EVALUATION REPORT 1995

FERTILISER AID

EVALUATION OF NETHERLANDS FERTILISER AID 1975-1993 WITH SPECIAL REFERENCE TO BANGLADESH, MALI AND ZAMBIA

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NETHERLANDS DEVELOPMENT COOPERATION

FERTILISER AID

Evaluation of Netherlands fertiliser aid 1975-1993, with special reference to Bangladesh, Mali and Zambia

Operations Review Unit (IOV), 1995

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Preface

In this report the results are presented of an evaluation of Netherlands fertiliser aid in the period 1975–93, with special emphasis on the post-1985 period. The share of fertiliser aid in total programme aid has been substantial, particularly for Asian countries. The annual fertiliser-aid allocations peaked in 1981 when Dfl 352 million was disbursed for the purpose, and remained important throughout the 1980s at annual levels above Dfl 200 million. Since 1990, fertiliser aid has declined rapidly to just over Dfl 20 million in 1993. This evaluation therefore has an *ex post* character.

In the course of the 1980s, more and more questions were asked about the effectiveness of this important aid instrument in reaching the poor, about its ecological consequences and about its appropriateness in the face of structural adjustments. These questions constituted the main reason for undertaking this study.

The report consists of four main parts. Firstly, background information is provided regarding matters of soil fertility: the role of various fertiliser types in sustainable agricultural production, and trends in fertiliser use over the years. Secondly, fertiliser-aid policy and its implementation are analysed, with particular attention given to matters of aid efficiency. The effectiveness of fertiliser aid is subsequently discussed at the macro- and micro-levels in two chapters based on field studies in three countries: Bangladesh, Mali and Zambia. Particular attention is given to the effects of fertiliser aid on the economic self-reliance of the recipient country as well as to poverty alleviation and sustainable development. The findings and conclusions are presented in the final chapter.

The Operations Review Unit (IOV) is an independent unit within the Ministry of Foreign Affairs which is responsible for evaluating development aid granted by the Netherlands government. The evaluation of fertiliser aid was directed and coordinated by Arend Pieper (until January 1994) and Frans Makken, both staff members of the Operations Review Unit. Computational and file research assistance was provided by Henrice Wittenhorst and Marjanska Leeuwerik. An advisory group of

external and internal experts advised on methodology and commented on the draft report and advice was also sought from other experts and individuals. The contents of the report, however, are the sole responsibility of IOV.

Director, Operations Review Unit

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Abbreviations

ADB	–	Asian Development Bank
AN	–	Ammonium Nitrate (N)
ARPT	–	Adaptive Research Planning Team (Zambia)
AS	–	Ammonium Sulphate (NS)
ASEAN	–	Association of South-East Asian Nations
B	–	Boron
BADC	–	Bangladesh Agricultural Development Corporation
BARC	–	Bangladesh Agricultural Research Council
BRRI	–	Bangladesh Rice Research Institute
Ca	–	Calcium
CAN	–	Calcium Ammonium Nitrate
c.i.f.	–	cost, insurance, freight
CCCE	–	Caisse Centrale de Coopération Économique (France, now: CDF, Caisse Française de Développement)
CIDA	–	Canadian International Development Aid
Cl	–	Chlorine
CMDT	–	Compagnie Malienne pour le Développement des Textiles
Cu	–	Copper
DAC	–	Development Assistance Committee
DAP	–	Di-Ammonium Phosphate (NP)
DGIS	–	Directorate General International Cooperation of the Netherlands' Ministry of Foreign Affairs
DMP/Cda	–	Macroeconomic Emergency Section of the Multilateral Development Cooperation and Special Programmes Department of the DGIS
DSP	–	Double Super Phosphate (P)
DST/TA	–	Technical Advice Section of the Sector Policy, Spearhead Programmes and Technical Advice Department of the DGIS
ESC	–	Eligible Source Countries
FADINAP	–	Fertiliser, Advisory, Development and Information Network for Asia and the Pacific
FAO	–	Food and Agriculture Organisation of the United Nations
FDV	–	Fonds de Développement Villageois (Mali)
Fe	–	Iron
FEZ/IR	–	Development Cooperation Budget Inspectorate of the Financial Affairs Department of the DGIS

