Position Paper

Sustainable Agriculture

A Summary of Sida's Experiences and Priorities

SWEDISH INTERNATIONAL DEVELOPMENT
COOPERATION AGENCY

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Foreword

This is one of four similar papers written within the Department for Natural Resources and the Environment (DNRE) during 1997 - 1999 as inputs into a process intended to result in a policy document for Sida's work in natural resources management. The other three papers deal with water resources management, forestry and rural development methodology respectively. Inevitably, there is some overlap between the papers, in particular between the present paper and the one on rural development methodology by Karin Isaksson. However, in so far as this reflects the commonality of approach that one would expect within Sida it is not considered to be of material importance.

Much attention is being given these days within Sida to poverty eradication. Yet there is little reference to agriculture although it is well known that agriculture dominates the economies of most of Sida's partner countries, and that raising agricultural productivity is a key area for reducing poverty. One objective of this paper is therefore to resurrect the importance of agriculture in Sida's internal discourse and to refocus on the importance of efforts to improve the incomes of small farmers as part of the broader agenda of sustainable management of natural resources and indeed of poverty eradication.

The text is based on a draft written with the support of a consultant for the agricultural task force within DNRE chaired by Anders Höök. That draft has since been substantially revised with frequent use of reports published by IFPRI as part of its 2020 Vision project and the excellent book by Gordon Conway titled *The Doubly Green Revolution.*

Stockholm, May 1999

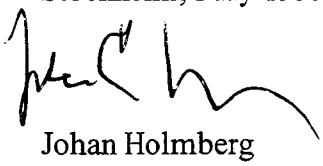

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Table 1: Indicators of Agricultural Production and Food Consumption in Selected Swedish Aid Recipient Countries

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Summary

Sida generally intervenes in agriculture in the context of broad-based rural development programmes which seek to raise agricultural productivity and, ultimately, small farmers' incomes through a set of coordinated activities. This is based on a sustainable livelihoods approach with a strong poverty focus that seeks to orientate programme activities towards identified needs at household level with an emphasis on participatory approaches and with increasing attention to agroecological techniques that minimize the use of imported farm inputs.

There are relatively few large-scale stand-alone agricultural development projects supported by Sida, and there are few examples of Sida support to capital-intensive, modern agriculture.

Given its emphasis on poverty alleviation, Sida has in recent years chosen to focus its support to agricultural development in low-potential lands, as illustrated by projects in Ethiopia, Mozambique, Tanzania and Vietnam. In the low-potential areas land husbandry is of high priority, and here Sida is basing its experiences on its successful involvement in the National Soil and Water Conservation Programme in Kenya. Sida is cognizant of the importance of safeguarding biodiversity, including plant and animal genetic resources, and supports efforts to conserve biodiversity and maintain access of developing countries to genetic resources. With security of tenure a prerequisite for farmers' willingness to invest in improvements on their land, Sida has for many years given priority to support to land surveying, including land registers and legislation regulating the sale and use of land.

Sida also seeks to strengthen the institutions most relevant to agriculture and rural development. These can be key functions in central government bodies affected by structural adjustment and in need of management and policy support or, in rural areas, local administrative bodies supporting small-scale agricultural development. Staff training in agriculture at all levels is important and a key component of most Sida interventions in agriculture.

Sida's support to agricultural research, through CGIAR as well as NARS, has been growing in recent years and should continue to grow in the future. Agricultural extension systems need support to disseminate the findings from research, and Sida encourages pluralism in such systems in terms of organizational and financial approaches. Support to local seed industry is important, since locally produced improved seed is often the most important and also relevant farm input to smallholder development. Farm credit at unsubsidized rates of interest provided through small-scale credit and savings institutions is necessary to enable small farmers make necessary farm improvements.

One of the most important actions to increase farm incomes will often be to open up markets for farm produce by reducing the cost of transport through road construction and improvement of rural markets, including facilitating the exchange of goods between the countryside and small rural towns.

This may include improvement of the infrastructure that serves the public good, such as market and storage facilities in these towns, market information, electricity and water at public markets, and access to transportation to and from these markets. Private sector development may also be important to capture opportunities to process agricultural produce, while providing work for surplus labour from the rural areas.

1. Preamble

The main purpose of this paper is to summarize Sida's experiences in agriculture and to highlight priority areas for possible future interventions. It is a position paper written within Sida's Department for Natural Resources and the Environment (DNRE) for the audience of the partners collaborating with Sida in agriculture internationally as well as in Sweden.

Other Sida departments intervene in agriculture to a certain extent. SAREC has a large programme of support to agricultural research. SEKA provides humanitarian relief in famine situations where urgent support to agriculture is required, e.g. through seed supplies, and also extends grants to Swedish NGOs active in agriculture. INEC supports training activities and consultancy studies in agriculture and is considering involvement of agriculture within its private sector programme. However, to date INEC has not provided any significant capital (loan) support for agricultural development.

A note on terminology is necessary. The paper deals with agriculture defined to include crop production, animal husbandry, agroforestry, and soil and water management for purposes of agricultural production. It makes frequent references to rural development which is defined as *poverty oriented development in rural areas including, but not necessarily limited to, activities in agriculture.* The rural development programmes referred to in the text below all contribute to agricultural development and improved food security .[i]

2. Challenges in agriculture facing developing countries

The United Nations has recently scaled back its population projections, but even the reduced estimates suggest that 80 million people are likely to be added to the world's population each year during the next quarter century, increasing world population from some 6 billion today to 7,7 billion by 2020. More than 95 per cent of the population increase is expected in developing countries, whose share of the global population is projected to increase from 79 per cent in 1995 to 84 per cent in 2020. The highest absolute population increase over this period will be in Asia, but the relative increase will be greatest in Sub-Saharan Africa, where the population is expected to almost double by 2020.

