a good itself, the public sector could, for example, simply fund private sector provision at optimum levels.

Röling (1990) argues that the Agriculture Technology System (ATS), which comprises all the individuals and organisations working on the development, diffusion and use of new and existing technologies in a given geographic area, and the relations among them, should be viewed and analysed as a whole. For the purposes of analytical clarity, however, the following sections take each of the key goods and services in turn, though the relations and commonality between these will quickly become apparent. The literature relating to each item is grouped according to:

- 1) examples of changes in supply or supplier (pulling out any trends and division of responsibilities, e.g. funding/provision)
- 2) economic analysis of the goods in question using the terminology outlined above
- 3) evidence (if any) of progress towards meeting the new goals of improved accountability, effectiveness and efficiency

- 4) focus on evidence (if any) of effects on the rural poor
- 5) lessons which can be learned from changes to date.

2. Fertiliser supply

2.1 Changes in supply or supplier

Developing country governments have traditionally exerted monopoly control over agricultural input supplies. Access to fertiliser, in particular, has been considered critical to the success of agricultural modernisation and the achievement of increases in production. Governments have thus chosen to manage supplies, directly or through government-sponsored cooperatives, and in many countries to subsidise the price paid by farmers. Funding and production (in this case supply) have gone hand in hand so that where subsidies are in place these are administered through public sector institutions.

Public sector control, with its attendant isolation from farmers' needs and bureaucratic inefficiencies, has resulted in extremely erratic and untimely supplies. Governments have been unable to provide fertiliser due to shortages in foreign exchange (most developing countries import fertiliser) and limited amounts of money available to finance the subsidies. That fertiliser which has become available has usually ended up in the hands of influential richer farmers (World Bank, 1994a). For this and other reasons, most small farmers continue to use no chemical fertilisers, especially in Africa.

The World Bank (1994a) lists twenty-two African countries which, pre-reform, had both controlled markets and subsidised prices for fertiliser. Removing these subsidies and liberalising markets were easily identifiable goals for early structural adjustment loans and by late 1992 only two of these twenty two countries are recorded as having achieved neither. Fourteen are judged to have succeeded in both while six of the original twenty two retain some price controls.

The progress of such reforms has not often been smooth. Both Malawi and Nigeria have reduced subsidies only to raise them again either explicitly, in the case of Malawi, or in Nigeria by failing to adjust the price of imported fertiliser following devaluation (World Bank, 1994a). Other countries, such as Kenya and Tanzania, are recorded as having liberalised markets but the reality is that public sector institutions still dominate supply – especially on the importing and wholesale side (Mans, 1994; Swamy, 1994).

Clearly, though, there is now greater scope for the private sector and farmers' organisations to become involved in fertiliser supply. Retail distribution tends to

entail lower risk and hence be more attractive to the private sector than wholesale supply. Mans (1994) reports that about 50% (by volume) of Tanzania's retail fertiliser is now in private hands. Following reform and decontrol of prices in Kenya the number of retail outlets in interior locations there has increased, although Swamy (1994) notes that over the period of Kenya's reform estimated fertiliser use declined.

In some countries, such as Senegal, cooperatives have stepped in when the government has pulled out of supply. While these can play an important part, especially in remote areas which are ill-served by the private sector, Shepherd argues that they may suffer from many of the same inefficiencies as the government itself (Shepherd, 1989). Many farmers' organisations have also focused on supplying inputs to their members. Bratton and Bingen (1994) argue that the farmers' organisations will tend to focus on the direct provision of goods and services to members rather than aiming to influence broader agricultural or technology policy.

2.2 Economic analysis

Of all the agricultural inputs and services under discussion, fertiliser perhaps comes closest to being a pure private good. It is both subtractable and excludable and farmers have almost always paid at least something for its use. As such it is an obvious candidate for private supply, a fact which has not gone unrecognised by donors.

However, there are some complications. Governments which subsidise fertiliser prices and control supply justify their actions in terms of raising aggregate domestic food production and thereby benefiting the nation as a whole. They receive support for this from Fontaine and Sindzingre (1991) who note that the price elasticity of demand for fertiliser is relatively high, implying that small changes in price can have a significant effect on demand. Assuming that output does increase when fertiliser is applied, fertiliser price rises will therefore reduce output, unless organic substitutes which are equally effective are used.

Concern for domestic food supply is common to governments throughout the world. Some respond by subsidising inputs such as fertiliser and others by supporting producer prices; either choice implies intervention in the functionings of the market (Fontaine and Sindzingre, 1994). The issue is likely to be particularly prominent in food deficit countries, especially where imports are constrained by lack of foreign exchange. It is precisely in these countries, however, that fertiliser use should be economically attractive to farmers – so long as two conditions are met. The first is that some proportion of farmers' output is sold and the second is that prices are market-determined and so will rise when there is a shortfall in supply.

Risk and incomplete markets, factors which, according to Smith and Thomson (1991) might justify intervention in the workings of the market, also complicate fertiliser supply. By raising a farmer's capital expenditure, purchasing fertiliser also increases his/her risk (especially in view of the fact that the full benefits of fertiliser will not be achieved unless there is adequate rainfall). Since farmers tend to be risk averse, fertiliser use will usually fall below the economically efficient level unless governments or other bodies intervene to bear some of the risk (cost) themselves (Smith and Thomson, 1994; Fontaine and Sindzingre, 1991).

Many farmers will not be able to purchase fertiliser unless they have access to credit before planting begins. Credit markets are, however, notoriously incomplete (see below). In the past this problem was often addressed through an 'integrated system' (Fontaine and Sindzingre, 1991) whereby marketing parastatals also supplied farmers with inputs or credit in kind. Their own risk was reduced by their monopoly position which put them in a privileged position for loan recovery and interest collection. They were able to deduct payments at source when purchasing farmers' crops. For this reason Fontaine and Sindzingre (1991) caution against over zealous 'network reforms' (reforms of the network of farmer supply mechanisms) and hesitantly suggest that some form of monopoly might be recommendable. They explicitly advise against applying theoretical microeconomic arguments about efficiency of markets to policy formulation.

The possibility of groups or farmers' organisations working together to overcome some of the problems associated with credit markets is addressed below.

The final complication relates to the potential negative externalities of fertiliser use, in terms of pollution and contamination. Although these may only become important after a certain volume threshold is surpassed in any area, they should be taken into consideration when devising overall fertiliser policy. Government intervention may be necessary in order to extend 'best practices' for fertiliser use or to devise some sort of regulatory framework (See section 9 below).

2.3 Progress towards new goals

Given the imperfections in fertiliser markets, wholesale liberalisation might not, even theoretically, result in an overall improvement in efficiency. Direct payment for goods to private enterprises should, however, increase accountability as long as these enterprises have a relatively devolved decision-making structure and individual rewards are based upon financial performance. The particular problem of timeliness of supply should be ameliorated under these conditions, as long as private traders actually control the timing of deliveries and are not dependent upon other unresponsive organisations for their own supply.

Accounts of change in almost all the countries covered in the literature show that

some elements of former interventionist government policies are retained under new systems. The extent to which full-scale liberalisation has been avoided because governments are aware of imperfections in the fertiliser market or wish to pursue objectives other than economic efficiency, rather than simply being unable to withdraw (either because private enterprise is not ready to step in or because of their own inertia), is not explicitly addressed in the literature.

Private traders have tended to concentrate on the retail side of fertiliser markets in countries such as Tanzania and Kenya (World Bank, 1994a). If market conditions worsen, exit from this side of the business tends to be easier. However, this also means that the private sector must continue to rely on public sector agencies as suppliers. This reduces their ability to enhance effectiveness as ultimate supplies are still in the hands of unresponsive institutions. Shepherd (1989) notes that public sector problems, such as late supply, have been replicated in cooperatives and amongst private traders. Furthermore the scope of gains in effectiveness and accountability are limited because the private sector itself is limited, especially by such factors as inadequate access to credit and foreign exchange and poor profit margins (Shepherd, 1989; Smith and Thomson, 1991; Bates, 1989).

2.4 Focus on the rural poor

Benefits to the rural poor deriving from change in the supply system for fertiliser are limited in the first instance by the fact that most subsistence farmers continue not to use fertiliser, especially in Africa. To the extent that they do use fertiliser or have an unmet demand for fertiliser it is unlikely that overall reforms in the system have benefited them. Since they are marginal users with a low ability to pay yet high service costs (due to spatial dispersion, poor transport systems to remote areas and low overall demand) they tend to fall below the profit threshold for private operators (Smith and Thomson, 1991).

This last factor is common to the supply of all purchased inputs under discussion in this review. The problem is more intense the higher the transport costs involved in taking a particular good to a certain area (this is partly a factor of volume:value ratios and perishability) and the lower the willingness to pay for the good. In the past governments implicitly subsidised the poor living in remote areas – and hence increased their own popularity – by means of pan-territorial pricing policies. Such policies cannot, however, be retained once production (supply) is out of the hands of government as they will simply result in private traders failing to service rural areas. On the other hand, if traders seek to maximise profits, such areas will probably be neglected anyway (as outlined above). The only way, then, for the government to *guarantee* supply to the poorer areas is to continue to provide the goods, or funding for the goods, itself on the grounds of equity – unless local groups or NGOs undertake this function.

Liberalisation of fertiliser markets has often taken place concurrently with cuts in subsidies. Farmers have suffered both because they have had to pay higher prices for their goods and because private traders have been deterred from entering a falling market. This observation is made by Richard Pearce (1992) about the situation in Ghana. It is only in exceptional circumstances that farmers may have benefited. These would arise if supply constraints prior to liberalisation had meant that effective purchase prices were way in excess of the official prices (for example in Nigeria parallel prices reached up to four times the official price (World Bank, 1994a)) or situations such as that noted by de Coninck and Tinguiri (1992) in Niger where official prices rose but were undercut by cheap imports from Nigeria. However, a new price which was double the former official price would still make fertiliser prohibitively expensive for most small farmers, regardless of how this new price related to the former parallel market price.

Aware of the negative correlation between price and demand, some governments, for example Tanzania, have nominally liberalised supply but retained some subsidies (World Bank, 1994a). The problem here is that the retention of subsidies essentially means the retention of the public sector supply system. Private traders are unlikely to be attracted by a market which is still severely distorted by government intervention (Shepherd, 1989). Even targeted subsidies are likely to result in 'leakage' into and hence distortion of the mainstream supply and a reduction in intended benefits to the poor (Fontaine and Sindzingre, 1991).

Another problem for smaller farmers is that they tend to be more risk averse and less eligible for credit than their larger counterparts. To the extent that the privatisation of fertiliser supply entails dismantling the 'integrated network' of input supply/marketing services/credit they therefore lose out. In addition their greater risk aversion implies a steeper decline in their demand, if fertiliser prices rise.

2.5 Lessons

Liberalisation of fertiliser markets has not been easy to achieve. Governments, particularly in Africa, have been reluctant to step back from control of what they consider to be one of the key instruments for modernising agriculture and raising production. Since removal of subsidies has clearly been shown to reduce demand (Shepherd, 1989; Kelly, 1988; Fontaine and Sindzingre, 1991), their concerns may be well grounded.

Private traders have been less willing to step in to fill the vacancies left by retreating governments than might have been expected, though part of this is due to the manner of the retreat. The debate about whether or to what extent entrepreneurs are waiting in the wings for the decision to 'unleash markets' (World Bank, 1994a) has been going on for some time (World Bank, 1989; Marsden, 1990) and is relevant not only to fertiliser supply but to almost all the areas under

consideration in this paper.

Most authors concur in the fact that private trade might need a 'kick start' or some sort of infant industry protection. Piñeiro (1986) sees underdevelopment as 'characterized by a weak private sector' meaning that it is unrealistic to expect the private sector to take over former government activities without some positive encouragement. In Bangladesh Parish (1992) reports that while private traders in general existed at the time that the liberalisation programme got underway, there was a lack of viable mid-level businesses, between bazaar-type dealers and cartels which offered little improvement on government monopolies. Many states have spent decades trying to stamp out any vestiges of private trade which makes it unlikely that entrepreneurs will emerge the moment policy is reversed. This is particularly true in countries where traders have traditionally come from unpopular ethnic minorities and therefore have particular grounds for caution (Bates, 1989). At the very least, private traders will require consistent signals to emanate from government before they are willing to invest. Clearly some of the half-reforms and reversals detailed above do not provide this (Shepherd, 1989; Commander, 1989).

Another concern put forward by some authors is that instead of the efficiencies predicted by free-market economics, what emerges is a class of profiteering and exploitative businessmen who seek rather to find and safeguard monopolistic positions than to compete for normal profits (de Janvry and Sadoulet, 1993; Hewitt, 1992; Shepherd, 1989). If this proves to be the case in the long run, governments must be prepared to step in; close monitoring is therefore required.

Traders themselves require credit and inputs. Shepherd (1989) notes that credit tends not to be forthcoming for them for similar reasons that they might be unwilling to extend credit to farmers – lack of collateral. Thus, in Bangladesh, establishing a substantial commercial credit facility for the private sector was seen to be an essential step in the transition to private supply (Parish, 1992). As regards inputs, traders require a functioning transport and communication system. If they wish to import fertiliser they also require access to foreign exchange and import procedures which do not act as a major deterrent (Shepherd, 1989). Ultimately, though, unless they can be relatively sure of demand, they are unlikely to enter a business such as fertiliser supply which has high capital requirements and may require investment in infrastructure (such as storage facilities to manage the very seasonal demand).