FIA	–	Fonds d'Intrants Agricoles (Mali)
FID	–	Fertiliser Imports Department of the Ministry of Agriculture, Food and Co-operatives (Pakistan)
f.o.b.	–	free on board
f.o.r.	–	free on rail
FOS	–	Financial accounting system for development cooperation
f.o.t.	–	free on truck
FSRDP	–	Farming Systems Research and Development Programme (Bangladesh Agricultural University, Mymensingh)
GNP	–	Gross National Product
GTZ	–	Gesellschaft für Technische Zusammenarbeit (Germany)
HYV	–	High Yielding Variety
IAC	–	International Agricultural Centre, Wageningen
ICB	–	International Competitive Bidding
IER	–	Institut d'Économie Rurale (Mali)
IFDC	–	International Fertiliser Development Center
IFPRI	–	International Food Policy Research Institute
IMF	–	International Monetary Fund
IOV	–	Operations Review Unit of the DGIS
IPM	–	Integrated Pest Management
IPNS	–	Integrated Plant Nutrition System
K	–	Potassium
KCl	–	Potassium Cloride (K)
LDC	–	Least Developed Countries
LEISA	–	Low External Input Sustainable Agriculture
LIB	–	Limited International Bidding
LIW	–	National India Working Group
LMIC	–	Low and Middle Income Countries
Mg	–	Magnesium
MMTC	–	Minerals and Metals Trading Corporation of India
Mn	–	Manganese
Mo	–	Molybdenum
MOP	–	Muriate of Potash (K)
MV	–	Modern Variety
N	–	Nitrogen
NAFC	–	National Agricultural and Fishery Council, Department of Agriculture, the Philippines
NCZ	–	Nitrogen Chemicals of Zambia
NEI	–	Netherlands Institute of Economics
NIO	–	The Netherlands Investment Bank for Developing Countries
ODIMO	–	Opération de Développement Integré du Mali Ouest
ODIPAC	–	Office de Développement Integré des Productions Arachidières et Céréalières
ODR	–	Organisation de Développement Rural (Mali)
OGIL	–	Open General Import License system
ON	–	Office du Niger (Mali)

P	–	Phosphorus
pH value	–	degree of acidity
PNT	–	Phosphate Naturel de Tilemsi (Mali)
PTN	–	Post Tender Negotiations
S	–	Sulphur
SARD	–	Sustainable Agriculture and Rural Development action plan
SGS	–	Société Général Suisse
SOMO	–	Forum for Research on Multinational Enterprises
SRTI	–	Sugarcane Research and Training Institute (Ishurdi, Bangladesh
SSP	–	Single Super Phosphate (P)
TSP	–	Triple Super Phosphate (P)
UNCED	–	United Nations Conference on Environment and Development
VCR	–	Value Cost Ratio
VIB	–	The Food Supplies Purchasing and Sales Section of the Ministry of Agriculture, Nature Management and Fisheries (Hoensbroek, the Netherlands)
VKP	–	Dutch Association of Fertiliser Producers
ZCF	–	Zambian Cooperative Federation
Zn	–	Zinc

Main findings

In the period 1975–93 the Netherlands spent some 3,600 million guilders on fertiliser aid, 93 per cent of which was provided to ten countries: Bangladesh, India, Kenya, Mali, Pakistan, the Philippines, Sri Lanka, Sudan, Tanzania and Zambia. India alone received more than 1,300 million guilders. Some 71 per cent of the fertiliser originated in the Netherlands. Since the mid-1980s there has been a shift towards purchase in the Eligible Source Countries (ESC). Fertiliser aid peaked in 1981, when its value amounted to over 350 million guilders, and declined subsequently to around 200 million guilders in 1985. It then remained stable until 1989, decreasing to around 150 million guilders annually in the following three years. In 1993 fertiliser aid fell to approximately 20 million guilders.

Fertiliser aid provided by the Netherlands is evaluated for the entire period between 1975 and 1993, with emphasis on the period 1985–91. Evaluation of its short- and long-term effectiveness at various levels in the recipient country was based on case studies in Bangladesh, Mali and Zambia.

A major dilemma in the evaluation of fertiliser aid is that it has been regarded as both a fungible form of macro-aid and as a means with which to realise objectives at the meso- and micro-levels. It might be asserted that once the fungibility of aid is established, there is no longer scope for analysis at the sectoral or micro-level. The report does not enter into the complicated issue of fungibility in its various forms (aggregate or categorical) but uses the definition formulated in *Import Support* (IOV 1989).* It is assumed that even fungible aid is not without economic and/or policy effects, which allows for analysis of its effects at the meso- and micro-levels.

* Programme aid is considered fungible when it substitutes for imports that would have been effected anyway, rather than being additional to planned imports (both commercial and aid financed). Fungible aid, therefore, does not lead to more means for the recipient of the currency or commodities, but frees financial means at the macro-level (for the recipient government) for other (usually unknown) purposes. This definition is a simplification of the complex realities that underlie the concept of fungibility. While

1 Policy relevance

Fertiliser aid is intended to contribute to the two main objectives of the Netherlands' development aid policy: poverty alleviation and economic self-reliance. Over the years, it has been considered a flexible form of aid, enjoying high priority by recipient countries. Fertiliser aid met a distinct need in those countries, which generally received the fertilisers they requested. Recent reductions in this form of aid stem mainly from reconsiderations on the side of the Netherlands regarding programme aid in general. Environmental aspects have played a role since 1989, when the decline of fertiliser aid was already well-advanced.

1.1 *Macro-level effects*

Since fertiliser aid was perceived as a fungible form of macro-economic aid, general policy agreement between the Netherlands and the recipient country was in principle a sufficient condition for its allocation. Despite this fungibility, however, the Netherlands preferred commodity aid as a form of import support to straight currency support, for reasons of accountability and control over effects on the sectoral and micro-level. The scope for guiding developments in recipient countries offered by fertiliser aid as against pure currency support, however, has not been exploited to any significant extent.