At issue is whether food will be produced in sufficient quantities for these additional consumers, considering that (a) the rapid rate of urbanization will profoundly affect dietary and food demand patterns with shifts from basic staples such as maize, sorghum and millet to rice, wheat and livestock products, (b) good quality crop land is already in short supply in most parts of the world, and (c) much of this land is already subjected to increasing environmental degradation.

Projections of food production and consumption in the decades ahead paint a mixed picture. One common indicator of food security is the number of malnourished children under the age of six which is expected to decline from 200 million 1993 to 150 million in 2020. Child malnutrition is expected to decline in all major developing regions except Sub-Saharan Africa and remain high in South Asia. In 2020 70 per cent of the world's malnourished children would be found in these two regions which in the decades to come will be the locus of hunger in the developing world.

Worldwide, per capita availability of food is projected to increase by around 7 per cent between 1993 and 2020, and increases in average per capita food availability are expected in all major regions. However, the projected average availability of about 2,300 calories per person per day in Sub-Saharan Africa is just barely above the minimum required for a healthy and productive life. Since available food is not equally distributed to all, a large proportion of the region's population is likely to have access to less food than needed.

The challenges facing agriculture globally and, in particular, in Sub-Saharan Africa and South Asia to keep pace with projected future demand for food are thus tremendous. As will be further elaborated below, many of those challenges lie outside agriculture proper and deal with the environment in the broad sense within which agricultural production takes place. Two dimensions of that environment stand out as particularly important. First, *basic to production increases in agriculture is peace and stability*. Social unrest and political conflict will set back efforts to reduce hunger. The present situation in parts of Africa does not augur well in that regard. Second, *the macro-economic policy environment must not discriminate against agriculture*, e.g. through overvalued exchange rates making food imports cheaper at the expense of local production.

A particular challenge that has emerged in recent years is the adverse impact of HIV/AIDS on smallholder agriculture and rural livelihoods, particularly in Africa. In many rural areas of the worst affected countries labour shortages are beginning to affect agricultural production. Women bear the brunt of the disease. They are highly vulnerable to infection and at the same time have to support the family, while also being responsible for most on-farm work.

Table 1 shows that agricultural performance in a sample of Swedish aid recipient countries on the whole has been poor. In six of the seven countries for which full data are available agricultural production per capita for 1994-96 is below the levels of 1984-86 and also below the average for developing countries, the only exception being Vietnam. Food consumption as measured by average daily per capita calorie supply has declined in all countries, again with the exception of Vietnam, and all are well below the average for developing countries. Improved food security would appear to be a high priority for most of the countries in the sample.

Agriculture dominates the economy of most developing countries. Generally, the poorer a country the larger the relative importance of its agricultural sector to GDP, employment and exports. The biggest economic challenge of all for these countries is therefore to

stimulate growth and increase productivity in agriculture as a necessary (but insufficient) engine for growth and development also in other sectors of the economy. Table 2 illustrates the importance of agriculture to the countries listed in table 1.

3. Sida's approach to agriculture

3.1 Guidelines for Sida's work in agriculture

Since 1962 the overall Swedish objective for international development cooperation has been to promote the welfare and standard of living of poor people. This overall objective has been complemented with more specific objectives: economic growth, economic and social justice, economic and political independence, democratic development, environmental concern and equality between women and men. Those objectives are operationalised in Sida's four action programmes for *poverty alleviation, justice and peace, gender equality* and *sustainable development.* Each one of them impacts on Sida's work in agriculture.

Sida is divided into several *programme areas*[ii], each of which includes all work carried out in that particular area within the agency regardless of organisational affiliation. DNRE is guided by the following objective for the programme area *natural resources management:*

To create preconditions for better living conditions and income for (primarily) the poorer part of the rural population. This is to be realised through sustainable and productive use of renewable natural resources with due consideration of the long term functioning of the eco-systems. This objective is to be achieved through support to:

- *rural development* (promoting active participation of poor women and men in economic and social development),
- *agriculture, including animal husbandry* (to foster effective and sustainable production systems),
- *forestry* (to increase the contribution of wood products to sustainable development for the rural poor),
- *water resources management* (departing from an integrated view and with due consideration of the long term functioning of the eco-systems) and
- sustainable use of *costal and marine resources.*

3.2 Sida and sustainable agriculture

In the late 1980s environmental awareness grew rapidly in the OECD countries. "Green" parties were formed and there was sustained political pressure for improved environmental management by governments. In the area of development aid this coincided with a growing disenchantment with support to agriculture based on perceived negative experiences from projects in the sector. Aid donors shifted their resources from

agriculture to natural resources management with an emphasis on environmental protection. Sweden was no exception to this trend, as illustrated by the name change in 1990 of the responsible unit within SIDA[iii] from Agriculture Division to Natural Resources Management Division. Sida still views agriculture as an integral component of natural resources management.

Sustainable agriculture can mean very different things to different people. Some agriculturists equate sustainability with food sufficiency and look askance at low-input approaches that, they say, can never achieve high output objectives. But there is a growing consensus on the need for a different approach to agricultural development that is less dependent on imported farm inputs such as fertilizers and other chemicals (which many developing countries in any case can ill afford). This is often referred to as agroecology, an approach that emphasizes biodiversity, conservation tillage, recycling of nutrients and synergy among crops, that relies on indigenous farming knowledge and that makes selective use of modern technologies.