These conditions have frequently not been met, particularly in the adjusting countries of sub-Saharan Africa. The economic environments in such countries tend to be very unstable. Successive devaluations severely affect the fortunes of importers. Demand for fertiliser is also linked to current crop prices; these may change rapidly during periods of transition. Hewitt (1992) reports that after adjustment began in Madagascar in 1982 fertiliser prices rose sixfold in six years. Although the paddy price also rose the ratio of paddy price to NPK price still fell

to 66% of pre-adjustment levels.

Finally, if governments wish to pursue goals of enhanced equity or donors wish to support pro-poor development policies, more effective ways of ensuring the supply and use of fertiliser by the poor will have to be found.

3. Seed supply

3.1 Changes in supply or supplier

Seed supply can usefully be divided into three different aspects. The first is research into new or improved types of seeds, conducted both domestically and internationally. The second is the physical supply of seeds themselves, either wholesale or retail, and the third is regulation. There is no reason why the same institution should be responsible for all functions, though governments, in conjunction with international public sector research institutions (members of the Consultative Group on International Agricultural Research (CGIAR) system), frequently have been so. Even after liberalisation most governments retain responsibility for basic, as opposed to adaptive research (Brenner, 1991)¹.

Non-governmental bodies (NGOs, private institutions etc.) may also do all three things, though some aspects of regulation are likely to remain at least funded by government. It is rare for private sector organisations to restrict themselves to research alone, unless they do so under contract to another organisation. NGOs may be less concerned about sales than commercial companies, but to be effective they must ensure dissemination of their research findings. They usually, therefore, sponsor seed multiplication programmes to support any research they undertake (Cromwell et al., 1993).

Otherwise organisations can operate only at the level of physical supply – producing seeds using technology which has been developed by public institutions. At the limit this would imply the type of exclusive on-growing contract that the Zimbabwe government concluded with the Seed Co-op (Cromwell, 1992). At the other end of the spectrum are small companies and individual farmers who specialise in growing seed for local markets – relying not on exclusivity, but on reliability of supply and high quality, to secure sales (Brenner, 1991).

Bangladesh provides an example of a traditional public sector seed supply system which was designed to provide an integrated service but ended up providing little

¹ It should be noted that very little basic agricultural research – meaning research that is unfocused and pioneering – is conducted in developing countries, and that much of the debate in this area is therefore somewhat academic.

service at all. The Bangladesh Agricultural Development Corporation (BADC) was overgrown, provided poor quality goods and services and, as a monopoly, was unresponsive to farmers' needs. Farmers were therefore forced to rely on locally produced seed and illegal imports from India (Huntings, 1994). Recognition of the shortcomings of such institutions has resulted in major changes in the seed supply networks in many countries.

In Bangladesh a new Seed Policy was devised in 1990. This explicitly called for private sector involvement (in both research and supply) and encouraged BADC to act as a wholesaler rather than a retailer. A new Seed Wing was created in the Ministry of Agriculture to monitor the progress of the reforms and to provide services to the whole system, but particularly the private sector. The Department of Agricultural Extension was charged with the responsibility of feeding back information on farmers' needs. Overall support was to be provided by various donors (Huntings, 1994).

This last factor – donor support and/or pressure for reform – is common to the seed sectors of many countries. For example, in the Gambia seed reform was part of the 1985 Economic Recovery Programme. The public sector monopoly on groundnut seed was lifted and the private sector was expected to take over seed supply in the long term (though Cromwell et al. (1993) argue that it has not yet taken on a major role). In the interim donors were to support NGO and government seed projects. An FAO fertiliser project, for example, was designed to encourage groups of farmers to multiply seeds, to spur private sector development.

Where donors are not involved, international influences often come in the form of multinational seed companies such as Cargill and Pioneer. The literature here covered does not suggest that these companies force the opening up of seed sectors in various countries. However, authors such as Grobman (1992) argue that in countries where the seed markets are large enough to be attractive to multinationals, these will soon dominate unless governments specifically promote domestic companies. Multinationals have a particular advantage in research because they can spread its high costs over the many markets in which they operate and transfer technology from one to another. Domestic companies, which tend to be more resource constrained, usually limit themselves to seed multiplication and supply, where their local knowledge can give them a competitive advantage. Often the two types of company form partnerships to capitalise on joint strengths. In certain countries multinationals are obliged to link up with domestic companies if they wish to enter the market.

In Turkey, considered one of the success stories of seed market liberalisation, about thirty foreign companies now operate in conjunction with local partners. Before liberalisation in Turkey only 1.5% of total seed production was in private hands. Five years later, in 1990, 96% of hybrid maize was produced by private companies (Dalrymple and Srivastava, 1994; Srivastava and Jaffee, 1993). Governments, for

their part, might recognise the advantage of association with multinationals. Thus, in 1988, the Malawi government sold a controlling interest in ADMARC, the state-owned seed distribution company to Cargill (Cromwell, 1992).

The role of NGOs, both international and domestic, in the seed sector varies enormously. Cromwell et al. (1993) study the activities of eighteen NGOs in nine countries. These range from multiplication of non-accredited seeds with no local testing to the establishment of formal, local breeding programmes. In almost all cases seed is sold, though frequently at prices below those prevailing in the market.

Farmers' organisations are also active in the seed sector, particularly in areas where government supply has failed. As noted above, successful supply of physical inputs to members can be an effective way of enhancing member loyalty, hence group cohesion and the scope for collective action. While smaller organisations are likely to operate only at the level of semi-formal supply, the larger and richer farmers' associations can conduct their own research. For example, Seed Co-op in Zimbabwe runs its own research station (despite exclusive rights to seeds developed by the NARS) and invests 1.5–1.75% of its turnover in research. In Ecuador, the NGO CESA (the Ecuadorian Centre for Agricultural Services) helps farmer associations with seed production (Bebbington and Farrington, 1992; Bebbington et al., 1993). Formerly CESA had to compete with private operators for access to seed produced from INIAP (the Ecuadorian national agricultural research institute), but in 1991 it signed an agreement for preferential access (Cromwell et al., 1993).

The third important aspect of seed supply is regulation. According to Grobman (1992) there are two distinct activities which are often confounded under this single heading: seed certification and seed quality control. The former is a methodology for ensuring that varieties developed in public institutions are true to type, and hence is limited in scope, while the latter is required for all seeds as a protection for customers, given the dangers of adverse selection and moral hazard (see next section).

Seed certification must, then, be sponsored by the public sector, though it can be actually performed by a private organisation (as in the USA (Grobman, 1992)). The Zambia Seed Company – a commercial organisation which nonetheless remains in the public sector – is monitored through the Seed Control and Certification Institute. This is currently a public body, but Cromwell (1992) argues that were it allowed to retain the fees which it collects it could become financially autonomous.

Seed quality control can be performed by the public sector – indeed Grobman (1992) argues that the government must have a role in this and should perform spot checks on producers' output. Non-governmental bodies can also regulate themselves, individually or in associations. Visible quality control mechanisms are often used by companies to try to distinguish themselves from their competitors in order to gain commercial advantage. In Turkey companies responsible for about

10% of seed production are members of the Seed Industry Association which regulates itself in conjunction with the Ministry of Agriculture. Unfortunately regulation for non-members remains rather haphazard which increases the risk to purchasers (Dalrymple and Srivastava, 1994). In Peru Srivastava and Jaffee (1993) report the existence of almost thirty private companies which have entered the market since liberalisation began in 1980. These account for a rapidly increasing proportion of overall seed supply. Quality control is provided by regional seed associations (which also provide technical support to farmers who wish to grow seed themselves), four out of eight of which are self-sustaining.

Cromwell et al. (1993) report that about half the NGOs they studied execute strict quality control testing while one quarter are nominally linked to government quality-control agencies. These may or may not have the resources to reach the scattered NGO production sites.

3.2 Economic analysis

Seed technology is subtractable, but except in the special case of hybrids, it is not excludable. Open-pollinated varieties can be reproduced by farmers themselves and passed on through the very active informal seed distribution mechanisms which exist in most areas. This makes them common pool goods (Umali and Schwartz, 1994).

There are clearly no barriers to private companies researching into or producing such seeds. Brenner (1991) identifies private companies in three out of four of the countries which she studied (Thailand, Brazil and Mexico) which do just this and Venkatesan and Schwartz (1992) argue that private companies tend to favour seeds research as an entry point into the whole area of agricultural research. However, private companies will often not find it economically attractive to produce seeds of open-pollinated varieties, unless they have clear advantages in terms of quality and reliability of supply which enable them consistently to capture significant market share. Brenner (1991) suggests that larger companies are generally interested in producing open-pollinated varieties only while they are in the process of developing hybrids. Rather than looking for a sustainable profit stream from their early products, they use open-pollinated varieties to establish a reputation and develop their distribution mechanisms. Otherwise only small, localised firms with low overheads are likely to compete in such markets.

In the absence of such companies some intervention in the seed sector is likely to be required, either by government or non-profit organisations. Farmer retention and informal seed distribution will always account for a majority of the seed sown each year in developing countries (Cromwell et al., 1993). However, there should still be at least one alternative source of seed available to farmers. Where NGOs have recognised that farmers' needs are not being met they have sometimes stepped into

this role. Cromwell et al. (1993) criticise NGOs in their study, however, for basing their intervention more on their own policy agendas than on a sophisticated understanding of the needs of the communities with which they are working.

Governments themselves can become suppliers. They can also, arguably, intervene to make open-pollinated varieties more attractive to private companies. This brings up the whole issue of intellectual property rights and patent protection (Grobman, 1992; Evenson and David, 1993). Some developed countries have systems of plant-breeders rights in operation, but Brenner (1991) questions whether these could be enforceable in developing countries and Dalrymple and Srivastava (1994) suggest that they might not be appropriate until the seed industry has reached a certain level of maturity. Before this time, they argue, added regulation would be more likely to stifle than encourage creativity.

Hybrids, on the other hand, demonstrate qualities of what Brenner (1991) refers to as 'patent-like protection'. Their full benefits can only be captured by farmers if new seed is purchased each season and they can, therefore, be considered private goods. Thus the reach of hybrids in any country will, other things being equal, determine the involvement of the private sector. Where hybrids are suitable for cultivation, farmers are only likely to be willing to pay the relatively high prices required to recoup companies' development costs, if quality control is stringent. Hybrid-producing companies thus have an incentive to regulate their own quality and little intervention by government should be required (except, perhaps, to prevent counterfeiting by others).

However, for other companies and in production of lower cost seeds, the adverse selection and moral hazard problems are expected to be significant. Adverse selection is the economic name given to the problem which occurs when purchasers, unlike vendors, are not able to judge the value of the good at the time at which the sale is made (Umali et al., 1992). Except where seed is obviously damaged, farmers will be unable to judge how it will perform when planted and therefore their purchase will be more risky than is desirable. This might lead them to underinvest (Smith and Thomson, 1991). Complicating matters further is the fact that even if the seed appears to fail, other factors (weather, soil conditions, pests etc.) might be blamed – this introduces moral hazard. Because the performance of the seed depends not only on its own quality but also upon a range of other factors which are out of the control of the vendor, it is not possible for the vendor to attach a guarantee to the seed at the point of sale. While such problems are not entirely soluble, government regulation can help (Grobman, 1992). In general, Smith and Thomson (1991) note that governments have a competitive advantage in regulation because of their legitimacy in coercion, although transaction costs associated with regulation can in some cases, they argue, outweigh its benefits.

Other concerns which might militate towards continued government intervention in the seeds sector relate to the protection of genetic diversity through seed

breeding programmes (Brenner, 1991) and the nature of basic, as opposed to applied, research. Both are addressed below (see sections 8 and 13).

3.3 Progress towards new goals

The entry of new suppliers into the seed sector has, in general, benefited farmers by improving the variety as well as the sheer quantity of seeds available (Srivastava and Jaffee, 1993). For example in Mexico poorer farmers who receive subsidies for seed purchases can now choose between public and private sector varieties (Brenner, 1991). Private companies are also reported to be more responsive to farmers needs and to give more technical advice with their seed sales (Srivastava and Jaffee, 1993).

Public sector organisations are not, however, necessarily non-functional. Cromwell (1992) characterises the public sector (though commercially oriented) Zambia Seed Company as 'an efficient and reasonably effective seed organisation'. Perhaps the greatest difficulty with public sector seed organisations is that they have always attempted to provide national coverage which Cromwell (1992) notes is likely to be far more expensive and difficult than running a series of regional seed networks.

One fact noted by a number of authors (Brenner, 1991; Dalrymple and Srivastava, 1994) is that individual researchers will be more productive in the private sector because of their greater access to resources. Brenner (1991) illustrates this by analysing Mexican maize research budgets in 1987. Twenty five private seed companies together spent \$1.7m on research, equivalent to \$113,000 for each research station and \$61,000 for each scientist. The National Research Institute's maize budget was less than half this amount, despite the fact that it was supporting the same number of research stations and three times as many scientists (though there is no suggestion that simply raising the amount of resources available to public sector researchers would solve all their productivity problems).

A study by Echeverria cited in Dalrymple and Srivastava (1994) shows that tropical countries in which multinational corporations are conducting more research have a higher yield of maize. The suggestion is that the involvement of the private sector improves the efficiency of the seed sector, although the extent to which the effect is due to hybrid density rather than private sector involvement, per se, is not very clear. In any case overall efficiency gains may be reduced if the public sector refuses to withdraw from areas where the private sector is active. Brenner (1991) argues that the public sector may want to 'keep up' with private work on hybrids, for example, as this may represent the cutting edge of research. The result is wasteful duplication. Some countries, such as Mexico, have demonstrated a willingness to withdraw. The Mexican seed parastatal was established in 1960 with a mandate over twenty three crops. In 1989 this was cut to just the four main staples: maize, rice, beans and wheat.