The macro-economic impact of the Netherlands' fertiliser aid has been positive in that it relieved pressure on the balance of payments and the recipient government's budget. The relative size of fertiliser aid value vis-à-vis current account deficits and government budgets varied from several per cent in Mali and Zambia to well under one per cent in Bangladesh. This suggests that the direct macro-economic effect has been of some importance for African countries but modest in Asian countries.

Conditionalities for fertiliser aid were rare, particularly before 1986. Later in the 1980s, conditionalities were usually adopted from World Bank programmes for structural adjustment, without investigating whether the speed and scope of imposed adjustment measures were in the best interests of ecological sustainability and certain target groups. In the turmoil of market liberalisation and the privatisation of state enterprises, recipient governments were usually left to sort out their new

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(1994) distinguishes categorical and aggregate fungibility, which each have different economic and policy effects. He further gives three reasons for conducting micro-analysis when evaluating macro-aid forms: aid may not be fully fungible; donor involvement may change the nature of that activity; and donors must be able to pin their funds to some goods or activity (White 1995).

position vis-à-vis the private sector, without adequate help from donors to equip them for their new role.

Counterpart funds, i.e. revenues generated from the sale of fertiliser aid, are in principle at the free disposal of the recipient government. Nevertheless, attempts have been made to tie these funds to particular projects. Counterpart funds for Mali were supposed to be spent on specific rural development programmes, but in practice they largely constituted general budget support to two recipient Regional Development Organisations (particularly CMDT). In Zambia, counterpart funds were partly tied to local cost financing of Western Province projects, but the enforcement of this was hardly feasible. In Bangladesh no conditions were attached to their use.

The Netherlands sometimes continued to deliver fertiliser aid to inefficient parastatals (e.g. in Bangladesh and Zambia) while simultaneously demanding their privatisation or abolition through structural adjustments. Attempts to circumvent government institutions met with limited success in several cases (e.g. Mali and Bangladesh). It seems that not only the recipients but also the donors including the Netherlands, were far from ready to shift their attention to the private sector.

1.2 *Implications for poverty alleviation*

Two effects on poverty are distinguished: direct effects resulting in increased production and hence increased income for poor farmers, and indirect effects gained by the increased availability of food at reasonable prices.

In *Bangladesh*, Netherlands fertiliser aid has helped to further the Bangladeshi government's overall aim of raising rural living standards. This was realised through increased production, among others by small farmers, and by increasing the availability of food at reasonable prices. Intensification has helped to maintain the viability of numerous small farms, but on the other hand, it may have increased the dependency of small farmers.

In *Mali* food production has risen in regions of the Office du Niger and CMDT where fertiliser aid was given, thus increasing the supply of food on local markets. The provision of fertilisers in combination with institutional support has helped many poor farmers to improve their income.

Fertiliser aid to *Zambia* has been instrumental to a shift towards the cultivation of hybrid maize, particularly among small and emerging farmers. However, it did not increase productivity. Increased food production was mainly due to the expansion of areas under cultivation. By contributing to state revenues, fertiliser aid helped temporarily to maintain general food subsidies, which benefited the poor together with everyone else.

Fertiliser aid is not an aid instrument that is aimed specifically at direct poverty alleviation, but small farmers are among its beneficiaries. The poorest sections of the rural population, such as the (virtually) landless and subsistence farmers, do not directly benefit from fertiliser aid unless they receive some form of institutional support. The poorest and most vulnerable segments of society spend a large proportion of their income on food. They benefit indirectly from fertiliser aid when this increases productivity and hence leads to a more stable and cheap food supply, as was the case in Bangladesh and Mali. Low food prices in Zambia were not based on productivity gains and therefore could not be maintained.

Data on fertiliser use by women are scarce. The case studies in Bangladesh, Mali and Zambia however, seem to suggest that women's access to mineral fertilisers is limited, despite the important role they often play in food production. In Mali, fertilisers are used primarily by male farmers, who occasionally provide their wives with small quantities for use on foodgrain and horticultural crops. In Zambia during the 1980s subsidies enabled many women to engage in commercial food production, although they regularly used fertilisers on traditional crops for home consumption. In Bangladesh, fertiliser use was clearly the prerogative of men, but special programmes have been developed to stimulate fertiliser use among female-headed households.

1.3 *Implications for sustainable development*

For operational purposes, the implications of fertiliser aid have been evaluated in terms of the ecological and financial sustainability of fertiliser use. Evaluation of the former has been limited to maintaining soil fertility, whereas financial sustainability has been reviewed at farm level.

Ecological sustainability

During the 1980s, several pressure groups and Members of the Netherlands Parliament raised the issue of the environmental effects of fertiliser use. The sectoral memorandum *Fertiliser Aid* (1985), devoted scant attention to the use of fertiliser in various farming systems, or to its ecological consequences. In 1990, the White Paper *A World of Difference* devoted ample attention to ecological sustainability, but ignored mineral fertiliser application in favour of Low External Input Sustainable Agriculture (LEISA). The sectoral memorandum, *Sustainable Land Use* (1992), gave a balanced view of the respective roles of organic and mineral fertilisers in sustainable land use systems.