There is lively debate between proponents of agroecology and of high input agriculture respectively. It would appear that the debate does not have a conclusive answer: the short answer is to be selective. With the financial cost of imported farm inputs prohibitive to many small farmers agroecological approaches should always be applied as part of a package of improved farm husbandry practices. However, on many nutrient poor soils, e.g. in Africa, application of fertilizer is also necessary, lest productivity will decline.

The ultimate objective of all approaches should always be *to maximize sustainable productivity increases and farm incomes,* and it is against that criterion that Sida's agricultural projects should be assessed. Generally, Sida's interventions in agriculture take place in the context of broad-based programmes in which agriculture in the limited sense is but one of several components, while other components may include support to local administration, natural resource conservation, road construction, training, forestry development, social mobilization etc. There are relatively few large-scale stand-alone agricultural projects, as conventionally defined, supported by Sida.

Sida's approach to rural development is well described in the position paper by Karin Isaksson (see reference list). It could be summarized as people-centred development that seeks to adopt a partnership model emphasizing local leadership and locally owned development strategies. It is based on the belief that changes in agricultural systems cannot be commanded from above but must be stimulated with the active participation of the beneficiaries themselves, men as well as women. There is a focus on supporting sustainable livelihoods with attention to all needs identified by the household. This identification is often carried out using participatory rural appraisal (PRA) techniques or similar methods.

The target group is poor rural households. However, agricultural development may not directly affect the poorest in the countryside since they may be landless. At the same time the innovators in agriculture, those with higher propensity to try new farming methods,

are usually the relatively better endowed, those able and willing to take risks. Special efforts will therefore be made by Sida to design activities directly targeting the poorest farmers to involve them in the use of improved farming methods. For the landless a different set of activities is required, such as labour-intensive construction schemes and training in various crafts based on the produce from farming and forestry.

Gender equality is important in all of Sida's projects in agriculture. Particularly in Sub-Saharan Africa, women account for a dominating share of farm work, and yet women continue to be discriminated against in the provision of agricultural services, e.g. in extension and research. Sida tries to address such imbalances in the projects it supports by identifying women's needs through special analyses and targeting specific actions at those needs.

A special case is the key role of agriculture in emergencies and humanitarian disasters. In these situations it may be necessary to provide heavily subsidized farm inputs to get agriculture going again in affected areas and to resettle disaster victims. Food aid is normally considered detrimental to domestic agricultural production due to its depressive effects on prices but has an obvious role to play in emergencies to supplement locally grown food.

Outside the broad-based rural development programmes, Sida also supports more narrowly focused projects in research, farm input production, training and institution building. Examples of such projects will be given below.

While Sida gives priority to food security in Sub-Saharan Africa, it is cognizant of the methodological difficulties and uncertainties of pursuing a livelihoods approach to rural development and agricultural production. Support is therefore given to two projects that seek to develop methodologies and techniques in this area, while providing expertise to Sida-supported projects (box 1).

Box 1: RELMA and FARMESA
The Regional Land Management Unit for Africa (RELMA) is based at the CGIAR institute ICRAF in Nairobi. It originates from the regional unit established to disseminate regionally the experiences from the successful national soil conservation programme in Kenya but was in 1997 given a broader mandate to work with land management issues generally. It has about ten professional staff and is active with pilot projects, training activities and networking throughout eastern Africa. FARMESA is based in Harare and executed through FAO. Its main objectives are to develop improved field methodologies for the identification, prioritization, testing and adaptation of appropriate small holder technologies and to disseminate these technologies through training and networking.

Sida usually does **not** support large-scale agriculture. There are few examples of Sida support to investment in irrigation or to irrigation management, largely because irrigation in tropical countries is not an area where there is strong Swedish expertise. There has also

been relatively little Sida support in recent years to animal husbandry and the production of beef or milk, mainly because experiences from projects in this area in the past have not been very positive. However, this may now be changing as farmers identify livestock needs based on the livelihoods approach mentioned above and as livestock increasingly is recognized as a necessary part of drylands development.

There are also relatively few examples of support by Sida to export crop production. While there are exceptions, such as tea production in Uganda, Sida's poverty approach to rural development tends to favour food crops grown for local consumption.

To estimate the volume of Sida disbursements for agriculture it is necessary to define agriculture as distinct from e.g. rural development or protection of the environment. This is not straightforward since the statistical classifications of projects inevitably become somewhat arbitrary and therefore can be misleading. Allowing for such uncertainties it can be estimated that Sida disbursed about SEK 0,5 billion per year during 1996 – 1998 for purposes of agricultural development, equivalent to 6-7 per cent of total disbursements during those years.

What follows is a summary account of Sida's experiences and priorities in agriculture grouped under the headings

- natural resources management
- capacity building
- innovations and farm inputs
- infrastructure and markets

4. Natural resources management

4.1 High-potential vs low-potential lands

When the allocation is made of scarce resources for investment in agriculture in developing countries the choice between high-potential or low-potential lands is seldom straight-forward and often controversial. There is usually an argument that centres on the efficiency of the investment from a poverty perspective. Some argue that by investing in high-potential areas the returns on investment in terms of incremental farm output can be maximized, therefore food supplies to the cities can be increased and food prices for the urban poor reduced. This strategy has been successful in many countries and was underlying the Green Revolution.

But at the same time large areas of less-favoured lands have been neglected. On these lands the agricultural potential is generally low, often because of poor soils and uncertain rainfall and also because neglect has left them with limited infrastructure and poor access to markets. Despite some outmigration, population continues to grow, while crop yields

remain stagnant due to lack of relevant research and agricultural services. The result is worsening poverty, food insecurity and widespread natural resource degradation (including mining of soil fertility, soil erosion, deforestation and loss of biodiversity).