NGOs attempts at seed supply have been complicated by mixed relief/development motives (Cromwell et al., 1993). They have tended to be more responsive to local seed requirements than public sector agencies. However, they are criticised for lack of efficiency, a failure to coordinate with other agencies and a rather unsystematic approach which has prevented them from understanding who is gaining and who is losing from the seed supply mechanisms which they are supporting. Together these problems may reduce the scope for sustainability in their projects, after their funding and expertise are withdrawn.

The clear consensus in the literature is that the seed sector, and farmers in general, will benefit from the involvement of various different types of actor. However there is plenty of scope for this benefit to be reduced by duplication of effort, both between different actors and between the formal and the informal (farmers' own) seed supply systems.

3.4 Focus on the rural poor

In much the same way that most of the poorest farmers do not use fertilisers, most of them are also outside the formal seed supply system. Since they rarely buy seeds (only about 20% of seeds used in developing countries are produced by formal suppliers (Cromwell et al., 1993)), changes in the formal seed system have very little impact upon them. Even NGO projects have involved the sale of seeds and have therefore excluded them. These projects have also tended to support richer farmers who have the capacity to multiply seeds for local supply and have built on traditional supply mechanisms which have often been dominated by local elites (Cromwell et al., 1993).

In countries where the private sector is active it has tended to focus either on hybrid seeds or on richer areas. Indeed Brenner (1991) notes that in both Mexico and Brazil both private and public systems focused on more favoured areas. Cromwell (1992) argues that private companies are unable to extend their reach by cross-subsidising sales to more remote areas with resources generated from sales to richer areas because of the power of the richer farmers themselves.

In parallel with the fertiliser sector, traders are unwilling or unable to meet the needs of smaller farmers by providing tiny quantities of seed in remote areas. Yet there is little evidence in the literature of government refocusing its own efforts on poorer farmers, having withdrawn from those areas which are attractive to the private sector. Neither do the authors address the issue of the relative costs of privately and publicly produced seeds. It is therefore impossible to draw general conclusions as to whether seeds have become more accessible and more affordable – the two criteria which Srivastava and Jaffee (1993) single out as being of critical importance.

Certainly in Zimbabwe small farmers do not benefit from the fact that the government has granted long-term rights for reproduction of government-researched seed to the Seed Co-op which is controlled by large scale commercial farmers. As a virtual monopoly Seed Co-op operates a cost-plus pricing arrangement but appointed distributors have developed cartels based upon geographic monopolies and have raised prices still higher. Past government attempts at price control have simply resulted in a decline in supply in rural areas (Cromwell, 1992).

If poorer farmers are really to benefit they will require training schemes, run by either government or NGOs, which help them improve the quality of the seed they grow themselves (Cromwell et al., 1993). Certainly national suppliers, either public or private sector, are unlikely ever to meet their diverse and very location-specific needs.

3.5 Lessons

Many of the lessons to be learned from early efforts at reform in the seed sector are similar to those in the fertiliser sector. The most obvious of these is that reform will tend disproportionately to benefit the relatively better off farmers unless special safeguards for the poor are built in. A second is that the government might need to provide some active encouragement to private traders if reforms are to increase the availability of seed (Cromwell, 1992).

Strong seasonality in seed supply means that traders have to carry high inventories for which they need adequate storage facilities. Entry therefore requires a significant amount of capital, which Grobman (1992) argues the government might need to provide, at concessional interest rates. Governments can also not expect private traders to enter markets which are still subject to severe distortions. For example in Malawi liberalisation began as part of the first structural adjustment loan of 1981. By the late 1980s few private traders had established businesses since prices were still controlled and margins were therefore insufficiently attractive, especially given the very poor transport infrastructure in the country (Cromwell, 1992). Dalrymple and Srivastava (1994) report that in both India and Pakistan the development of the private sector has been severely impeded by subsidies to the public sector and very low official prices, although they also note that both countries provide tax incentives to companies which conduct research.

Another lesson common to the two sectors is that the complexity of existing systems and linkages between sectors should not be underestimated when planning reform, as this might lead to unexpected results. Thus when the seed market in Zambia was liberalised in 1990 and the Provincial Co-operative Unions there lost their position as monopsonistic purchasers they also lost their access to credit. Instead of facing up to new and potentially beneficial competitive influences (they tended to be very corrupt) they ended up unable to purchase seed at all. Some seed

was sold through other bodies, such as NGOs, but these were new to the business and not well organised and general seed availability fell (Cromwell, 1992). Private traders failed to step forward partly because the margins to be made in agricultural trade were perceived to be very low.

Problems of sequencing of reform have also been evident in the seed sector (Cromwell, 1992). Seed purchases, like fertiliser purchases, will be affected by the price paid to farmers for their crops. Where these do not rise as fast as seed prices, demand for purchased seed will fall. In Malawi the producer and seed prices for groundnuts converged and seed ended up being consumed as food. In Zimbabwe, on the other hand, producer prices for all varieties of sunflower seed were the same which meant that farmers had no incentive to purchase the seeds of varieties with a higher oil content. Such a situation damaged both the seed suppliers and the government as the purchaser of inferior grade sunflower seeds. Availability of fertiliser will also have a significant effect upon demand for modern seed varieties (Cromwell, 1992).

Finally, all authors emphasise that the public sector role in the seed sector will always remain, especially in small and poor countries which would not be attractive to multinationals even were markets to be liberalised (Dalrymple and Srivastava, 1994). Market imperfections, especially those relating to non-hybrid seeds, are sufficiently great that wholesale privatisation would be likely to result in huge gaps in supply and regulation. The scattered efforts of NGOs and farmers organisations would not adequately fill these (Farrington and Bebbington, 1993) nor compensate for the loss of the reach of the old-style parastatals (Cromwell, 1992). In addition, perceived risk associated with new varieties might deter planting unless governments are able to sponsor their adoption in the first place.

4. Agricultural research systems

4.1 Changes in supply or supplier

The outputs of national agricultural research systems, the traditional suppliers of formal research in developing countries, are increasingly being supplemented by private, cooperative or NGO research efforts. Following Hobbs and Taylor's analysis of private research in Kenya, six different types of supplier of agricultural research can be identified (Hobbs and Taylor, 1987). Some, but not all, are also involved in extension.

The first type are multinationals, many of which are also active in the seed sector, which conduct commodity-specific research for their main crops. As an example Hobbs and Taylor cite BAT which, at the time of writing, employed nine tobacco

researchers and one hundred and fifty extensionists.

The second type are national companies. Hobbs and Taylor suggest that these might be driven into research at times when lack of foreign exchange limits imports. Thus Kenya Breweries, faced with a crisis over imports of malting barley, developed their own local variety.

The third type are family enterprises. Because of limited resources, these do not engage in any extensive research but they might at times employ certain individuals to help them solve specific problems. The advantage that they have over their competitors is their closeness to and knowledge of product markets. This enables them to pinpoint very specifically what they are aiming to achieve, making their research very focused and usually fairly short-term.

The fourth type are commodity boards. These can be important sources of research and extension for the key export commodities in a country or region. For example, the Tea Research Foundation of Southern African countries, based in Malawi, is considered to be at the forefront of tea research (Venkatesan and Schwartz, 1992). Research is usually paid for by a cess on commodity sales which gives these autonomous institutes a reliable source of funds enabling them to conduct more long-term research than some of their private counterparts.

The fifth type are non-governmental or non-profit organisations. These usually conduct research as part of integrated research/extension and rural support programmes. For example in Bangladesh the Mennonite Central Committee conducts research on soya production and then operates training programmes in marketing and extension. According to Bebbington and Farrington (1992) most NGO research is at the adaptive end of the spectrum – they adapt new technologies to suit local needs. However, there are also examples of NGO research, such as the Bharatiya Agro-Industries Foundation work on artificial insemination in India, which is both long-term and ground-breaking.

In the final category are farmers themselves. It is clear that farmers conduct their own research, to varying degrees. The challenge for other researchers is to identify and build on this, where possible, rather than sweep it aside (Okali et al., 1994).

While all these suppliers can work on their own, partnerships which combine the different skills of the different suppliers may well be more fruitful and sustainable. In Zambia commercial farmers and commodity organisations together own and manage a 700 hectare research farm (Venkatesan and Schwartz, 1992) while in Mali Ceiba-Geigy has supported the establishment of an agricultural research station in conjunction with the public sector research system. In general, NGO/public sector partnerships, especially in on-farm research are becoming more common (Bebbington and Farrington, 1992).

In Latin America another hybrid source of agricultural research and extension has emerged in the form of donor-funded agricultural development foundations. Since 1984 five such foundations have been established with the assistance of USAID. These are specifically science-based institutions which support both public and private research and extension programmes in addition to conducting their own work. For example FUNDAGRO in Ecuador works with the national research service and FENECAFE (the Federation of coffee cooperatives) to improve the cultivation of coffee. It provides coordinators for the extension programme and funding for operational expenditures (Coutu and O'Donnell, 1991; Umali and Schwartz, 1994).

One other change in supply, rather than supplier, results from the efforts that some governments have been making to decentralise their own national research systems in order to make them more responsive to local needs. For example Mali's Commission on Decentralisation mandated the creation of regional centres with financial and administrative autonomy in the IER (Institut d'Economie Rurale), the main institute for agricultural research (Collion, 1994). In Israel regional R&D authorities are operated as independent units and draw on sources of local funding, although the Ministry of Agriculture, which provides the remainder of the funding does also draw up a list of national research priorities (Blum, 1991). In Chile, on the other hand, the Agricultural Research Institute (INIA) contracts research through regional Centres for Adaptation and Transfer of Technology drawing in both farmers' organisations and NGOs (Ashby and Sperling, 1994).

4.2 Economic analysis

Like seeds, different types of agricultural research have different economic characteristics. Once again the pivotal issues are appropriability and saleability of the results of research. Hobbs and Taylor (1987) distinguish between mechanical, chemical, biological and agronomic research. These they consider to be in a descending order of attractiveness to the private sector, according to their economic characteristics. At one extreme, mechanical technology is highly excludable and subtractable. At the other lies basic agronomic research which has neither of these attributes. Private sector companies will, therefore, be reluctant to invest in it; with no intervention this will result in a socially sub-optimal supply of the goods (Smith and Thomson, 1991; Umali and Schwartz, 1994). In most developing countries, however, a lack of human and financial resources means that basic research is not conducted domestically, rather it is 'imported' in product form or through the CGIAR system.

Evenson (cited in Pray and Echeverria, 1991) distinguishes types of technology not by their subject, but by their stage. He talks of pre-technology, prototype technology and usable technology. The private sector focuses on the last of these but he believes that government should play a role at each stage. This is because

private firms base their investment decisions not only upon the degree of appropriable gains from research but also on market factors and technological opportunities for innovation (Pray and Echeverria, 1991). Government intervention is thus justified not simply to remedy public goods problems, but also to stimulate the flow of technology in the market and to help overcome the most difficult technological barriers which might otherwise reduce private sector research.

According to Evenson, pre-technology is a public good and therefore requires full government support. Prototype technology may be a private good but if markets or firms are small (which is often the case in developing countries) then some government support is likely to be required – particularly to mitigate the risk of large investments in research. Usable technology (so long as it is also saleable) is a private good; government involvement here is limited to the promotion of technological competition through enhancing the functioning of the market (Pray and Echeverria, 1991).

Once again, no authors put forward the view that the government should withdraw from research related activities entirely. Rather they stress the potential complementarities of different sources of research. Cleaver (1993) suggests that these will only be fully realised if a national agricultural research masterplan is drawn up. Such a plan would aim to consolidate and define all the various research efforts conducted by government, universities, donors and the six different private suppliers identified above and in so doing would lay out the scope for collaboration. It would also provide information to help the refocusing of government research efforts, on the understanding that the government acts almost as a supplier of last resort.

Such a reorientation and functional reorganisation of public sector research is also called for by Piñeiro (1986). As private companies begin to dominate the market for 'usable technology' (which functions reasonably efficiently), the public sector must focus upstream on public goods provision. He warns that unless this is done at a national level, private domestic companies will suffer in relation to multinationals. He discusses whether the public sector should become a direct supplier to private research, responding to particular requests, and concludes that, given the weakness of many public institutions, this should be the case. Since public institutions are so far removed from the needs of the customer, they are more likely to achieve value for money, efficiency and accountability if they respond to openings identified by the private sector than if they define their own agenda in isolation. However, he also believes that if this is the case, private companies should be made to pay for the service they receive from public institutions.

4.3 Progress towards new goals

Private sector research, especially in Africa, is still very much in its infancy. Pray and Echeverria (1991) calculate that the private sector rarely accounts for more than 10% of overall national research expenditures. Although they make no estimate of the percentage of valuable results which this 10% generates, they do emphasise that results are more impressive because of the greater emphasis on linkages (between farmers, researchers and technology transfer agents) in the private sector.

Hobbs and Taylor (1987) concur in this. They believe that private sector research has advantages in being appropriate, having good extension and rapid, painstaking and accurate reporting on all financial expenditures. Antholt (1994) is also a supporter of the private sector. He cites the example of the rubber, tea and coconut research institutes in Sri Lanka which used to be efficient when funded by private industry but since nationalisation, have become far less so.