The intensification of land use is causing soil nutrient levels to decline in most agricultural areas. Without the use of mineral fertilisers, that decline would in many instances have been more severe. The prolonged and unbalanced application of single fertilisers (particularly nitrogen) could lead to ecological degradation, however, such as the exhaustion of other nutrients and organic matter, as well as increased acidity. The rising share of compound fertilisers in the Netherlands fertiliser aid programme in the 1980s was positive in this respect.

Despite their high natural fertility, soils in Bangladesh are deteriorating, mainly due to poverty combined with extreme population pressure. Most organic crop residues are not being returned to the soil but are used as construction material, fuel and fodder. The effects of unbalanced fertilisation and declining organic matter content in the soil are already being felt: the efficiency of Nitrogen application is levelling-off. The scarcity of organic materials and prevailing tenure systems do not encourage farmers to invest much in longer-term soil fertility. The Netherlands fertiliser aid programme contributed to more balanced fertilisation by switching to Phosphorus (TSP) donations in 1985/86 when Bangladesh indicated that it had become self-sufficient in Nitrogen. Also, the Netherlands' contributions to the TSP plant in Chittagong had a positive side effect in that its by-product, gypsum, contains the increasingly needed sulphur.

In the cotton growing areas of Mali the soil is gradually undergoing degradation. Present agricultural practices are basically traditional farming systems, involving crop rotation and fallow periods, which in the long run cannot adequately respond to growing population pressure. Malian farmers make fairly extensive use of fertilisers (once every four years), which renders only the longer-term Phosphorus balance positive. The occurrence of wind and water erosion is already severe and much topsoil containing precious nutrients is being lost. In rice-growing areas, nutrient balances are generally good for the major nutrients but here, too, the organic matter content will decline over time if it does not receive more particular attention.

The subsidy system in Zambia has been responsible for considerable misallocation of fertilisers. Many areas with a high natural soil acidity (e.g. Northern and Western

Provinces) have been supplied with nitrogenous fertilisers which have degraded some soils to the point where they are no longer fit for agricultural purposes. Subsistence and emerging farmers thrown back to subsistence agriculture after liberalisation of the fertiliser market, revert to the traditional slash-and-burn system. Due to population pressure in inhabited areas, the required 20–25 year fallow period is no longer observed and the sustainability of these low input systems has therefore deteriorated. A positive aspect of the abolition of subsidies is the shift of fertiliser use to areas that are better suited for more intensive agricultural practices. A Netherlands-funded project in Western Province has devoted much attention to more sustainable low input agricultural practices.

In developing countries, the increasing population pressure and soil degradation give rise to a great need for mineral and organic fertilisers. To the extent that such countries have to import fertilisers, some may remain dependent on balance-of-payments support for some time to come. In countries where fertiliser markets have been or are being liberalised, project aid is often needed to guide and equip governments regarding several aspects of their new role, such as: facilitating private trade through sound pricing policies, provision of market information and quality control, formulation of fertiliser legislation, as well as adequate research and extension to ensure sustainable fertiliser practices.

Financial sustainability

Fertiliser use has remained economically attractive after market liberalisation in Bangladesh and Mali; the pace of liberalisation in Mali, however, is slow. In Zambia the abolition of price controls has shifted fertiliser use back to the more fertile areas along main transport routes, leading to improved cost effectiveness due to lower transport costs. In areas where price ratios are no longer attractive, population pressure could lead to unsustainable farming practices.

Government policy can positively influence the cost/benefit ratio of mineral fertilisers by facilitating private fertiliser trade, research, extension, credit systems, timely currency allocation to importers, legislation, etc. Should unsustainable farm practices prevail in areas not serviced by the private sector, due to unfavourable fertiliser price ratios at the farm level, governments could weigh the provision of well-targeted fertiliser subsidies or other measures against the longer-term effects of soil degradation on vegetation.

2 Aid efficiency

2.1 *Procedures*

Fertiliser aid requests have not been appraised uniformly. In line with the macro-character of this aid form, limited attention has been given to agronomic and developmental effects at the sector and micro-levels. Appraisal memoranda made regular but selective reference to the conclusions and recommendations of evaluation missions, but mission findings have had no structural and systematic impact on the points covered. Evaluations have often noted problems at sectoral and micro-levels in the recipient country, but a positive evaluation at the macro-level was evidently thought sufficient to justify approval of new proposals. Advice was mainly sought with regard to procedures and logistics. Procedures for procurement, shipment and payment of fertilisers under the Netherlands' aid programme were clear and have been efficiently implemented by organisations in the Netherlands and in recipient countries.

2.2 *Disbursement pressure and prices*

Most fertiliser aid has been delivered on a partially untied basis. Prices paid for the fertiliser were generally competitive. Disbursement pressure* has not played a major role in the provision of fertiliser aid. Where it has been observed, disbursement pressure has not led to higher prices. Lower prices could in some cases be obtained through direct negotiation rather than international competitive bidding and through probable alternatives for expensive formulas. The ultimate efficiency of fertiliser aid would have been greater if more effort had been devoted to improving logistics and the use of fertiliser in the recipient country.

2.3 *Technical support activities*

Activities directed towards the efficient use of fertiliser have remained relatively few. This does not mean, however, that fertilisers have not found their way to nutrient-hungry soils in developing countries. It merely implies that opportunities have been missed to complement this substantial aid item on a larger scale with measures that could have increased its efficiency and the introduction of more sustainable fertiliser use practices.