On poverty and environmental grounds alone, more attention needs to be given to low-potential lands in setting priorities for policy and investment. This has also been Sida's conclusion. The choice is not always clear-cut, and some of the larger, and also more successful, Swedish aid interventions in agriculture in the past have been in high-potential areas. Two frequently cited examples are the CADU project in Ethiopia supported by SIDA 1967-1986 and the National Soil Conservation Programme in Kenya still supported by Sida (box 3 below). But in recent years Sida has been more guided by the poverty criterion and given priority to low-potential areas for support to rural development. There are ongoing examples of such projects in Ethiopia, Tanzania, Zambia and Vietnam and others being planned in Mocambique and Nicaragua. The current strong emphasis on poverty in Sida's work makes it unlikely that this approach will change.

Box 2: Rural development in the Amhara Regional National State (ARNS), Ethiopia
In 1996 Sida decided to provide SEK167 million to a broad-based rural development programme in this part of Ethiopia that includes the famine-prone central and northern highlands. The programme seeks to increase agricultural production in areas where most farmers still use centuries old farming techniques and almost 40 % of the land is subject to high or very high erosion rates. Population grows at an annual rate of 3 per cent, average farm size is less than one ha and yields of the main staples, teff and barley, as low as 400-800 kg per ha. Poverty is deeply entrenched and is compounded by a lack of possibilities for outmigration

4.2 Land husbandry

There are increasing concerns about the extent and rate of soil degradation in the world and its effects on agricultural productivity and preservation of natural resources, including biodiversity. Some of the most severely affected regions of the developing world - the uplands and highlands of Asia and Latin America, the semi-arid areas of Sub-Saharan Africa and perhaps in particular the highlands of eastern Africa and the saline and waterlogged soils of South Asia - are precisely where many of the rural poor and chronically undernourished now live.

Overgrazing, deforestation, and inappropriate agricultural practices account for most of the degradation. To a large extent, these problems result from or are exacerbated by inadequate property rights, poverty, population pressure, inappropriate government policies, lack of access to markets, to credit and to technologies appropriate for sustainable agricultural development. Crop productivity losses are widespread in hilly areas, dryland cropping areas, rangelands, and irrigated areas. Unless nondegraded soils are protected and currently degraded soils are restored, increasing population and

persisting poverty will hasten soil degradation and reduce prospects for future agricultural productivity increases.

With soil degradation pervasive in many low-potential areas, measures to improve land husbandry will be prominent in many of the rural development programmes Sida supports. Such measures should always be adapted to the farming system that obtains in each particular situation. They may include earth banks or bunds on sloping soil often reinforced with crop stalks or trees, various forms of terraces, the interplanting of trees and agricultural crops (agroforestry), tree planting. Construction works are carried out by farmers themselves acting on the advice of extension agents.

The best known project in this area supported by Sida is the soil conservation programme in Kenya (box 3). The approaches adopted by this programme have been widely disseminated in eastern and southern Africa and are currently being applied in Sida-supported projects in Ethiopia, Uganda, Tanzania and Zambia.

Box 3: The National Soil and Water Conservation Programme, Kenya
Since 1974 Sida has supported this programme for the purpose of increased production by small farmers through adoption of sound land husbandry practices. The total Sida contribution has been SEK262 million and the support is still ongoing. Since the inception some 1,5 million farms have been reached. Training activities have involved one million farmers, 97,000 teachers and 61,000 students. An evaluation from 1998 evidenced important production increases as a result of programme activities, e.g. maize yields had increased by 50 per cent. Dairy production and tree planting had also increased and small farmers' food security improved significantly. To Sida the most important lesson from this programme has been the close relationship between improved land husbandry and increased agricultural productivity.

4.3 Biodiversity

Protection of biodiversity, including maintenance of plant and animal genetic resources, is essential to promote a sustainable agriculture, enhance productivity, profitability and stability of farming systems without depleting the natural resource base. Unfortunately, the role of biodiversity in agriculture and consequently biodiversity of local value to poor communities has generally received little support compared to the conservation of wild ecosystems.

Biodiversity enables traditional production systems to exploit a range of varied ecological niches and to cope with the hazards of the climate and attacks of pests and disease. There is also a direct link between biodiversity and the capacities of agro-ecosystems to function properly and deliver ecosystem services, e.g. for the pollination of crops and purification of water in wetlands.

The support that Sida has given to food diversification, seed production and regional and national gene-banks is of great importance to conserve biodiversity, promote food security and maintain access of developing countries to genetic resources. Traditional farming systems depend heavily on the availability of numerous land races, and Sida supports innovative forms to conserve the genetic variability *in situ.* Sida will also facilitate the access of developing countries to improved genetic resources and seek to influence international processes to ensure their fair share of benefits from commercial use of such resources.

Box 4: SADC Plant Genetic Resources Centre in Lusaka, Zambia
The Nordic countries have since 1988 supported the centre (Denmark withdrew in 1998) with the objective of creating better preservation and sustainable utilisation of plant genetic resources for food and agriculture indigenous to southern Africa. To date the Nordic contribution has been SEK94 million of which Sida, which is coordinating the Nordic support, has contributed SEK27,5 million. The centre is in full operation and currently has 6,000 accessions of plant material in long term storage. It promotes a variety of training activities and has e.g. funded 34 Msc degrees. All SADC member states now have national PGR centres with a majority of them doing qualified scientific work.

4.4 Land tenure

Security of tenure is a prerequisite for farmers' willingness to undertake long term improvements to their land, e.g. for purposes of soil conservation or tree plantation. In the absence of secure property rights, natural resource degradation will accelerate as traditional systems for allocating land break down in the face of population increase and "modernization". In some countries land-grabbing fuelled by corruption is carried out by rich and usually urban elites at the expense of small farmers. Female-headed households are numerous in many rural areas, in particular in Africa, while customary law may preclude women from inheriting and owning land.