Pray and Echeverria (1990) believe that better linkages between research and marketing in private companies generate more marketable products. As an example they cite two Virginia tobacco breeding programmes in Bangladesh, one public sector and the other run by the private Bangladesh Tobacco Company. The private sector company has identified the importance of smoking quality to tobacco acceptability and rigorously tests and measures this in its new varieties. The public organisation has no testing facilities and, as a result, continues to produce varieties which have low leaf quality, fetch low market prices and are rarely grown by farmers. This also provides an example of duplication of effort resulting in wasteful use of public resources.

One result of diversification of supply in agricultural research is that individual researchers have more choice as to where they will work; indeed there is likely to be competition for human resources (Piñeiro, 1986). This is seen as having a positive impact in terms of the dynamism of the system as a whole. Researchers themselves are considered to be more productive in the private sector as they have greater access to resources (Dalrymple and Srivastava, 1994). However there are drawbacks as well. If all the high quality researchers are working in the private sector, Piñeiro (1986) suggests that this will dangerously erode the public sector support base. Farmers will look elsewhere for solutions to their problems and cease to lobby on behalf of the national research system (this argument presupposes that the farmers have at some time had confidence in the public sector research system). The problem is compounded by the fact that if the public sector focuses on basic research, its results will become increasingly less visible to consumers. Piñeiro's hypothesis is that as agricultural development takes place, further change becomes more dependent upon the use of improved inputs. These will be closely associated with their suppliers who will consequently be seen as the catalysts of such development, regardless of whether initial research findings in fact came from the

public institutions. The end result could be a reduction in the capacity of public institutions to perform vital basic, or supporting, research.

This is a problem which Jarvis (1994) has identified in Chile. During the fruit boom of the 1970s the government effectively withdrew from research into export fruits. At that time private companies readily took its place. However, now that the boom is over the kind of adaptive research that they were conducting is less productive, especially since most of the relatively easy gains have already been made. What is required now is basic research but private companies are unwilling to invest in this and the government's capacity to do so has severely diminished. The overall effectiveness of the system has thus declined.

Decentralisation of public institutions along the lines of Mali's efforts can increase local participation and accountability. It is particularly important in countries such as Israel, where the very distinct agroecological environments in different regions require separate approaches. However, in such cases the emphasis must be on effective communication between different regional institutes to avoid wasteful duplication (Blum, 1991). Also, in isolation, decentralisation will solve few problems. In Mali it was felt necessary to supplement the benefits of the decentralised structure by establishing Research Users' Commissions at both central and regional levels to institutionalise consultation into the technology generation process (Collion, 1994).

4.4 Focus on the rural poor

Once more, by not being in a position to purchase the technology which is generated by private sector research, the poor have gained less than the relatively better off farmers from diversification in the supply of agricultural research. Commodity boards tend to deal with export crops which are usually less important to the poor than food crops and NGO research efforts are not generally broad in their coverage. The issue of trends in overall research spending in developing countries is not addressed by the literature covered here, and thus the extent to which private research adds to, rather than substitutes for, public research is unclear.

On the other hand, even if the poor do not benefit immediately they are likely to benefit from overall increases in the supply of agricultural research in the long term. (If private research organisations are more productive than their public sector counterparts, as most commentators argue, then the stock of research results will increase even if overall expenditure on research remains static). The price of new products frequently falls over time as manufacturing techniques improve and competition in supply increases. Non-paying farmers can also benefit from spillovers; information which forms part of new product packages may prove to have broader applicability.

Finally, changes in the supply of research have been coupled with an overall effort to enhance the responsiveness of all research to the needs of the rural poor. ISNAR studies show that this has been extremely difficult to achieve (Merrill-Sands and Kaimowitz, 1991), but certainly this is becoming an increasing focus of attention in many public research institutes, especially those which have received donor support. There has been much attention paid to using participatory techniques to facilitate the involvement of resource poor farmers in the technology generation and transfer process. Various group approaches, ranging from specialised research groups established by public sector organisations to self-sustaining groups of farmers who interact with research institutions on their own terms, have been examined. None fully solves the problem of representation of the interests of the very poorest farmers but all have certain strengths (Bebbington et al., 1994).

4.5 Lessons

Most authors follow Pray and Echeverria (1991) in asserting that there are a range of different reasons for government intervention in agricultural research. Evenson and David (1993) argue that in the rice sector passive reliance on the private sector would not have generated anything like the technology improvements which have been witnessed over the last thirty years. They also emphasise that rice research and extension must be guided by 'informed public policy discussion'. Private research should complement public research but it should not steal the agenda from the public sector entirely. The extent of this complementarity, Pray and Echeverria (1991) argue can only be gathered by empirical investigation of each individual country and research system, and thus general lessons are hard to draw in the research sector.

5. Agricultural extension systems

5.1 Changes in supply or supplier

In many people's minds extension and government are indissolubly linked. Yet elements of privatisation and diversification in supply of extension services have been witnessed throughout the world over the past two decades. Developed countries such as Britain and France have made enormous steps towards complete privatisation of their services and other countries as ideologically diverse as Chile and China have moved to new contractual extension arrangements.

In some countries, particularly in Latin America, the private and non-governmental sectors have been actively brought in by the government. Antholt (1994) argues that in Asia, on the other hand, this has not happened, even when the importance

of the private sector has been recognised. Active encouragement of non-governmental participants is most effective when the government is willing to retain responsibility for a large part of the cost of the service, at least while the new providers are getting established (this is tantamount to infant industry protection). In practice this means that governments stipulate a period over which they will finance extension services but subcontract actual delivery. For example the National Extension Service (NES) in Zaire invited local NGOs and private cotton companies to provide extension in their local areas. NES provided training, equipment, funding and monitoring.

Most of the clearest examples of this type of government policy are drawn from Latin America, where both private trade and civil organisations are more developed. In Costa Rica the World Bank is supporting a project in which farmers are allocated vouchers which they can then use to contract in private extension services. The government trains the new extension agents and aims to phase out vouchers after seven years, leaving farmers to make direct payments to private agents (Ameur, 1994).

Chile's first attempt at privatisation, the replacement in the early 1980s of the Agricultural Extension Service by a Private Technical Assistance scheme, failed because of the 'false assumption that there is a market of technical assistance in the rural areas of Chile' (Berdegué, 1994). After this experience a more gradualist approach was taken. In 1986 the Agricultural Development Institute (INDAP) introduced subsidised private consulting services for smaller farmers and drew up a plan to discontinue public services to medium and large farmers. Those farmers who remain eligible for public services are assessed and grouped according to their access to resources and their productive potential. The poorest ones become the beneficiaries of a scheme which has a primarily social emphasis (PTTB) and for which they make no financial contributions (although a 15% contribution is planned). Better endowed farmers are catered to by a more market-oriented scheme. This focuses on commercial development and incorporates increasing farmer contributions over the years (PTTI). In both cases farmers receive services as members of groups rather than as individuals. Firms and NGOs seek certification by INDAP to allow them to bid for contracts to provide extension services in a particular area. The recipients themselves draw up a medium term agricultural development plan for their locality, with the assistance of private consultants who are hired directly by INDAP. By 1988/9 over eighty TTCs (technology transfer consultancies) were involved in PTTI and twenty nine in PTTB (Wilson, 1991; Ameur, 1994; Umali and Schwartz, 1994). Berdegué (1994) reports the breakdown by type of these TTCs in 1994: 60% private commercial companies, 22% NGOs, 15% small farmer organisations and 3% universities.

In both Chile and Costa Rica new providers (private agents) are combined with new sources of financing – the beneficiaries themselves. However, cost recovery from beneficiaries can take place without a change in the physical supplier of

services. This has been the case under a World Bank project in Mexico where the public sector still supplies the services. Once again, farmers are stratified according to wealth and those in the richer, irrigated areas must pay up to 50% of the costs of extension services and 100% for personalised services such as soil sampling and animal feed mix formulation. After a three year period of intensive services, the level of provision is reduced unless farmers wish to take on the whole cost of intensive services themselves (Wilson, 1991). This project is also experimenting with cost cutting measures through innovative methods such as increased use of information technology (Umali and Schwartz, 1994).

Under a decentralisation programme in Colombia the federal government is withdrawing from extension provision, including financing, in favour of the municipalities. These must pay for services out of local taxes. Instead of providing actual services, the role of The National Research Institute is now to train both private and public extension agents from the municipalities (Wilson, 1991). Such a model of decentralisation and mixed public/private services is perhaps best operated by China. There, groups of farmers sign contracts for the provision of extension advice with Agrotechnical Extension Centres (which operate all the way from the national to the township level) as well as research institutes, universities and individuals (Ameur, 1994).

Private sector involvement in extension is not, however, limited to taking over the functions formerly performed by public sector institutions. Schwartz (1994) and Umali and Schwartz (1994) list numerous different forms of extension by private companies. The most simple is when private input supply companies – often the same companies that were discussed in the previous sections on seeds, research and fertiliser – provide information with their products. This acts as a marketing device.

Schwartz (1994) notes that private extension is generally not a stand-alone activity but will be provided where three conditions hold. First, purchased inputs must be necessary to achieve desired production results. Second, these purchased inputs must be cost effective relative to output prices. Third, there should be a fairly high degree of competition between input suppliers for the same market share. This latter condition is probably too extreme in that potential competition could be just as good a catalyst to the provision of product advice as actual competition.

However, private sector extension may be provided not only by companies wishing to sell to farmers, but also by those wishing to purchase from them. As Schwartz (1994) notes, extension advice may be provided both to increase product quality to the benefit of the purchaser and as a way to promote partnership with suppliers. This latter point is important especially where several firms are competing to purchase the same produce. In Kenya private companies have introduced new technology for producing high quality horticultural goods. In order to benefit from the investment that they have made in research and providing advice, they must ensure that the farmers sell to them. Thus they often have to expend resources on

'policing' so that produce is not 'poached' (Schwartz, 1994). Any loyalty-building extension advice can reduce the need to do this.

Both motives (i.e. increasing quality and enhancing partnership) are apparent in the provision of extension advice in the dairy sector in Argentina. A recession there in the mid 1970s made other types of agriculture relatively more attractive to farmers. Threatened with a loss of raw materials, two dairy plants, the cooperative SANCOR (Santa-Fe Cordoba United Cooperatives) and a private company, La Serenissima, moved into dairy development. SANCOR established an extension and artificial insemination service for cooperatives and small groups of farmers. La Serenissima targeted medium and large scale farmers with media broadcasts and publications through five regional offices with over one hundred professional staff. Both efforts resulted in significant increases in the amount of milk delivered (Umali et al., 1992).

Groups of companies, in the form of producer associations, can also provide extension advice. Such associations act, in some ways, as publicity arms for their members and as such they tend to be more ready than individual firms to engage in activities without immediate commercial benefits. In Zimbabwe the Agro-chemical Industry Association has a safety programme which tries to find packages of protective clothing which are more affordable for small farmers and in India the Fertiliser Association publishes literature and has set up hundreds of demonstration plots (Umali and Schwartz, 1994).

However, as in research, it is not just private companies which are moving to supply extension services. Individuals within the government extension services may supply advice on a private basis. For example in Ecuador extension agents share-crop with farmers. They provide advice and inputs (which they are able to secure on credit with the guarantee of their government salaries) while the farmers supply land and labour (Wilson, 1991; Umali and Schwartz, 1994). Unlicensed individuals outside the public sector can also provide advice. Ameur (1994) reports that this is common in China.

In addition, commodity organisations, NGOs and groups of farmers are also formal suppliers of extension services. The first of these, commodity organisations, have been a significant force in extending new production techniques. For example, in the early 1980s the Malaysia Rubber Industries Smallholders Development Authority provided extension advice to more than half a million smallholders through about 1,500 extension agents, financed by smallholders' production contributions (Maalouf et al., 1991).

In rural areas, especially those which can be classified as complex, diverse and risk-prone where many farmers cannot afford to buy advice, NGOs may be the main providers of extension services. Not only do they provide the services themselves but they are also responsible for developing many of the methodologies

for research and extension work which are subsequently adopted by the public sector (Farrington and Amanor, 1991).

Farmers' organisations may be both consumers and providers of information and extension services (Umali and Schwartz, 1994). Larger, more formal organisations, such as the Argentine Association of Agricultural Experimentation Groups (AACREA), tend to provide more advice than they consume. They are financed to do so either by membership dues – \$60 per month in the Argentine case - or, in the case of the El Ceibo cocoa cooperative in Bolivia, through a combination of product revenues (a percentage of annual profits and sales revenues), NGO and donor funding. El Ceibo provides both agronomic advice and training in business methods and general education to its members (Schwartz, 1994; Bebbington et al., 1993). Smaller organisations are more likely to consume advice, though they might also generate and share information internally.

5.2 Economic analysis

The characterisation of extension as either a public or a private good depends both upon the nature of the extension itself and also upon the stage of development of the country in question. While Leonard (1985) argues that 'most extension work is inevitably a public good everywhere in the world', Wilson (1991) believes that information on new technology is a public good but that as a certain level of technology becomes widely accepted extension becomes a private good. At this stage farmers require a more individually tailored problem solving service – such information will be subtractable and excludable and, so long as it is high quality, they should be willing to pay for it.

Umali and Schwartz (1994) concur in this view over the long term. They see general agricultural information, designed to improve existing cultural and production practices, as a toll good in the short term. It is not subtractable in that one person's use of the information does not reduce its availability for others, but it is excludable; not all farmers receive the information at the same time – indeed the speed of information dissemination can vary enormously, partly due to differences in medium (word of mouth versus mass media for example) and differences in quality of the communications infrastructure. In the long term, however, Umali and Schwartz (1994) believe that information is diffusive and therefore will no longer be excludable, rendering it a public good. At this stage it is ineligible for private supply except by purchasing companies which themselves benefit from increasing the speed of information dissemination or as a 'secondary task' which complements another activity. This possibility is emphasised by Schwartz (1994). She notes that some extension information, despite being a public good, only benefits those who have access to certain inputs, facilities or credit. The public sector can therefore cut back on its costs by leaving the provision of this type of information to the private sector.