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* Disbursement pressure as defined in appendix 9.

Summary

1 Design and scope of the study

Fertiliser aid has long been an important component of Netherlands spending on development cooperation: between 1975 and 1991 a total of almost 3,600 million guilders went into this form of aid, equal to six per cent of net official development assistance (ODA). Fertiliser aid is a form of macro-economic support: it puts foreign currency at the disposal of recipient developing countries, thus relieving their balance-of-payments problems, while receipts from the sale of fertiliser by recipient governments contribute to state revenues. Fertiliser aid, however, is also seen as an effective tool with which to bring benefits to the micro-level in the form of increased agricultural output.

This study was prompted by a need for more information on the effects of fertiliser aid and on its role as an instrument of development cooperation. Fertiliser aid is primarily a macro-aid instrument which is employed on the basis of macro-economic considerations in pursuance of a principal goal of Netherlands' aid policy: to contribute to the economic self-reliance of the recipient country. In practice, however, appraisals of fertiliser aid requests often refer also to possible effects on the micro-level, such as benefits to small farmers and improved food security for poor people. As such, the second main goal of Netherlands' aid policy comes into focus: the alleviation of poverty.

The questions addressed in this connection are:
- How has Netherlands policy on fertiliser aid developed, and to what extent does it correspond with the changing needs of developing countries?
- What considerations are taken into account in the appraisal of applications for fertiliser aid and how effective are the management instruments at the disposal of the Directorate General for International Cooperation (DGIS)?
- How efficiently is fertiliser aid provided?
- How effective is fertiliser aid at macro-level?

- Is fertiliser aid an effective instrument for the relief of poverty?
- Does fertiliser aid contribute to sustainable development? (recognised as a precondition to effective poverty alleviation).

A major dilemma in the evaluation of fertiliser aid is that it has been regarded as both a fungible form of macro-aid and as a means with which to realise objectives at the meso- and micro-levels. It might be asserted that once the fungibility of aid is established, there is no longer scope for analysis at the sectoral or micro-level. The report does not enter into the complicated issue of fungibility in its various forms (aggregate or categorical) but uses the definition formulated in *Import Support* (IOV 1989). It is assumed that even fungible aid is not without economic and/or policy effects, which allows for analysis of its effects at the meso- and micro-levels.

The study comprised four components:
- An examination of mainly official documents with a view to charting policy development over the last 20 years and determining the nature and scale of fertiliser aid, and a study of comparative prices.
- A study of the literature, focusing on the agricultural importance of fertiliser, the main points of the international debate on the economic, social and environmental drawbacks and benefits of fertiliser use, and supply and demand trends for different types of fertiliser in different macro-regions.
- Interviews with experts and persons involved in implementing fertiliser aid schemes.
- Field investigations in three countries (Bangladesh, Zambia and Mali) aimed at building up a picture of the role and function of fertiliser aid, the efficiency of Netherlands fertiliser aid, and the implications of fertiliser use for the relief of poverty and sustainable development.

An advisory group comprising external experts and DGIS staff provided guidance to the coordinators of this evaluation (appendix 1).

The report is set up along the following lines. Chapter 2 provides an introduction into the basics of soil fertility, plant nutrients and the role of fertilisers. Global developments in demand and supply are depicted, as well as an overview of the issues that have dominated the international debate on sustainable agriculture since the 1960s. Chapter 3 devotes attention to Netherlands fertiliser policy formulation and implementation throughout the reference period, with particular focus on the period 1985–91, culminating in an assessment of the efficiency of fertiliser aid. In chapters 4 and 5 the effectiveness of fertiliser aid at the macro- and micro-level respectively is reviewed. At the micro-level special attention is given to matters of poverty alleviation, ecological and economic sustainability. In chapter 6, finally, concluding remarks are formulated in answer to these questions.

2 Soil fertility, fertiliser use trends and sustainable agricultural production

2.1 *Soil fertility*

Changing demographic, economic and social conditions have meant growing pressure on the soil's stock of nutrients, threatening a loss of productive capacity. Nutrient losses can be made good by natural processes, appropriate agricultural practices such as green manuring, as well as by the use of organic and mineral fertilisers. Ecologically sustainable production implies maintenance of the nutrient balance, and mineral fertiliser has had an increasingly important role to play here.

Less than one-fifth of tropical soils have a reasonable to good natural fertility. Nutrient balances are largely negative in most agricultural production areas in the tropics, particularly in severely-weathered tropical soils. The weathering process, which evolves faster in tropical than in temperate climates, affects the soil structure and determines inter alia its capacity to retain water and plant nutrients. Maintaining an adequate soil structure and nutrient balance requires the application of sufficient organic materials and the balanced application of mineral fertilisers.

2.2 Global fertiliser use trends

Mineral fertiliser is a collective term covering a range of manufactured products of widely varying composition. Some provide only one nutrient (nitrogen, phosphorus or potassium), while others combine two or more. Sometimes secondary and trace elements are added (often sulphur, boron and zinc in tropical regions), notably in the case of fertilisers for export crops, such as cotton, tea and tobacco.