Legislation regulating the allocation, sale and use of land, modern computerized registers of land ownership rights, maps, and the strengthening of institutions to respond efficiently to the needs of farmers and the public at large is therefore basic to natural resources management. Transparent and efficient protection of rights to land use is also important in a democracy and human rights perspective, since it provides the basis for farmers to invest and to obtain credit as well as a means of reducing corruption. Sida gives high priority to this area, the ultimate objective of its support often being to allow local smallholders to better manage their own land resources.

Sweden has a strong resource base in land surveying with extensive involvement of the Swedish Board of Land Survey in developing cooperation in many countries. Sida's experiences from interventions in this area are generally positive, as projects tend to be

technically focused and well suited for institutional cooperation. At present Sida is supporting such projects in e.g. Vietnam, Zimbabwe and Mozambique.

Box 5: The National Directorate for Surveying and Mapping (DINAGECA), Mozambique
Through Swedesurvey support is being provided to DINAGECA to create an efficient system for land application and allocation of rights to land use, especially protecting user rights of family sector communities. Sida contributes SEK46,5 million to the project for the 1997-99 period. So far the project has developed a realistic and demand-driven approach to land titling, trained personnel and strengthened management of the agency.

4.5 Water resources management

Fresh water availability may well emerge in the years to come as the major constraint to increased agricultural production in many developing countries. Soil and water conservation are intimately connected and often dealt with in the field by the same organizations. Water is as important for the productivity of plants as is the provision of a good soil structure and sufficient nutrients.

Water resources management is an important priority to Sida which has a specific policy governing its work in this area (see paper by Perrolf in the list of references). However, Sida's experience lies mainly in the provision of water and sanitation services to the rural poor. While there have been examples of small-scale irrigation schemes in the context of soil and water conservation programmes, Sida has little experience from irrigation management. In agriculture Sida's focus in this area is therefore more on water as part of land husbandry (soil and water conservation) and on research and crop husbandry treating water as a scarce resource.

Box 6: Research on stress tolerant maize
Yields on around half of the maize area in Sub-Saharan Africa are reduced by insufficient rainfall in an average year. Sida is therefore supporting research by the CGIAR institute CIMMYT to develop maize cultivars with increased tolerance to drought by increasing the frequency of genes for stress-tolerance in locally adapted germplasm acceptable to farmers and consumers in target areas.

5. Capacity building

Capacity building is one of the buzz words of the development jargon, meaning many different things to different people. According to a widely accepted definition by UNDP, it includes the creation of an enabling environment, institutional development and human resource development. At issue is the capacity of governments to perform their appropriate functions necessary to raise production in agriculture.

The structural adjustment programmes under way in a many developing countries have called for often dramatic changes in the way governments do business. There remains considerable confusion and often disagreement about the new role of government, as there can be no blue-print solution applicable to all countries. However, the reform process usually means that government relinquishes those functions better performed by others, while strengthening its capacity to perform the functions identified as essential.

Predictability and transparency in policymaking and enforcement is critical to assist the private sector to anticipate the investment environment. Governments must develop and enforce rules, regulations, standards and measures in private-sector markets as well as promote fair competition in those markets. States play an important role in ensuring that conditions necessary for competition in private-sector markets are present. Governments must also invest in or facilitate private-sector investment in education, health care, agricultural research, infrastructure, and other public goods. Governments should also strengthen their capacity for raising revenue, through taxes or other means, to finance the necessary investments in such public goods.

Structural adjustment has meant that many of the government institutions established for direct or indirect support to agriculture are subject to severe financial constraints in the short term. Inevitably, this is part of the often painful reform process itself as the institutions have to change the nature of the work they perform and in so doing often acquire more qualified staff, while reducing their overall number of employees. Concurrently with these changes a new policy environment has to be put in place, an often difficult process in its own right.

Sida supports this reform process in the institutions most relevant to agriculture by providing advice on the new policy directions they should adopt, strengthing their management, training staff and providing the requisite equipment and other hardware. For example, this is precisely the kind of support provided by Sida to land survey departments in different countries, as shown with the example of DINAGECA in Mozambique in box 6 above.

Large rural development projects initiated with Sida support in the 1970s or early 1980s were built up independently of the local government administration which was often perceived as corrupt and inefficient. However, this prejudiced chances of building local ownership and hence project sustainability. In recent years Sida's support to such projects has therefore been carefully designed to include strengthening the ability of local authorities to perform functions of e.g. project planning and implementation, regulation and enforcement of marketing standards, agricultural research and extension, and revenue collection.

Box 7: Support to local government inTanzania
Sida's support under the Land Management Programme (LAMP) in Babati district in northern Tanzania is designed to strengthen communal and institutional sustainability by enhancing the capability to identify and address problems among Village Councils, Village Assemblies and District Councils. A component of the programme seeks to increase tax revenue for the local authorities. It is assumed that the intensified support to primary production - i.e. more effective extension services together with incremental capital for productive communal and individual investments - by the village and district administrations, in combination with a more "enabling environment" for primary production, such as more secure land rights and more efficient marketing arrangements, will increase agricultural productivity. The concept seems to be working: during 1991/92 - 1996/97 maize yields in the district have almost doubled.

Staff training at all levels continues to be important in all of most of Sida's recipient countries, not least in agriculture. Countries such as Ethiopia, Mozambique, Tanzania and Zambia all have weak and inadequate university systems relative to needs, all four have less than 200 students per 100,000 inhabitants[iv]. Still, many university graduates have difficulties finding jobs because of the cutbacks of public sector employment caused by structural adjustment. At intermediate levels this situation can be even more severe with widespread unemployment among high school graduates or equivalent. Trade schools and other post-secondary training facilities can only absorb a small minority of the unemployed.