It is only by making information 'specialised' that it becomes excludable for the duration which, in turn, reduces the need for public sector intervention in the market. Specialised information will either not be relevant to other farmers, for example soil analysis, or, like marketing information, it will be so valuable to them that they will not wish to share it (Umali and Schwartz, 1994).

The stage of development of a country has a bearing not only on the prevailing levels of technology but also on the demand for agricultural produce and the difficulty of providing extension (Umali and Schwartz, 1994). It can be argued that in countries with a shortage of basic food crops, governments should do everything in their power to raise overall output and thus provision of all types of information should remain in their hands. Indeed Wilson (1991) argues that most technology for basic food crops will always remain a public good and therefore should be provided by the public sector. The implication here is that narrow goals of economic efficiency are replaced by a broader aim of enhancing general welfare in a country. Extension programmes with this and other types of social goals will always require public funding and equally they will always require some kind of decision-taking as to their scope, based not so much on economics as social priorities.

Even if efficiency is the primary aim, some market intervention may be necessary because of the existence of imperfections due to the 'lumpy' nature of extension and adverse selection (Smith and Thomson, 1991). The first problem concerns that fact that marketed information is usually sold at the same cost to all farmers, regardless of the size of their operation. This means that the cost per unit of output is far higher for smaller than for larger farmers. Indeed information sold to small farmers may even be charged at a higher absolute rate because of the greater costs associated with serving those with lower levels of education in more distant areas (two common attributes of smaller farmers). The formation of farmers' organisations to act as purchasing consortia is one response to this problem. If this is the primary reason why a farmers' organisation is formed it would support the view expressed in World Bank (1994b) that relevant advice, by definition, has an attractive cost:benefit ratio and therefore should be saleable, in some shape or form.

Finally, the problem of adverse selection occurs because private extension providers (and public ones too) may knowingly provide erroneous information. The perceived threat of this might reduce consumption to sub-optimal levels (Umali and Schwartz, 1994). This problem might be particularly acute in the extension sector because farmers are unaccustomed to paying for information and they may, therefore, have serious problems with valuation. The difficulty for governments which hope to regulate is that they may be in no better position to value the information than farmers themselves – especially if they have withdrawn entirely from the area in question. In this case the costs of regulation might exceed the benefits, a possibility raised by Smith and Thomson (1991).

5.3 Progress towards new goals

Changes in extension, perhaps more than in other areas, seem to be due to governments' own recognition of the financial insustainability or general inadequacy of their services. Antholt (1994) cites the example of the 1990-1 Tamil Nadu extension budget. Salaries accounted for 88% of total spending and only \$1 per extension agent was allocated for 'materials and supplies'. The possibility of providing an effective service was essentially ruled out at the budgetary stage.

Donor pressure to reform systems which, despite their own involvement, they see as unresponsive to farmers' needs and financially problematic, has also been strong. A recent World Bank evaluation of completed extension projects, all of which were located within and designed to help the public sector, shows that 90% have experienced recurrent-cost funding problems and 70% are probably not sustainable. In 84% of the projects research-extension linkages were considered inadequate to ensure that the needs of some of the major farming systems were defined and addressed and just over 50% demonstrated an entrenched 'top-down' approach in developing recommendations, despite objectives of continuous feedback from farmers (World Bank, 1994b).

Non-traditional suppliers of extension would seem, therefore, to have little to live up to, although it is questionable whether the 'lean teams' of private extension agents postulated by Ameer (1994) are actually forthcoming in developing countries. Antholt (1991) argues that the single most important thing in an extension service is control by beneficiaries. He develops this thesis in Antholt (1994) into an argument that beneficiaries should bear at least some of the cost of the service, for the following three reasons. First, this gives ownership and drawing rights on the services. Second, it takes some financial pressure off the government, thereby increasing the chances of sustainability and third, it provides the basis for a more demand-driven, responsive service.

Thus, for him, all private services and government cost recovery systems are by definition more efficient and more accountable than their predecessors. They are also better at responding to farmers needs. He does, however, note that the degree to which this is true depends upon certain other factors such as farmer participation, professional competence of extension agents and cost effectiveness. It is probably safe to say that private or NGO services could not be worse than many public sector suppliers in these respects – and with competition they will surely be better. A glowing example of all these qualities seems to be provided by the extension agents in China who sign contracts directly with farmers in highly competitive environments and whose payments are based upon farmer performance (Umali and Schwartz, 1994).

However, unless public sector cost recovery is accompanied by increased competition, improvements in cost effectiveness may be slow to materialise. Indeed

Antholt (1994) argues that public sector services are always isolated and slow to adapt. It is Wilson (1991) and Rivera and Gustafson (1991), however, who point out some of the operational difficulties with cost recovery programmes, such as defining the criteria upon which charges are made and actually collecting the payments. Ingram (1992) points out one of the first operational implications of implementing cost recovery schemes in the UK: civil servants needed new skills – they particularly required training in marketing techniques.

Rivera and Gustafson (1991) emphasise that, whatever benefits accrue from public sector cost recovery, 'public sector extension alone will never attend the entire demand for extension services by the world's farmers'. Schwartz concurs in this. She argues that 'the existence of multiple (sometimes conflicting) information sources is an advantage for farmers in that they can best select the information mix most suited to their goals as producers and the most reliable information source' (Schwartz, 1994). The argument is that extending the choice available to farmers is a good in its own right. Consequently not just public sector cost recovery but also the replacement of a government monopoly with a private monopoly in a certain area (which is effectively what happens for short periods in Chile, despite competitive bidding) is very much a second best option for reform. Decentralisation of government efforts also falls into this category if it creates a system of local monopolies.

One other factor which may help private extension agents provide a more effective service is their closeness to product markets. They are far better able than government or NGOs to feed marketing information into the extension process (Hobbs and Taylor, 1987). Indeed this is the driving force behind purchasing company information dissemination. An example of this is also provided by the El Ceibo cocoa cooperative in Bolivia which identified the market opportunities in organic cocoa and then begun research and extension work to try to address some of the problems raised by this type of cultivation (Healy, 1987). Hercus (1991) argues that the commercialisation of advisory services in New Zealand has forced those offering the services to look more closely at the farm in its environment, producing as part of a commercial system rather than as an isolated production maximiser.

The final issue that should be borne in mind, however, is that in some areas there simply may not be any relevant technology to extend. The World Bank (1994b) criticises the projects it reviews for having always assumed that there was. If there is not, however, a change in service provider can logically do nothing to increase the effectiveness of extension. It is NGOs rather than private providers who are likely to be the new entrants in areas where technology is lacking (because these areas are also likely to be very poor). They therefore need to be aware of this possibility and focus their efforts accordingly (perhaps on adaptive research rather than extension in the first instance).

5.4 Focus on the rural poor

The World Bank (1994b), in emphasising the importance of clients of extension services contributing to their costs, does explicitly recognise the difficulty of this in very poor areas. Its suggestion, which it does not fully develop, is that farmers may make contributions in 'non-cash' terms, so that the accountability link is maintained. This would also help to overcome the problem that a number of authors mention of information being deemed less valuable if it is provided for free.

Unlike in most of the sectors addressed in this area, the extension area provides specific examples, such as Chile and Mexico, of a refocusing of government efforts on the poorest sectors of the population. In addition, participatory diagnosis techniques, developed by NGOs in an effort to make planning more responsive to the needs of the poorest, are increasingly being incorporated into public sector activities. The chances of poorer sections of the rural population having benefited from reform in this sub-sector are therefore correspondingly higher than in other areas.

5.5 Lessons

All authors agree that there will always remain a role for the public sector in extension. None, however, argue that a public sector monopoly is an appropriate solution to the numerous and long-debated problems of extension provision (World Bank, 1994b). Antholt (1994) calls for institutional pluralism and lists all the other actors with a role to play in the sector, namely: NGOs, seed companies, implement dealers, fertiliser distributors, TV and radio systems, farmer associations, youth groups, local communities and primary school systems. To make such a system function, governments, and others need a 'broader conceptual vision of extension'.

According to Rivera and Gustafson (1991) extension programmes are 'long-term actions implemented by a network of institutions'. They are extremely complex and because of this complexity, the role of government agents might need to expand rather than contract. Public extension planners should coordinate and attend those needs not supported by the private sector, arbitrate when there is conflicting information, assure accountability of all services to the public and facilitate the operation of the entire complex through regulation and provision of information. These are certainly heavy responsibilities, but the government's role is not simply to act as monitor and provider of last resort. It will also want to plan and implement national agricultural development strategies which may become more difficult in a newly pluralistic environment.

In addition, the extent to which other bodies will be willing to provide extension services is partially determined by government actions. Umali and Schwartz (1994)

note the particular influence of commodity prices (in turn dependent upon price, trade, fiscal, monetary and exchange rate policy), the degree of development of the supporting infrastructure and the level of education of farmers (this affects both their absorptive capacity and their ability to access cheaper written and broadcast extension materials) amongst other things. All these are influenced by government policy as are farmers' security of tenure and, often, access to credit which can be important determinants of demand for extension services.

Given the arguments in section (c) above about the overall increases in efficiency and accountability which attend diversification and competition in supply of extension services, the main emphasis of government policy should therefore be to enhance the enabling environment for non-governmental provision of extension services.

6. Veterinary services

6.1 Changes in supply or supplier

In developed countries we have long been used to paying for veterinary services, but in most developing countries these were freely provided by the public sector from colonial times. Since the inception of such services, however, the livestock population of most countries has grown enormously. Government budgets have not kept pace and services have deteriorated.

While in the research and extension areas the problem has often been an inability or unwillingness on the part of government agencies to identify the needs of the rural poor, in the provision of veterinary services the main issue has been a lack of funds and hence of a broad, effective service. Hence the emphasis in recent years has been on cost recovery in the public service, coupled with complementary private services in some countries. Indeed in their survey of twenty nine African countries and eight Asian and Latin American countries Umali et al. (1992) show that by 1991 no country offered completely free veterinary services. Even in the three main animal health areas, namely clinical care, delivery of vaccinations and vector control (as opposed to the provision of drugs or artificial insemination) all operated either full cost recovery schemes or a combination, including subsidies, rather than entirely cost free provision.

While NGOs, such as Proshika in Bangladesh and Intermediate Technology in Kenya and India, have been involved their role has largely been to extend services to regions which were formally unreached rather than to alter fundamentally the nature of services provided (Khan et al., 1991; Grandin et al., 1991).

Farmers' organisations have also made efforts to improve services to their members. One mechanism for achieving this has been to organise routes which public veterinarians follow on specified days, enabling members to gather to receive services (Leonard, 1993; Umali et al, 1992). Another has been to employ veterinarians themselves (Gros, 1994). One of the largest scale efforts by a farmers' association has been in the Central African Republic where the National Federation of Livestock Producers (FNEC), with donor assistance, successfully undertook the distribution of veterinary drugs after the collapse of the public system in 1973. Since then it has expanded its activities and scope so that it now provides extension services and education and its fee-paying membership has risen to over 60% of the herders in the country (Umali et al., 1992; Umali and Schwartz, 1994).

Another well-known example in the Anand Milk Union Ltd. (AMUL) in Gujarat, India. This is a milk marketing cooperative initially formed in 1946 by a group of dairy producers aiming to increase the prices they received for their goods. It consists of a three tier cooperative structure owned and managed by member farmers. Village-level Dairy Cooperative Societies (DCS) purchase milk and provide veterinary health services together with artificial insemination and extension advice. District Milk Producers' Unions collect and market milk, provide support to DCSs and are members of an overall Federation. The donor-funded Operation Flood Programme in India has attempted, with a good degree of success, to transfer this model to other states (Umali et al., 1992).

6.2 Economic analysis

There is extensive discussion in almost all the literature about the economic nature of the various veterinary goods (Umali et al, 1992; Leonard, 1985 and 1993; Gros, 1994; James and Upton, forthcoming). First, the different types of goods need to be identified.

Umali et al. (1992) distinguish between curative health services, preventative health services (subdivided into immunisation, vector control and disease control methods), the provision of veterinary pharmaceuticals and production services (research and extension for improved methods, including artificial insemination). Leonard (1985) refers to this last category as 'promotive services'. Much of the discussion in this area is similar to that in the research and extension sections of this paper. It will not, therefore, be explicitly addressed here.

The two types of goods which are closest to being pure private goods are curative health services and the provision of veterinary pharmaceuticals (which often go hand in hand). In receiving treatment for his/her sick animal an owner reduces the stock of curative services available to others (subtractability) and, at least at first sight, is the sole beneficiary of the services (excludability). However, there are positive externalities, especially in the case of infectious diseases (Gros, 1994).

Umali et al. (1992) further disaggregate curative services into diagnosis and treatment. Diagnosis, they argue, involves externalities because by making a diagnosis and communicating it to the animal owner, the veterinarian is increasing the overall level of knowledge in the community – especially important if the illness in question might grow to epidemic proportions (Gros, 1994). Treatment only involves externalities where the illness in question is infectious and can be cured, thereby reducing the risk to other livestock owners. Despite these externalities, however, Umali et al. (1992) do not believe that public provision of curative services is justified.

Gros (1994) concurs with this but gives more emphasis to the private nature of curative services. This, he argues, derives from two factors. First, nobody but the owner of the animal receives immediate economic benefit from the treatment. Second, most of the curative treatment in Africa, in particular, does not involve infectious diseases.