While the decades from 1930 to 1960 saw steady growth world-wide in the use of fertilisers containing all three macro-nutrients, with little difference in their absolute volumes, from 1960 onwards the use of nitrogenous fertiliser began to increase more rapidly as a result, among other things, of the Green Revolution. By 1990, world consumption of Nitrogen amounted to approx. 80 million tonnes, whereas the consumption of Phosphorus and Potassium did not exceed the 35 and 25 million tonnes respectively.

The greatest increases in fertiliser use since 1970 have been in Asia, where the impact of the Green Revolution was greatest; this trend is expected to persist. Levels of fertiliser use in Sub-Saharan Africa are extremely low: 52 per cent of the annual increases in cereal production can be attributed to higher yields, but mineral fertilisers only partly replenish the extracted nutrients (soil mining). The other 48 per cent of the annual rise in food production results from increases in the area under cultivation: in Asia this is only 6 per cent and in Europe –13 per cent. Fertiliser use in Latin America rose rapidly up to 1987, thereafter falling as fertiliser subsidies were cut in various countries. Whereas in Asia and Latin America food production is at least keeping pace with population growth, in Sub-Saharan Africa the latter has overtaken the former and per capita output is thus falling. Long-term projections indicate a growth in fertiliser use world-wide of 2.2 per cent per year, reflecting growing demand for cereals.

World fertiliser output in 1991 totalled some 152 million tonnes, just over twice the 1970 figure. The general trend hitherto has been for production to exceed consumption. While the World Bank expects the surplus to be somewhat smaller in the period to 2000, the surplus is likely then to increase again until 2005 as a result of increasing production capacity. Of the increase in mineral fertiliser output expected over the period 1991–2005, 83 per cent will be concentrated in low- and middle-income countries (LMICs); the nutrients concerned are mainly nitrogen and phosphorus.

Fertiliser use in low- and middle-income countries is structurally in excess of local production, while in the richer countries there is a considerable excess of production over consumption (their surplus fluctuates between 10 and 13 per cent of world output).

Notwithstanding short-term price fluctuations, due e.g. to movements in the dollar exchange rate and specific events such as the Gulf War in 1991 and oil crises, the general trend since 1965 has been one of falling real prices. In 1991 the World Bank expected fertiliser prices to show only moderate increases through the 1990s, reflecting the narrower gap between supply and demand, falling again thereafter in response to an increase in production capacity.

2.3 *Sustainable agricultural development, issues in the international debate*

The Green Revolution was initially hailed as an excellent way to boost cereal production: the introduction of High Yielding Varieties (HYVs) in combination with mineral fertilisers, pesticides and irrigation. Before long, Green Revolution practices, despite their obvious successes, were also criticised for several reasons: the gap between poor and better-off farmers widened and dependence on western countries increased since they supplied the technology and inputs. The short stalks of the HYVs reduced the availability of fodder and organic materials and the genetic base of the crops narrowed in such a way that they became more susceptible to pests and diseases, hence the increased need for pesticides. Also, due to its immediate effects, Nitrogen became the most popular fertiliser product (mainly Urea), and its consumption and eventually its production immediately started to exceed that of other macro-nutrients (Phosphorus and Potash).

In 1972, the Club of Rome pointed out that Green Revolution methods did not provide a lasting solution to the problems posed by an exponentially growing population: the problem of growth in a finite system. The Club called for a change away from looking for technological fixes by which to remedy the consequences of the growth model, to the more sustainable path of thinking in terms of an equilibrium model.

The Brandt Report of 1980 brought a political dimension to the findings of the Club of Rome by stressing the need for a North-South dialogue: the problems facing humanity were of a global nature. The report called inter alia for increased domestic food production to improve food security in low-income countries, requiring the availability of necessary inputs at affordable prices. FAO's *Agriculture: Towards 2000*, published in 1981, acknowledged the problems noted in the Brandt Report but saw no other way out of the quickly mounting food supply problems than to further focus on the spread of Green Revolution methods.

The Brundtland Report *Our Common Future* of 1987 pointed out that the world simultaneously faced an environmental and a development crisis. Poverty was identified as the main cause of the rapid degradation of natural resources. Green Revolution methods in their present form were considered ill-adapted to the needs of the poor and unsustainable in the long run. The report called for sustainable development defined as 'development that meets the needs of the present population without compromising the ability of future generations to meet their own needs.'

The Club of Rome produced a second report in 1992: *The Limits Breached*, in which it concluded that population, capital investments and the associated pollution were still growing exponentially and that certain environmental limits had already been breached, thus narrowing the options for the future. Solutions had to be sought in more sustainable production systems such as Low External Input Sustainable

Agriculture and Integrated Plant Nutrition Systems, for which research would need to be intensified.

Also in 1992, the UN Conference on Environment and Development took place in Rio de Janeiro, where government leaders voiced their support for a Sustainable Agriculture and Rural Development action plan. This plan had been developed by FAO in the previous year during the 'Den Bosch' conference in the Netherlands as a run-up to UNCED. As yet, however, little has been done to find practical ways for its implementation.