Training in agriculture at all levels, from university to farmers in the field is a high priority for Sida and usually an essential component of rural development programmes. Such training may obviously take many different forms, often there is a need for special attention to gender issues. As part of its research cooperation Sida supports faculties of agriculture in e.g. Tanzania and Nicaragua. The specialized training courses organized in Sweden and supported by Sida include training in e.g. seed technology and veterinary science. Some of the larger rural development programmes, such as those mentioned in Ethiopia (box 2) and Tanzania (box 7), establish special schools for agricultural training and include support to farmer training schools. A type of training that Sida has found cost-effective is based on networking between scientists working in a priority area (box 8 below).

Box 8: African Network for Agroforestry Education (ANAFE)
As part of its support to the CGIAR-institute ICRAF in Nairobi Sida has since 1991 supported ANAFE. The network promotes a multidisciplinary approach to the teaching of agriculture and natural resources management, with a special focus on agroforestry, at African universities and colleges. In 1998 almost 100 such institutions were participating in the network.

6. Innovations and farm inputs

6.1 Agricultural research

As set out above, increasing yields is one of the major challenges for agriculture in developing countries in future years. All forecasts of access to low-cost food for poor people are based on assumptions of increased agricultural productivity per unit of existing farm land (and, increasingly, per unit of water). The required productivity gains will only be realized if systems for agricultural research are mobilized and strengthened. The major issue in this context is the rapid trend toward privatization of research and of knowledge about plant and animal genetic material.

Better-off farmers may be able to afford the research products of private companies that can patent and protect their discoveries for sufficient time to realize a profit. But private research focuses on the high-value crops, on labour-saving technologies and on the needs of capital-intensive farming. Research on the food needs of the poor is less attractive. It frequently involves long lead times, it is risky when focused on heterogeneous environments subject to high climatic or other variability, beneficiaries have little capacity to pay, the products cannot be restricted to those who pay and intellectual property rights can rarely be protected.

For these reasons alone, Sida's emphasis on poverty eradication makes a strong case for support to publicly funded agricultural research. However, this case can also be made from the perspective of protection of the environment - higher yields per unit of land reduces the need for expansion of farming into lands with less agricultural potential more susceptible to degradation. It can equally be made from an economic efficiency perspective, as higher yields and more intensive use of land enhances the potential for economic growth in countries where agriculture accounts for perhaps half of GDP. For these (and other) reasons Sida's support to agricultural research should increase in future years.

Such support basically takes three different forms. First, Sida provides core support to the CGIAR, the single largest programme within its research cooperation through SAREC (box 9). Second, restricted project support consistent with Sida priorities is given, usually through DNRE, to a number of individual CGIAR institutes and two examples have been cited above (boxes 6 and 8). Third, support is extended to national agricultural research systems (NARS) in recipient countries through both SAREC (usually to universities) and through DNRE (usually in conjunction with major rural development programmes). Of particular importance is support to NARS in absorbing, adapting and applying research findings from the CGIAR institutes.

Sida's experiences from collaboration with the CGIAR institutes are generally excellent, but it has been difficult to elicit the participation of Swedish scientists in the work of these institutes.

Box 9: Support to CGIAR
Sida's core support through SAREC to CGIAR in 1999 is SEK65,5 million, an increase from SEK50,5 million in 1998. All CGIAR institutes receive core support from Sida, the largest recipients being CIP and ILRI (SEK7 million each in 1999). In addition, restricted project support to five institutes will amount to about SEK23,5 million in 1999.

A particular issue in agricultural research relates to the application of modern scientific methods, such as biotechnology and molecular biology. The challenge is how best to harness the potential of biotechnology and plant genetics for the benefit of small producers in developing countries. There is an increasing concern among consumers and also governments in western Europe about genetically modified food. At the same time biotechnology offers great opportunities for expanding food production while reducing the consequences of drought (box 6), pests and nutrient shortage. Sida's view is that every effort should be made to exploit those opportunities, while at the same time seeking to ensure that biosafety considerations are fully met.

6.2 Agricultural extension services

But research will be insufficient if not closely linked to extension systems to ensure the dissemination of improved technologies to small farmers, male and female. Systems for the dissemination of knowledge are key not only for improved husbandry practices but also in order to raise farmers' awareness of market opportunities and other developments. Most Sida-supported rural development programmes therefore include a component to strengthen agricultural extension services.

Sida's approach to such services has been well described in a paper by Christoplos and Nitsch (see reference list). It stresses pluralism, first by acknowledging that a broad variety of structures providing extension services is already in place in any rural development context and, second, by considering the comparative advantage of different structures for handling different technologies and creating a dialogue with different groups of farmers. Pluralism is best promoted by refocusing national level extension efforts on vision and principles, while leaving methodological decisions to a broad spectrum of service providing organizations.

Increasingly, private sector approaches are being tried in agricultural extension, e.g. in Nicaragua. They would fall well within the emphasis on pluralism encouraged by Sida, provided that they can safeguard the needs of the poorest farmers. The concern is that they will focus on the more lucrative cash crops and on the better endowed farmers.

Box 10: Farmesa's Farmer Field Schools

The Sida-funded Farmesa programme (box 1) has successfully promoted Farmer Field Schools as an approach to close the gap between research and the rural reality. This is a logical extension of Participatory Rural Appraisal in which communities identify and analyse their potentials, problems and needs. The Farmer Field Schools offer farmers opportunities to learn by doing and being involved in experimentation, discussion and decision-making. The objective is to strengthen the role of the farmer in the research-extensionist-farmer chain, building on existing farmer knowledge and indigenous technology. Farmers make experiments based on comparative studies on their own fields with training sessions following the seasonal cycle and involving communication skills, problem solving and leadership training. This methodology has been introduced by Farmesa in Kenya, Uganda and Zimbabwe and is eliciting much interest by farmers.