Preventative health services are also largely classified as private goods by Umali et al. (1992), though with the exception of actual vaccine production, they involve externalities. They therefore believe that the extent of public sector intervention should depend upon the type of externality involved and the degree to which the private sector can internalise it (through, for example, membership organisations). Pure public provision is only justified under 'special economic circumstances' such as for zoonotic diseases, foot and mouth disease which might affect exports and tse-tse control in open range lands. Otherwise the public sector should back up the primary efforts of the private sector through, for example, subsidising private provision or monitoring compliance. Umali et al. (1992) recognise, however, that because both clinical and preventative services are frequently provided by the same individuals, any subsidy to preventative services might unavoidably spill over to clinical services. Unlike Leonard who sees this as a positive effect (see below), they express concern that it might be used to usher in subsidies to the clinical sector by the back door.

Gros (1994), on the other hand, treats the entire spectrum of preventative care delivery as a public good. His belief is based on the fact that (most obviously for vaccinations but also for meat inspection and vector control) the benefits of action accrue to all meat consumers and livestock producers. They should therefore be provided by some sort of collectivity in which everyone pays dues, rather than by private bodies.

Leonard (1985) concurs with Gros (1994). He believes that in order to achieve the economically optimum coverage of preventative services their provision should be financed out of taxation. Otherwise, since each individual has an incentive not to inoculate (because of the slight risk of doing so) all individuals will attempt to free-ride and the percentage of the population which is inoculated will be sub-optimal (Leonard, 1993). Another issue which Leonard raises is the high discount rates of

many African farmers. Their preference for cash in hand today, rather than benefits in the future, is considered by Leonard (1993) to 'violate the rationality assumptions of economic action'. This can only be corrected for by the actions of veterinarians (and by implication the public sector in general) who have more rational (i.e. lower) discount rates and thus a greater appreciation of the value of preventative medicine. Finally, he argues that public sector provision of preventative services has a further benefit in that it increases the scope for private provision of curative services. This is due to the fact that increasing the general level of animal health in a community will increase livestock owners' readiness to pay for individual curative services.

Upton and James (forthcoming) equivocate; they believe that preventative medicine lies somewhere along the public good/private good continuum but lean towards Leonard and Gros's view that external benefits may well be greater than private benefits, especially when the diseases in question are communicable to humans. For this reason they moot the option of imposing a tax on meat consumers to finance services, but reject it on the grounds that it would be too difficult to administer and would reduce the overall demand for meat and thus damage the livestock industry as a whole. They also point out that because of high transport costs to remote areas, the marginal cost of service provision is far lower when programmes are comprehensive than when they are offered on demand in a private capacity. In other words, there exist economies of scale which militate towards public or at least group provision.

Gros (1994) emphasises the fact that the extent to which any particular service can be privatised depends not only upon its 'intrinsic' economic nature, but also the environment in which it exists. This is similar to the argument made about extension services and the stage of development of the country in question. Other factors which Gros argues will be important are: the nature of the prevailing livestock system, herd size, the value of the average animal to its owner, producer concentration in a given area and (this he stresses from his own experience in Cameroun) the receptiveness of high level policy-makers at the livestock ministry.

Gros has collected data from Cameroun which shows that smaller farmers are more likely than larger farmers to be deterred from using a service for which they have to pay. This is not because they value their animals any less (indeed he suggests that they may value them more as a single animal might be the only source of wealth for a small farmer), but simply because they are less able to pay, especially since the costs of servicing them in remote areas are likely to be higher. Umali et al. (1992) add that smaller farmers are more likely to own traditional, rather than modern varieties which are, in general, less susceptible to diseases. In addition, the threat to themselves from contagious disease is lower because of their more extensive production systems and their lower number of animals.

Such reduced demand might imply that economically efficient levels of service

provision will not be achieved, if services are entirely privatised. It also has the knock-on effect of reducing the feasibility of establishing and sustaining private veterinary practices in areas where small farmers dominate, which, in turn, further reduces the provision of services. The paper by Odeyemi (1994) looks at the various different types of information which will be necessary to predict whether different areas can sustain a private practice.

Leonard (1993) thus believes that private practice in Africa will only be feasible if organisational arrangements designed to overcome these types of structural constraints are put in place. He believes that costs to individuals must be reduced. This can be done through the use of paraprofessionals and the establishment of veterinary routes to reduce transport costs, but direct government support to private practitioners is also likely to be necessary. It is for this reason that Gros (1994) suggests that the attitude of ministry officials to privatisation is so critical; if they are not in favour of reforms, they can block this support and thus sabotage progress.

Leonard believes that the public sector should sub-contract certain services (e.g. vaccinations) from private practitioners, thereby covering most of the fixed costs they incur and enabling them to offer additional services on a private basis at a lower price. The practitioners might even remain in the public sector, as long as their main contracts are well-specified and include permission to charge for additional services. This would have the added benefit of increasing the motivation of public sector personnel. Leonard recognises that veterinarians might have an incentive to cut down on their publicly financed work in favour of their private work but argues that this is not inevitable. Whether or not it will occur depends on the actual demand for private services and the professional attitude of practitioners (Leonard, 1993).

Leonard also addresses concerns about the fact that in awarding public contracts, governments are effectively granting a cost advantage to a single producer. This might inhibit competition and result in the emergence of geographic monopolists charging extortionate prices. He believes, however, that such problems can be reduced if contracts are bid for at relatively short intervals (he suggests two to five years) and so long as most of the costs of establishing a practice in a certain area can be recouped (so that the incumbent does not have an unfair advantage). He makes a case that most veterinary assets can be transferred or on-sold but this is not convincing when he discusses human capital and client relations in a specific area. He also notes that such a system will fail in the presence of corrupt officials who award contracts according to the bribes they receive (Leonard, 1993).

Finally, there is moral hazard in the market for veterinary services, especially in the areas of drug provision and hygiene inspection, but also in monitoring the quality of the veterinarians themselves. The government, Umali et al. (1992) argue, will be required to provide such services itself, for the benefit of the population at large.

Leonard (1993) notes that groups of professionals can regulate themselves, through their associations. Their higher levels of education put them in a better position to do this than many other groups. This will, however, only be feasible where there is adequate competition in the provision of services and where associations are dominated by their better members. Otherwise, one can assume, government regulation will be superior.

6.3 Progress towards new goals

Leonard (1993) believes that it is generally accepted that a veterinary service in Africa will be ineffective if staff salaries represent more than 60% of its budget. If this is true, then countries such as the Central African Republic, where by 1986 staff salaries accounted for 99.5% of the National Agency for Livestock Development budget, must have had an almost entirely ineffectual service pre-reform (Umali et al., 1992). It is, however, hard to draw general conclusions about the effects of change in the veterinary sector because few country experiences have been documented in any detail, despite the concerted moves towards privatisation throughout the world which are noted by Umali et al. (1992).

Those experiences which have been documented are certainly not without fault. In Kenya prior to reform, veterinary services were nominally provided free of charge, but practitioners often withheld provision unless payments were made. When charging was introduced as an official policy the cost to farmers did not necessarily rise but the number of visits made by veterinarians did, implying an increase in productivity on the part of the providers (Leonard, 1985). Other reforms may not have been so beneficial. Kenyan community groups have shown themselves to be good at financing construction of dips (required to protect cattle against ticks), but not at operating them. In 1983 a survey showed that in areas where dips were operated by local groups 90% of diseases reported were tick related while in areas with government operated dips only 20% of diseases were attributed to ticks. Leonard believes that local herders did not have the technical knowledge required to supervise dips themselves. Leonard also notes problems which occurred in Kenya when cost recovery schemes were established. Neither did veterinary department officials have experience at dealing with money collection, nor were adequate accounting practices established. In addition, public sector veterinarians themselves often failed to make charges for preventative vaccinations as they were more interested in increasing coverage than recovering costs.

In Cameroun, Gros (1994) believes that privatisation and cost recovery programmes were introduced purely to relieve financial pressure on the state, under the influence of donors (the World Bank and EEC in this case) and without regard for improvements in the service provided. Neither veterinarians themselves, nor farmers, were consulted about these major structural changes in provision. Of those livestock ministry policy-makers who were consulted, only 38% wholeheartedly

supported the reforms, 52% were neutral (though Gros suggests this was a hedging mechanism by those who opposed the changes but were unable to speak up) and 10% were against. Even at the planning stage little regard was given to accountability. His argument that reducing the public sector payroll was the key objective, is supported by the fact that instead of starting in the obvious place with a strong push towards privatisation of drug delivery, reforms commenced with a wholesale attack on veterinary service provision. He believes this was because the EC was ready to continue funding drug import and distribution in the public domain, and thus that this was not a drain on state resources. Any gains that might have been made in this area were therefore ignored.

A final problem, experienced by FNEC in the Central African Republic but probably common to other farmers' organisations, is that initial success sometimes leads organisations to expand their activities so much that they become unmanageable. FNEC has suffered from a lack of adequate organisation at the field level, increasing financial pressure and a dearth of members with sufficient education effectively to manage the organisation (Umali et al., 1992).

6.4 Focus on the rural poor

Leonard's concerns about whether privatised services will reach the poor appear to be well grounded in countries such as Brazil and Argentina where private supply has proved to be biased towards large and medium scale farmers. The issue of the extent to which user fees deter poorer farmers from drawing on services is, however, less clear cut. Umali et al. (1992) cite contrary evidence from Kenya (two studies of dipping are mentioned, in only one did fees reduce demand) and a World Bank study of rinderpest vaccination in ten African countries which shows there to be no significant depressing effect on demand from cost recovery.

Where NGO efforts have supplemented public and private services, the poor, who formerly had no access to services, have benefited. In Bangladesh, the NGO Proshika works with groups providing training in cattle rearing and disease control, vaccinations (with some cost recovery) and livestock insurance (although this is not proving popular). In addition they have set up research farms. By 1991 they claimed to have benefited over 12,000 households (Khan et al., 1991).

Intermediate Technology's programmes in both India and Kenya are based upon the belief that many bovine diseases are treatable by trained farmers. They have therefore operated training programmes and opened shops which sell veterinary drugs to expand the poorer people's access to at least some form of veterinary advice (Grandin et al., 1991). Such deregulation has been one of the most beneficial aspects of change as far as poorer people are concerned. Paraveterinarians usually operate at lower cost and also, because they represent new competition, may force fully qualified veterinarians to lower their prices. Perhaps

the greatest impediment to such change is the attitude of veterinarians themselves – losing their monopoly may be threatening for them, although it is more common for them to justify their resistance to change in terms of threats to animal health rather than to their own private interest and status. The same problem has been faced by those working in family planning where doctors have been reluctant to allow people with lesser qualifications to provide advice.

What is notable, though, is that much of the attention in the veterinary sector is devoted to larger animals, in particular cattle. Poorer people may own cattle but a greater proportion of them probably own goats and chickens. To the extent that problems relating to these animals are ignored, poorer people fail to benefit from change.

6.5 Lessons

Once more the key lesson that can be drawn from experiences thus far is that there are no widely applicable blueprints for reform and each country will have different requirements. For example the World Bank tried to transfer the successful model of the India's Anand Milk Union Ltd. to Pakistan in the late 1970s. Project performance was held to be 'very inadequate' (Umali et al., 1992), partly because of political rivalries amongst the agencies involved and partly because of inadequate commitment on behalf of the Punjab government.

This last factor was also important in Cameroun (Gros, 1994). There, Ministry officials had little faith in the programme and even less expertise with which to support it. Since there were no existing private veterinarians in the country there were no models to follow and those who were supposed to administer reform were veterinarians rather than economists or accountants. Thus, after four years only twelve of the country's 112 veterinarians had set up private practice and producer cooperatives had not emerged to take on any of the former public sector functions. Those veterinarians who did move to the private sector had no government support – at best they were advised by international pharmaceutical companies. Finally, the banking system in the country was crippled at the time and thus potential private providers could not secure credit for their new enterprises.

7. Rural credit

7.1 Changes in supply or supplier

The supply of rural credit is usually divided into 'formal' and 'informal' sectors. The former, which is the subject of this review, includes banks, government

agencies and, frequently in the past, monopsonistic marketing parastatals. These provide credit and deduct repayments at source from the following year's crop sales. The informal sector is made up largely of individuals (traders, landlords or farmers themselves) who lend money as a business. They are traditionally characterised as being highly usurious and in positions of considerable power due to lack of local competition (Yaron, 1992a).

In the credit area recent changes have been due both to the reform of marketing parastatals and increased criticism of public sector credit programmes characterised by very high costs and poor recovery rates. In losing their monopsonistic position, parastatals have lost their presumed competitive advantage in credit supply (if principal and interest recovery are delinked from output sales the risk to parastatals is as high as to any other body providing credit) and governments facing huge bills for subsidising credit programmes in turbulent economic times have withdrawn. For example, the Government of Brazil was, at times, spending more than one quarter of its entire agricultural budget to maintain the rural credit system (Yaron, 1992a). Cleaver (1993) reports that most World Bank agricultural credit programmes in Africa have failed.

What is less clear is the extent to which the gap left by the withdrawal of government has been filled at all and if so, whether it has been filled by the formal or informal sector. World Bank projects are still working through public institutions (Cleaver, 1993), but projects are now part of overall financial reform programmes, institution building and rural savings mobilisation. Yaron (1992a) reports successful credit schemes in Indonesia and Thailand where very quickly lending has been largely financed out of rural savings. To this extent the source of supply of credit within the formal sector has changed.