There seems to be a deadlock between the need to feed an exponentially growing population, particularly in developing countries where food production per capita is decreasing, and increasing pressure on the environment through indiscriminate use of Green Revolution practices or through soil mining resulting from lack of access to inputs. In its *Agriculture towards 2010* (1993) FAO fears a worsening of this situation in that fertiliser use is falling in many countries that face growing poverty and foreign exchange constraints, while in others the unsustainable intensive agricultural practices pose a threat to the environment. FAO therefore recommends Integrated Plant Nutrition Systems, which comprise an optimal combination of organic and mineral inputs and biological fixation administered in tune with the agro-ecological limitations of the area.

3 The Netherlands' fertiliser aid policy

3.1 *Introduction*

Until 1973 financial aid, including fertiliser aid, was the responsibility of the Ministry of Economic Affairs, and its main role was to promote Netherlands fertiliser exports. Decisions on the disbursement of financial aid were transferred to the Minister for Development Cooperation in 1973, since when development policy considerations have played a larger part in the provision of fertiliser aid.

3.2 *Fertiliser aid policy formulation*

Despite the substantial volume of fertiliser aid throughout the 1970s and 1980s, an explicit fertiliser aid policy was lacking: only one sectoral memorandum dealt specifically with fertiliser aid. Due to its supposed fungibility, fertiliser aid was usually treated as programme aid. Only after environmental concerns started to play a role did this aid form receive more explicit attention in policy statements. More fertiliser aid policy views have been given in response to parliamentary questions and to the lobby and publications of the fertiliser industry and other interest and pressure groups who sought to influence policy on fertiliser aid.

White Papers and sectoral memoranda

According to the White Paper *Improving the Quality of Bilateral Aid* (1979), fertiliser deliveries contributed to the achievement of both main policy goals: poverty alleviation and economic self-reliance. Poverty was to be alleviated by the supply of goods such as fertilisers which met basic needs, while programme aid in general was seen as promoting economic self-reliance. In 1984, the White Paper *Regauging Bilateral Policy* sought to better integrate the earlier twin goal policy into structural poverty relief.

A subsequent White Paper in 1985, *Development Cooperation and Employment*, acknowledged the objectives of the 1984 document, but also stated that promotion of the interests of Netherlands industry was a legitimate function of development policy. *Fertiliser Aid*, the only sectoral memorandum on fertiliser aid, was published in 1985. It argued that fertiliser aid could contribute to the relief of poverty, since most of the aid supplied was used in cereal-growing, including by small farmers. It acknowledged the many shortcomings in distribution, training, and information and credit services, but concluded that fertiliser aid had nevertheless brought about a considerable increase in agricultural output. The document recommended complementary measures, targeted on relevant groups and aimed at increasing the effectiveness of fertiliser use.

So far, the various policy papers had devoted virtually no attention to the role of fertilisers in different agricultural systems or to environmental aspects of their use, nor had they considered the fertiliser policies of the developing countries concerned. Towards the end of the 1980s this changed with the issue of *A World of Difference* (1990). This accorded a major role to programme aid as a form of support for sound economic and social policies: controls on its use were seen as necessary only where the Netherlands was unhappy with the recipient country's policies. This document was the first to focus on the environmental effects of fertiliser use, introducing low-external-input sustainable agriculture (LEISA) as an alternative to modern methods and noting that marginal farmers cannot afford the large-scale use of modern agricultural inputs. The report further argues that, in the broader context, large inputs of fertiliser and energy are unsustainable: fertiliser is manufactured using non-renewable resources and contributes significantly to the greenhouse effect. The implicit conclusion was that fertiliser deliveries did not contribute to sustainable development.

In 1992, the sectoral policy document *Sustainable Land Use* took a more differentiated approach towards LEISA than had *A World of Difference*, questioning whether LEISA techniques would meet the rising demand for food in the short term. Increases in food production had hitherto largely been achieved using modern agricultural methods in areas where economic and ecological conditions were favourable. *Sustainable Land Use* recommends that research be stepped-up into alternative methods and into a more sustainable use of external inputs in high input systems, particularly in ecologically sensitive areas. Alongside the accumulation of knowledge in the area of LEISA and the development of techniques for the sustainable management and conservation of ecologically sensitive areas, the central goals of policy in respect of sustainable land use include 'promoting ecologically sound agricultural methods in production systems based on the intensive use of external inputs, with a view to promoting the sustainable use of natural resources while maintaining or raising levels of productivity'.