6.3 Seeds

Improved seed is an essential input to increase small farmers' productivity, one that can be produced locally and hence is less costly in terms of foreign exchange than fertilizers and farm chemicals that usually have to be imported. But effective systems for the multiplication and distribution of seeds are absent in many developing countries. They are needed to disseminate the products of research and introduce improved, more high-yielding plant varieties superior to those traditionally used by small farmers. While seed multiplication and distribution may be undertaken by either the public or the private sector, the government should ensure a conducive environment for the private sector to enter these activities. It needs to develop and enforce regulations to ensure quality control, competition and access to improved seeds by small farmers.

Sida has largely positive experiences from its long-term support to the establishment of national seed companies in Zambia (box 11) and Mozambique. In both cases strong institutions were established. A major reason for the success was probably that seed was treated as a production factor integrated into a production chain covering institutional and national capacity development, research, plant breeding, seed production, processing, certification, distribution and marketing.

On the other hand, the seed markets in those two countries proved too thin and, in the case of Mozambique, too dependent on externally financed procurement of seed for relief purposes, for the commercial sustainability of the companies to be assured. In many projects simpler and more low-cost approaches should therefore be tried, e.g. as in ARNS in Ethiopia (box 2) where 200 small farmers with above average performance characteristics have been contracted to multiply seeds procured from the national seed company.

Box 11: Zamseed, Zambia's national seed company
Since 1981 Sida has been supporting the establishment of a national seed company, Zamseed, in Zambia. Svalöf-Weibull Ltd, a Swedish seed company, has from the outset been contracted by Sida to provide technical support to Zamseed, it has also owned part of Zamseed's stock. The project started with seed quality control, introduction of plant breeding technologies and maize research. Gradually seed production for fodder crops, vegetables, sorghum, millet, roots and tubers was introduced. An evaluation from 1993 concluded that, as a result of the project, Zambia was self-sufficient in maize seed. Maize breeding was judged to have had a multiplier effect of 1:5, i.e. the value of the incremental production generated by the seed was five times higher than Sida's investment in this activity of SEK40 million.

6.4 Soil fertility

Declining soil fertility in many regions of the world is becoming an increasingly serious constraint to food production. In fact, one of the largest environmental problems in Africa is the gradual decline in the fertility of much of the soil. Failure to deal with this problem will reduce future food supplies and accelerate soil degradation. Expanded use of plant nutrients from both organic and inorganic sources in Sub-Saharan Africa could help alleviate current production shortfalls as well as serious land degradation resulting from soil mining.

Basic to maintaining soil fertility is the use of farming systems techniques that allow recycling of plant nutrients and organic matter. However, that is unlikely to suffice in countries where soil fertility is low and the population is food insecure, and where increased fertilizer use should be encouraged. Unfortunately, fertilizer consumption in these countries is low because of high prices and the greater risk associated with food production in marginal areas. Fertilizer consumption in Sub-Saharan Africa is only about 14 kg per hectare compared to some 200 kg in East Asia and is only projected to increase at a modest rate of about 2 per cent per year.

The issue of subsidies of fertilizer is therefore frequently debated. It is argued that the government should reduce the cost to the farmers with a view to increasing production and food supply. However, large-scale fertilizer subsidies are plainly not affordable to cash strapped governments and are therefore not sustainable, even less so if the subsidy is paid by an aid donor. Sida therefore encourages the agroecological approaches referred to above, while recognizing the need for increased use of fertilizer in situations where the need is great and where the economy of its use can be reasonably assured.

6.5 Rural finance

But the products of research, improved seeds, fertilizers and other farm inputs, may not reach small farmers who do not have access to credit to finance their purchases. Lack of credit is a major constraint to investment for most small farmers and hampers their ability

to survive adverse conditions. The government credit schemes set up in the early years of the Green Revolution, such as those supported by SIDA in Ethiopia in CADU and later EPID, were mostly effective in the high-potential lands where fairly reliable returns to investments could be achieved. More problematic has been the provision of credit in low-potential areas where returns are low and risks high. Typically, such loans are very small but require careful supervision and are therefore costly to service. They are not attractive to commercial banks and difficult for more bureaucratic government agencies to handle. The traditional alternative to the farmer is the moneylender, often readily available in the village but charging high rates of interest and therefore contributing to indebtedness.

There is now a growing experience from developing countries to demonstrate the effectiveness of local, self-managed credit groups. The key to the formation of such groups is often a collective need that farmers can satisfy by coming together. That need can be a tubewell, a drainage system, a storage shed, or an access road. The collective physical activity and growing experience from cooperative planning and management is the basis for trust and self-confidence, allowing the group to expand and include other activities. The most famous credit institution supporting such groups is the Grameen Bank in Bangladesh, supported by SIDA for many years, but other similar schemes are now appearing elsewhere.

There can be no blue-print for the design of small-scale credit and savings institutions, and the Grameen Bank model may not be readily replicable in Africa. Key features of successful schemes are usually that they charge market price for the cost of capital, i.e. that interest to borrowers is not subsidised, that they have low overheads but are able to operate a network of representatives closely linked to farmers, and that they are attentive to farmers' needs for different types of farm inputs (but that they usually do not offer consumption credit).