Donors and both north- and south-based NGOs are also funding farmer-owned cooperative credit institutions which rely on savings mobilisation. Some, such as Benin's Rural Savings and Loan or BRAC's schemes in Bangladesh are outside the public sector entirely, while others, such as Ghana's Rural Banks have minority government participation. Cleaver (1993) reports that the World Bank has begun directly to support private sector credit activities. In some cases it subsidises not the loans themselves but helps to cover the transaction costs incurred by lenders and borrowers. The idea is that although new Savings and Loans institutions might need some support at the outset, especially in the provision of central liquidity funds, staff training and the establishment of viable accounting practices, actual lending operations should not be subsidised. The danger of subsidising loans as part of an initial support package is that institutions become accustomed to making lending decisions which are not strictly economic. This threatens their long-run security and sustainability (Yaron, 1992b).

7.2 Economic analysis

Credit may be a private good in the sense that it is excludable and subtractable, but these attributes are not necessarily sufficient to make it attractive to private suppliers. This is because the credit market combines the problems of imperfect information and risk (Smith and Thomson, 1991). In developing countries this risk derives especially from the poor legal frameworks for loan recovery and securing collateral (Yaron, 1992a). Risk aversion in the private sector leads to the provision of credit only to those with better access to collateral or particular ties to the lenders. It also leads to high borrowing costs which reduce the demand for credit.

In principle the government should be less risk-averse than the private sector because it covers a wider geographical area (agricultural failure due to climate or pest outbreaks tends to be geographically concentrated) and has a longer time horizon. Smith and Thomson (1991) would also argue that it has greater powers of coercion and therefore a better chance of securing repayment. It should, therefore, be a more efficient lender. However, it is generally disadvantaged in comparison to the private sector in terms of detailed knowledge of local conditions and lack of any sense of loyalty on the part of borrowers (Smith and Thomson, 1991). This reduces its ability to guard against adverse selection where those who are most likely to default are the most eager to seek credit.² This problem raises the overall cost of borrowing for others and further increases the likelihood that lenders will require borrowers to put up collateral (Yaron, 1992a).

Yaron (1992a) suggests that governments have used the arguments about their own ability to bear risk to justify the provision of subsidised rural credit. They have aimed to increase equity (particularly to compensate for the 'urban bias' of other policies) through credit programmes, and in so doing sponsor growth which would otherwise be constrained by lack of capital investment by farmers. It is this assumption – that rural economies are credit constrained – which Yaron particularly disputes. He believes that since most new technologies are divisible, credit constraints are not severe. On the contrary, he argues that the success of schemes such as those in Indonesia and Thailand demonstrate that it is functioning rural savings institutions which are really lacking. Furthermore he argues that informal lenders do face significant competition and are, in general, not as exploitative as they are usually portrayed to be.

He also points out that because subsidised loans often end up in the hands of the relatively richer people with broader economic interests, they have proved to be an extremely inefficient way of raising investment in agriculture. Two World Bank OED studies found that of the Bank funds provided through credit projects in

² In this incidence of adverse selection lenders take the role of purchasers – with incomplete information – and borrowers the role of vendors.

Mexico, Pakistan and the Philippines only 25-50% were estimated to have added to agricultural investment (Yaron, 1992b).

Thus, rather than providing credit itself at subsidised rates, and thereby reducing the opportunities for the development of a functioning private credit system, the public sector should focus on reducing the risk that individual lenders face. This they should do through improving physical infrastructure (improving transport and information systems to facilitate inter-regional trade should reduce commodity price fluctuation), improving enforcement mechanisms for loan collection and focusing on commodity risk mitigating arrangements. They may also need to provide some transitional support for institutions during the process of reform of the financial system, although Yaron (1992a) explicitly cautions against long-term provision of funds.

Another risk-reducing mechanism is the small group. Many of the success stories in rural credit, such as systems in Korea and Taiwan and the Grameen and BRAC schemes in Bangladesh, have relied on such groups. Their main advantages are detailed knowledge of individual members' circumstances and social cohesiveness which, especially if coupled with collective responsibility for all loans, reduce the risk of default (especially when the source of loans is members' own savings). A further advantage is physical proximity to savers and borrowers which reduces transaction costs. Yaron (1992a) suggests channelling World Bank spending for credit institutions through such organisations. Their cohesiveness must, however, be genuine if benefits are to be forthcoming. Externally inspired cooperative credit schemes have usually failed in the same way as other public sector efforts to provide credit.

7.3 Progress towards new goals

To the extent that the literature covers the new types of credit institution which have taken over where the public sector has withdrawn, they do seem to be more efficient. While old public sector agencies were judged in terms of loan disbursement, new commercial ones must meet profit objectives. The staff at Indonesia's successful Bank Rakyat Indonesia – Unit Desa are rewarded in part according to branch financial performance.

Existing public sector systems such as the Thai Bank for Agriculture and Agriculture Cooperatives have also become more efficient by reforming their financial reporting and administrative systems. While over 50% of the loans made through the cooperative system in Thailand were in arrears in the 1980s, the Bank now has a 'high loan recovery rate' and its running costs are equal to only 4% of its total assets. This contrasts with public sector lending in Mexico where transaction costs at one stage exceeded the amount of money loaned (Yaron, 1992a).

Institutions which are able to mobilise rural savings do so because they provide attractive interest rates and security as well as ease of access (because of their relative proximity to depositors). In the past rural people have often had no opportunities for savings and have thus been forced into inefficient uses of their money, for example saving with no interest at home (and thus losing out where inflation is high) or, frequently, investing in livestock. Although there are cultural and also economic reasons (it can be very profitable) why people invest in livestock this strategy can also be very risky, especially where general animal health is not good and the increase in livestock populations which it implies can lead to over-grazing and crop damage.

An even greater benefit of bringing together saving and lending is that it enables institutions to develop relationships with their clients before they take on any lending risk. They thereby incur loyalty and gain critical information about potential borrowers. Savers themselves learn about how financial institutions function and become accustomed to the discipline of making regular payments. It is for this reason that the Grameen Bank in Bangladesh collects one taka from each of its members every week.

7.4 Focus on the rural poor

Even when credit was subsidised, it was usually not the poorest who benefited, whatever the stated intentions of governments (Yaron, 1992a). Artificially low, sometimes negative, interest rates and little pressure to repay meant that the demand for credit often exceeded supply (Yaron, 1992a). In such situations it was often the more influential farmers whose demands were met first. Furthermore, the transaction costs associated with accessing formal loans may be so high that informal loans end up being cheaper, however high the nominal interest rates. A study in Bangladesh has shown that the average effective cost of a loan smaller than 1,000 takas varied between 146% and 169% in the formal market, while it varied between 57% to 86% in the informal market (study by Z. Ahmed cited in Yaron 1992b). Indeed some formal lenders do not even countenance such small loans, whether or not farmers are willing to bear their share of the transaction costs.

Therefore increased institutional support to groups and local associations which rely on members' savings to finance loans should benefit the rural poor by improving their access to credit and lowering the costs of borrowing. Such systems rely on group dynamics to ensure loan repayment. This reduces the need for collateral and therefore gives access to credit to landless labourers and women whose land may be in their husbands' names. For example the Grameen Bank loans exclusively to landless individuals, 90% of whom are women. Loan recovery rates are in the region of 98%.

Apart from accounts of the Grameen Bank the literature reviewed does not go into

any detail about comparative availability of capital and interest rates pre- and post-reform. It is therefore difficult to draw any broad conclusions in this area.

7.5 Lessons

The clearest lesson to be learnt in the area of rural finance is that rural savings can provide a viable basis for lending. Indeed, even if mobilisation of rural savings is not cost-effective in the short term, its costs should be borne as part of the investment required to create a viable system; it is, in effect, an investment in human capital (Asian Productivity Organisation 1992, Egaitu 1992, Vogel 1992).

Another lesson is that loans extended for 'non-productive uses' (e.g. funerals, weddings and to cover hungry periods in the agricultural calendar) are not necessarily more insecure than loans with a more obvious income-generating focus. In Mali 75% of the Kafo Jiginiew savings and loan organisation's loans are extended on a short-term basis to cover the hungry period between cotton planting and receipt of cotton revenues. The repayment rate is consistently over 99% (Kafo Jiginiew, 1994).

8. Agricultural produce marketing

8.1 Changes in supply or supplier

The focus of change in marketing systems has been the abolition or reform of monopsonistic parastatals, particularly in Africa. The degree of success in dismantling these has varied in different countries and for different crops. In Tanzania, for example, the National Milling Corporation's share of marketed maize dropped from 90% to 2% in a relatively short time (Mans, 1994), though of the export crops only cashew marketing has been liberalised. In Kenya the progress in maize reform has been less smooth. The National Cereals and Produce Board was reformed in the 1980s, but in 1992 movement controls on maize were reimposed and maize was reoffered to millers at subsidised prices, undercutting the nascent private sector (Swamy, 1994).

In most countries even during the time that private trade was outlawed, traders existed. Parallel market prices for controlled crops were frequently high, because of shortages. This allowed traders to make supra-normal profits which justified the risks of operation. Now that markets have been liberalised new entrants have begun trading (Smith and Thomson, 1991). Not all, however, are commercially oriented. Especially in Latin America, commodity organisations and cooperatives such as Bolivia's El Ceibo, (the federation of cocoa producing cooperatives) provide

marketing and processing services to their members.

8.2 Economic analysis

Buying and selling physical goods is at the very heart of private sector activities. However, the agricultural sector has some special characteristics which can be argued to militate towards public sector intervention (Smith and Thomson, 1991).

First, it is inherently risky and because of high covariance of risk in any geographical area and issues of seasonality, prices can fluctuate enormously (Thomson, 1991; Smith and Thomson, 1991). Governments often justify their intervention on the grounds of price (and hence income) stabilisation. Second, agricultural policies partly determine national food supplies. Many governments feel that they are too critical to be left to the vagaries of the market and intervene to secure buffer stocks, frequently operated and administered through marketing parastatals (Thomson, 1991). Third, production is extremely dispersed. Governments often justify intervention to protect small farmers, who are more likely than others to suffer from a lack of information and from exploitation by traders (Smith and Thomson, 1991). Finally, agriculture dominates many developing countries. Governments, can therefore argue that efforts to increase equity should be focused in this sector (i.e. that social policy should be effected through the agricultural sector). Thus they rationalise the operation of pan-territorial pricing and purchasing policies.

Many of these problems could, however, be partially addressed without direct intervention by the public sector. Governments could focus on increasing the flow of information (e.g. with marketing bulletins on public radio) and improving rural infrastructure to make far-flung communities more accessible. They could promote risk-reducing technologies, such as irrigation, and improve the legal foundation and enforceability of contract systems. They could also make agricultural trade more attractive to private commercial companies, through deregulation of import and export, including removing currency controls, and reducing domestic bureaucratic procedures. This would, in turn, reduce the likelihood of exploitative geographical monopolies and cartels developing. It would also indirectly enhance the likelihood that such companies would invest in research and provide extension as a way to gain advantage over the competition.

However, in the interests of general social welfare, complete government withdrawal may not be advisable. It is often critical for the public sector to maintain some influence in the supply of basic foods, particularly to ensure that poorer and more remote areas are serviced by marketing systems (both in terms of supply and purchasing). While in Asia private trade may be sufficiently well-developed to cater to most areas, however small the local market, this is usually not the case in Africa. As marketing parastatals have renounced their monopolies in

places such as Tanzania, distant villages have remained almost untouched by private trade (Mans, 1994). In Latin America farmers' associations and cooperatives have developed an important role in marketing of cash crops (for example El Ceibo in Bolivia), but such organisations tend to be underdeveloped in Africa and have less influence where food crops are concerned.

Even in countries where irrigation is extremely common and basic food crops are harvested two or three times during the year, seasonal price fluctuations are still significant. This is the case for rice in Indonesia where, despite a well developed private market, traders have been reluctant to exploit the opportunities for inter-seasonal price arbitrage. Indeed it has been argued that very limited intervention by the parastatal BULOG to stabilise prices has reduced the risk, rather than the trading opportunities, of private individuals and companies and hence had a positive influence on their involvement (Ellis, 1993).

8.3 Progress towards new goals

In those areas where marketing responsibility has been withdrawn from monopolistic parastatals, increases in efficiency do seem to be apparent. In particular, consumers (including many small farmers) have benefited from overall increases in trade and supply of staples and therefore more stable prices (although some intervention in food crop marketing can also have a positive influence on price stability as noted above).

Also noted above is the fact that not all areas are attractive to new entrants. In Mali, Smith and Thomson (1991) observe that traders have been deterred from entering markets because of demand and supply instability, regulatory uncertainty and the unenforceability of contracts. In both Tanzania and Mali traders are reported to be risk-averse and unwilling to invest in storage. This results in increased risk to farmers who are forced to store more of their produce on farm. The worst scenario for farmers is that they are forced to store beyond the period when their goods remain viable because the parastatal has withdrawn and no trader has taken its place. Governments must clearly be aware of this possibility and ensure the intervention of the public sector where the private sector does not exist.

8.4 Focus on the rural poor

The efficiency of agricultural marketing services is important to everyone. There are very few people who neither purchase nor sell agricultural produce (in particular foodstuffs) at some stage in the year or who would not wish there to be an efficient service in place should they need to call upon it. To the extent, then, that market reforms have improved the overall efficiency of services the poor should have benefited as much as anyone.