7. Infrastructure and markets

One of the single most important actions to develop the agricultural potential in many low-potential areas is to improve physical access to markets and reduce the costs of transport by building roads. By definition these areas are often remotely located; it is said that in the Ethiopian highlands half of the rural population lives one day's walk away from an all-weather road. Road construction opens up areas to the provision of agricultural services, such as extension and farm input supply and to traders raising the level of economic activity.

Sida therefore encourages rural development programmes to be "front loaded" with a substantial road construction component to precede the build-up of agricultural extension and farm input supply. This is the case in the ARNS programme in Ethiopia (box 2) and it will be the case in the programme being planned in Niassa province in Mozambique. What is important, of course, is that the appropriate technology is used for road construction schemes and there is a large body of experience in this area; what is needed

in many cases to build rural access roads may be no more than common agricultural tractors with trailers and hand tools.

In addition to roads, infrastructure that serves the public good includes market facilities in rural towns, market information, electricity and water at public markets, and access to transportation to and from these markets. Governments should develop and enforce standards, weights and measures and other regulatory instruments necessary for the markets to function.

Essential for economic growth in rural areas is a vibrant exchange of goods and services between rural areas and small rural towns where purchasing power is concentrated and where services in not only marketing but also in education, health and finance are provided. Support to private sector development may be necessary to capture opportunities for processing of agricultural produce and to promote small-scale industry that may absorb some of the labour surplus from rural areas.

In the past Sida has tried to enhance agricultural marketing through support to marketing boards, co-operative apex organizations and parastatal agencies. There is now a fairly conclusive experience to suggest that this area is best left to the private sector, while government should concentrate on providing the infrastructure and policy environment that will encourage rural trade to develop. Modest support through farmers' organizations can sometimes stimulate private sector development, if introduced with care and accompanied by the requisite training.

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[i] It follows that rural development can also involve other sectors than agriculture, such as health or education, and as such have only incidental impact on food security.

[ii] In Swedish *verksamhetsgrenar*

[iii] SIDA, the Swedish International Development Authority, was the forerunner of Sida, the Swedish International Development Cooperation Agency, which was created in July 1995 following a reorganization of the Swedish aid administration.

[iv] UNESCO, World Education Report 1995. UNESCO Publishing, Paris, 1995, table 8. By comparison, the US in 1995 had 5,486 students per 100,000 inhabitants, Sweden had 2,622.

Table 1: Indicators of Agricultural Production and Food Consumption in Selected Swedish Aid Recipient Countries

	Index of agricultural production per capita (1989-91=100)		Average daily per capita calorie supply (kilocal.)	
Country	**1984-86**	**1994-96**	**1982-84**	**1992-94**
Ethiopia	103	n/a	1,681	1,661
Kenya	94	89	2,042	1,914
Mozambique	98	87	1,809	1,685
Tanzania	106	84	2,286	2,054
Zambia	91	86	2,114	1,954
Nicaragua	125	98	2,395	2,267
Laos	106	98	2,148	2,106
Vietnam	92	114	2,246	2,302
Average, developing countries	94	111	2,406	2,555

Source: World Resources Institute et al.: 1998-99 World Resources - A Guide to the Global Environment. Oxford University Press, New York and Oxford, 1998, tables 10.1 and 10.3 (data in tables derived from FAOSTAT Statistical Datebase)

Table 2: The Role of Agriculture in the Economy of Selected Swedish Aid Recipient Countries

	The role of the agricultural sector (percentages) in		
Country	**GDP**[1]	**employment**[2]	**exports**[3]
Ethiopia	57	80	95
Kenya	29	80	66
Mozambique	33	83	66
Tanzania	58	84	76
Zambia	22	75	n/a
Nicaragua	33	28	90
Laos	52	78	70
Vietnam	28	72	n/a
Average, low income countries	25	69	n/a

[1] World Resources Institute et al.: 1998-99 World Resources – A Guide to the Global Environment. Oxford University Press, New York and Oxford, 1998, table 6.1

[2] World Bank: World Development Indicators 1997.The World Bank, Washington DC, 1997, table 4.5

[3] Ibid, table 4.8. Data for Tanzania and Laos are from 1980.

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List of acronyms used

ANAFE - African Network for Agroforestry Education
ARNS - Amhara Regional National State, Ethiopia
ASIP - Agricultural Sector Investment Programme, Zambia
CADU - Chilalo Agricultural Development Unit, Ethiopia
CGIAR - Consultative Group on International Agricultural Research
CIMMYT - International Centre for Research on Maize and Wheat, Mexico City
CIP - International Potato Research Institute, Lima
DINAGECA - Direccão Nacional de Geologia e Cadastre, Maputo
DNRE - Department for Natural Resources and the Environment, Sida
EPID - Extension and Project Implementation Department, Ethiopia
FAO - Food & Agriculture Organization of the United Nations, Rome
FARMESA - Farm-level Applied Research Methods for East and Southern Africa, Harare
GNP - Gross National Product
ICRAF - International Centre for Research on Agroforestry, Nairobi
IFPRI - International Food Policy Research Institute, Washington DC
ILRI - International Livestock Research Institute, Nairobi
INEC - Department for Infrastructure and Economic Cooperation, Sida
LAMP - Land Management Programme, Tanzania
NGO - Non-governmental organization
OECD - Organization of Economic Cooperation and Development
PGR - Plant Genetic Resources
PRA - Participatory Rural Appraisal
RELMA - Regional Land Management Unit, Nairobi
SADC - Southern Africa Development Council
SAREC - Department for Research Cooperation, Sida
SEK - Swedish Crowns
SEKA - Department for Cooperation with Non-governmental Organisations and Humanitarian Assistance, Sida
SIDA - Swedish International Development Authority
Sida - Swedish International Development Cooperation Agency

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