Much of the pressure for reform came from critics who held that parastatal or public sector marketing systems were directly damaging the interests of rural people – including the rural poor – because they were keeping prices artificially low to benefit the urban middle classes. For this reason, the rural poor might be assumed to have benefited relatively more than others. On the other hand, the commentary above has made it clear both that nominal reforms have often not changed systems in the poorest areas and also that governments holding some buffer stock or reserve of staple crops is not undesirable. This is a measure taken to protect the poor (both urban and rural) who are less able to deal with undue fluctuations in price. If such stocks have been run down or abolished the benefits of system reform might be somewhat tempered for the poorest sections of the population.

8.5 Lessons

Although there is no blueprint for state involvement in marketing systems, it seems generally rue to say that intervention in cash crops marketing is not advantageous. The situation for basic food crops is more complex. A certain number of lessons may be learned from the Indonesian example. BULOG's success in operationalising floor prices for rice is held to be due to its excellent price monitoring, its relatively quick response time to market conditions and the general reliability of its defence of floor prices. It is also very specific about the location and times of its purchases – it buys only between 3% and 8% of peak season production – and can thus limit the extent of its overhead (although this is still criticised). Once more, attention must be focused first on clear definition of ends and only then on selecting the most cost effective way of achieving them. Nonetheless, it must be emphasised that, despite all the work that has gone in this area, no generally applicable formula for marrying buffer stock activity with private sector enterprise has yet been found.

One thing that is clear is that effecting change, particularly in food crop marketing systems, is extremely difficult. These systems impact upon almost everyone within a country and reform is thus likely to be most contentious. Lewa (1995) points out the importance of constructing reform programmes very gradually, paying attention to detail and assuring consistency both internally and between donors' policies. He also deems it extremely important to devote attention to building support for reform amongst a country's politicians (and not just the bureaucracy which is what he perceives as having happened in Kenya).

9. Other goods and services

While this review has attempted to cover most of the goods and services which are critical to farmers, it is clearly not exhaustive. There are many goods which are less

easily defined but nonetheless critical to rural people, such as general skill levels for management of resources and environmental goods. This latter category would include the preservation of genetic diversity and soil fertility, both of which are critical to rural people in the longer term. Also important is research into biological methods of pest control and organic fertilisation which reduce rather than increase the use of purchased inputs and are therefore unattractive to private companies (Pray and Echeverria, 1991). Indeed if the public sector provides advice in such an area it should be prepared to come into direct conflict with private companies which are spreading different and more product-related messages.

Neither private entrepreneurs nor farmers' organisations are likely to be the major suppliers of such advice. For private entrepreneurs it will rarely be profitable (except, possibly, for purchasing companies which gain a premium for organic produce) and farmers' organisations tend to concentrate in areas where they are able to provide clearly visible short-term benefits to their members. Schwartz (1994) notes that as agriculture becomes more sophisticated private companies might provide general advice on farm management as part of software packages or information systems. Clearly most developing country agriculturalists are many decades from receiving such advice and thus must rely on government or NGOs whose agendas focus on empowerment to help improve their education and management capability (Farrington and Bebbington, 1993).

Environmental goods may also be supplied by interested NGOs. However, NGO coverage is often patchy, implying that governments must intervene to ensure their supply over a wide area. Indeed, environmental problems often require very broadly focused efforts if any progress is to be made. Government action is often said to be the only way to counter the very high discount rates (short time horizons) of individuals which may have serious environmental implications over the long term. Since it is usually argued that the poorer the individual the higher the discount rate, intervention may be more critical in developing countries than in richer ones.

10. Conclusions

This literature survey has looked at the evolving relationship between the state and the individual in the context of the supply of agricultural goods and supporting services. While in the past public sector agencies were frequently the only providers of all manner of goods and services, and individuals were consequently very dependent upon them, there is now far more choice and a philosophy of institutional pluralism prevails.

Two key issues have emerged during the transition. The first is that pursuing increases in efficiency, which provide the dominant rationale for change, may be antithetical to social equity unless specific safeguards are built in and a broad

definition of the concept itself is adopted. Efficiency is usually sought through the market mechanism and this itself has major failings; it is often the poorest who suffer most. The second is that while there may be no blueprints for the roles of different actors in the Agricultural Technology System (ATS) there is a growing pool of experience upon which decision-makers can draw. Furthermore, economic theory can help with early identification of areas where continued government involvement is likely to be desirable.

While each resource deserves individual attention, it is also apparent that general guidelines about the *process* of reform and the points that must be taken into consideration, if not the actual desired outcome, do exist. Tables 2 and 3 below summarise some of the main points of the discussion, emphasising for each sub-sector the areas in which there are major unanswered questions or points which require further research. The tables make it clear that the range of farmers needs is enormous. No single supplier could hope to satisfy them all; indeed, even a variety of different suppliers are not expected to succeed in this, though they are likely to do better than a single monopolist.

There are, then, no sectors in which complete government withdrawal appears prudent. At the very least public sector agencies must manage the markets; they are often the only bodies with the scope and the authority to enforce the necessary regulation. They also have a role in facilitating entry of new players, especially in those countries where private sector trade and the infrastructure which underpins it have been severely undermined over the past decades. Private sectors and farmers' organisations - both of which have formerly been considered subversive elements in many countries - need administrative, institutional and financial assistance to transform them into fully functioning members of the Agricultural Technology System.

It is only where other suppliers do not exist (possibly because of market failures) or where the narrow economic efficiency implied by dependence on markets is not felt to be socially acceptable that the government itself should become a supplier. The foregoing economic analysis together with a basic understanding of who in a country has purchasing power gives some early indications as to where this might be the case. Public sector agencies must, however, recognise that it will often be in the areas in which they have had least success in the past that they will have the greatest role in the future. The fact that they might wish to withdraw from these does not mean that it will be efficient for them to do so.

Table 2: Summary of sub-sector discussions: economic analysis

	<i>Economic characteristics</i>		<i>Other relevant market failures</i>
	<i>Private</i>	<i>Non-private</i>	
Fertiliser			
• Trade	✓		• Risk
• Best practices information		✓	• Capital market imperfections
			• Externalities (-ve)
Seeds			
• Research	✓ (hybrids)	✓ (other)	• Risk
• Supply	✓ (hybrids)	✓ (other)	• Capital market imperfections
• Regulation		✓	• Moral hazard
			• Adverse selection
Research			
• Pre-technology		✓	• Risk
• Prototype technology	✓	✓	
• Usable technology	✓	(✓)	
Extension			
• Broadly applicable		✓	• Lumpy purchase
• Highly specific	✓		• Adverse selection
Veterinary Services			
• Curative	✓		• Externalities
• Preventative	(✓)	✓	• Moral hazard
• Promotive	(✓)	(✓)	• Economies of scale
Rural Credit			
• Credit supply	✓		• Risk
			• Adverse selection
Marketing Services			
• Food crops	✓		• Risk
• Cash crops	✓		• Imperfect information
			• Capital market imperfections

Table 3: Summary of sub-sector discussions: key players and issues

	<i>Types of supplier*</i>	<i>Areas for attention</i>
Fertiliser		
• Trade	• Private sector (1,3)	• Supply in poorer areas
• Best practices information	• Public sector	• Improving physical infrastructure
		• New methods of organic fertilisation
Seeds		
• Research	• Public and private (1,2)	• Rationalising regulation
• Supply	• Private sector (1, 2, 3)	
• Regulation	• Public sector	• Support to local growers
Research		
• Pre-technology	• Public sector	• Improving relevance of public research
• Prototype	• Public and private (1, 2, 3)	• Coordination of public sector/private sector efforts
• Usable technology	• Private sector (1, 2, 3)	
Extension		
• Broadly applicable	• Public and private (2, 3)	• Enhancing effectiveness
		• Best methods for cost recovery/subcontracting
• Highly specific	• Private sector (1)	• Use of innovative methods
		• Coordination of public sector/private sector efforts
Veterinary Services		
• Curative	• Private sector (1,3)	• Extending coverage
• Preventative	• Public sector	• Best methods for cost recovery/subcontracting
• Promotive	• Public and private (2, 3)	
Rural Credit		
• Credit supply	• Private sector (with some support) (1, 2, 3)	• Improving mobilisation of rural savings
		• Secure economic environment
		• Provision of central liquidity funds and training
Marketing Services		
• Food crops	• Public and private (1,3)	• Building policy consensus for reform
• Cash crops	• Private sector (1, 3)	• Credit for traders
		• Improving infrastructure
		• Identifying the minimum effective government involvement in basic food crop marketing

* 1 = Private commercial companies

2 = Non-profit organisations

3 = Membership organisations

In particular the poorest living in the most remote areas will tend to be ill-served by markets. Amongst these will be many women who, in most countries, have very little access to cash since they are limited to household and food crop activities. Because of the marginal environments in which they live, these people tend to have the most complex needs. The gulf between them and government researchers and extensionists is far wider than for prosperous farmers and accountability is hard to achieve. Indeed it is precisely because these people have been so poorly served by public sector institutions that much of the pressure for reform has come about. Governments will therefore need to identify and find new ways of addressing problems in such areas if their efforts are to be effective.

This conclusion, that the role of the state in developing countries should be to regulate and monitor markets with a view to more direct intervention only in those areas in which the market underprovides is, then, easy to reach but extremely difficult to operationalise. Governments have been unable effectively to monitor, manage and regulate their own efforts in the past. It is not clear how they should be expected to be able to do this for others now, especially since the greater number and type of actors involved is likely to increase the complexity of the system. Leonard (1993) insinuates that the World Bank does not pay adequate attention to issues of regulation under market imperfections. He also notes the enormous volume of US literature documenting the difficulty of operating effective regulatory mechanisms, and the hazard of regulators being captured by those being regulated. The main problem lies in differential access to information between those who are trying to control activities from a distance and those who are actually involved. (In economic terms this is an aspect of the 'principal/agent' problem (Vickers and Yarrow, 1988).) In addition, governments are not simple efficiency or utility maximisers³, especially at the level of the nation as a whole.

In order to help them fulfil their new role governments need to restructure internally, reducing waste and seeking ways to improve their own capacity to identify problem areas and capitalise on opportunities for collaboration with the private sector, NGOs and farmers' organisations. Unless decision-makers within public sector institutions recognise the rich potential of the environment in which they are acting and the fact that they are no longer the only or even the dominant suppliers, only waste and duplication will result.

Structural ways of enhancing effectiveness and efficiency may be critical. The

³ For example, some argue that they are tools of the dominant classes manipulated into pursuing the narrow interests of this one section of the population (O'Donnell, 1973). Others argue that they pursue their own interests rather than those of the nation as a whole. Thus the political elites which constitute governments seek re-election in the short term and their own aggrandizement in the long term (Migdal, 1988).

whole notion of decentralisation within the public sector has been promoted by donors as one sure source of improvement. Eponou (1993) details the supposed benefits in the agricultural sector. Decentralised institutions are thought to: better serve the needs of local farmers; reduce central administrative overload; result in faster response to problems at the operational level and improve integration. However, drawing on the example of restructuring in the in Costa Rican research and extension services, he points out that decentralisation may also result in: poor coordination of research; lack of control over research direction; deviation from national development goals and added administrative tasks and linkage requirements.

Despite strong donor support this strategy cannot be automatically assumed to generate improvements. There is, after all, no guarantee that local decision-making will be any more relevant to farmers' needs than central decision-making; too many other factors come into play. Certainly, though, central institutions must be willing to cede real financial control to decentralised units if improvements are to be forthcoming. However, as Ingham and Kalam (1992) point out, it is frequently only strong governments (such as that in Tanzania) which are prepared to take the risk of decentralising – in which case the decentralisation rarely implies actual autonomy.

Some argue that by reducing the breadth of their commitments governments will naturally increase the depth and efficiency in the target areas in which they remain. However, given the concurrent pressure to cut absolute spending, it is not immediately apparent that target areas will be better resourced. Furthermore, targeting is not a simple process. First, criteria for support must be defined, then questions of degree must be addressed – how far should governments go in their efforts? Although it is possible to reduce costs by adopting innovative methods in agricultural service provision, especially as levels of rural education improve (for example increased use of mass media and printed matter in extension), other new approaches are extremely demanding in terms of both time and money (Farrington and Martin, 1988). Resources in most developing countries are very limited and competition to secure them is intense. While rural populations in many developing countries are greater than urban populations, the immediate needs of those in towns are often more visible and arguably sometimes more pressing. This whole issue falls beyond the boundaries of the market and moves into the realms of broad social cost benefit analysis. Such analysis is at best inexact and at worst very manipulable by governments with alternative agendas (see footnote on previous page).

Finally, whatever level of resources are used in targeting, methods to prevent leakage from target to non-target areas must be found. If they are not, not only will the right people not benefit but also the economic environment will be less attractive to private investors. Demand will fall and any economies of scale in operation will be reduced, causing the efficiency of the overall system to suffer.

The overriding conclusion must be, then, that while some solutions will work better than others – and pluralism of supply certainly works better than government or private sector monopolies – there is still much room for research into how to improve the whole supply system for agricultural goods and services. In particular there are gaps in the knowledge about the dynamics and actual functioning of new and varied types of systems. For example: how the public sector can best adapt to manage the large numbers of partnerships which it is expected to form with different types of private sector institutions; how participatory approaches to service provision can best be operationalised and cost savings identified; and how the performance of decentralised structures can be effectively monitored and improved upon. Finally, there is the thorny issue of how far governments can go in supporting those sections of the rural population which have little purchasing power without removing all the incentives for these people to seek opportunities for self-help. De Janvry and Sadoulet (1993) argue that it is only change which is well thought-out, executed for the right reasons and coherent with policy in general which will be effective. Progress certainly seems to be being made in this direction, but there is still quite a way to go.

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