Policy statements given in response to Parliamentary questions, fertiliser industry, pressure and interest groups

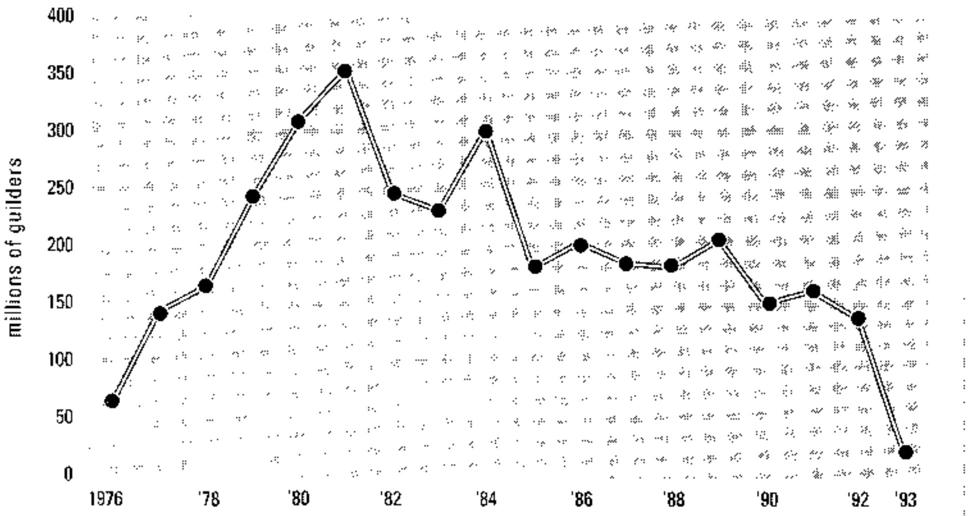
Various pressure and interest groups have been critical with regard to fertiliser aid. In the period 1982–93 they published several books and reports that highlighted certain negative effects of fertiliser aid on small farmers and the environment. Others claimed that Netherlands fertiliser aid was supply-driven and served only to promote Netherlands exports through tying arrangements. The fertiliser industry, however, lobbied actively among politicians, particularly since the mid 1980s, to vent their concern regarding the reduction in sourcing fertiliser aid in the Netherlands. The industry attributed this decline to the gradual untying of aid and reimbursement practices. Parliamentary questions voiced the concerns of various interest groups; they also queried the effects of fertiliser aid on poor farmers and the environment and asked whether agreements existed with the Netherlands fertiliser industry.

In 1984, Parliamentary questions on fertiliser aid to India led to the sectoral memorandum *Fertiliser Aid* in 1985; the White Paper *A World of Difference* (1989) was also clearly influenced by popular thinking at the time on low-input agriculture. The various lobbies, however, never evoked firm promises with regard to fertiliser aid levels, targeting or sourcing. Prior to 1989, the stance with regard to the ecological effects of fertilisers was that use levels in recipient countries were too low to have a serious negative impact on the environment. As to the effects of fertiliser aid on poor farmers, it was claimed that only limited information was available, thus preventing any conclusive remarks in this respect. It was rightly denied that agreements existed with the fertiliser industry to source fertiliser aid in the Netherlands.

In the early 1990s, when fertiliser aid had reached very low levels, the fertiliser industry shifted its attention to the need for sustainable use of mineral fertilisers. To this end the industry commissioned an independent study.

3.3 *Netherlands fertiliser aid 1976–1993*

Fertiliser aid between 1975 and 1993 totalled Dfl 3,600 million. The annual total rose from Dfl 62 million in 1976 to a peak of Dfl 352 million in 1981 (ten per cent of net ODA), gradually falling again thereafter to 1985 when it stabilised at around Dfl 200 million. Between 1989 and 1992, fertiliser aid levels were stable at Dfl 150 million, to fall steeply towards some Dfl 20 million in 1993.



Sources: Food Supplies Purchasing and Sales Section (VIB), Ministry of Agriculture, Nature Management and Fisheries, Netherlands; Investment Bank for Developing Countries (NIO); *Sectoral Memorandum on Fertiliser*, 1985.

Spending on fertiliser aid, 1976–93 (millions of guilders)

The upward trend in the 1970s can best be explained by the important increases in the annual development aid budget, which were largely spent on programme aid. In the 1980s project aid started to gain important momentum, which affected programme aid levels. The decline in fertiliser aid between 1980 and 1985 was interrupted by a sudden peak in 1984, most probably due to the decision that cumulation of commitments from previous years was no longer allowed: hence, many budgets had to be depleted lest they were lost to the recipient country. In subsequent years, fertiliser aid has also been used to neatly deplete annual aid budgets, until the 1990s when general programme aid levels were decreased. When programme aid declines, fertiliser aid is often the first victim due to its supposed fungibility. In the early 1990s, decisions to reduce or abolish fertiliser aid were supported by the critical attitude towards mineral fertiliser use which emanated from *A World of Difference*.

During the 1980s, other phenomena also affected fertiliser aid levels. In many recipient countries structural adjustment programmes gained momentum, including the abolition of fertiliser subsidies which reduced demand, at least initially. Also, several important recipients increased their domestic fertiliser production capacity (particularly nitrogenous fertilisers).

Of the fertiliser aid given between 1975 and 1993, 74 per cent went to Asia, 22 per cent to Africa and four per cent to Latin America. The ten countries receiving most aid were, in order of the amounts of money disbursed, India, Bangladesh, Pakistan, Sri Lanka, Tanzania, Zambia, Kenya, Sudan, Mali and the Philippines; between them, they accounted for 93 per cent of the total. India alone received more than one third of all fertiliser aid in this period.

Over the whole period, 71 per cent of all fertiliser aid was supplied by Netherlands producers, but the proportion coming from other Eligible Source Countries* rose steadily from a mere two per cent in 1975 to 40 per cent in the second half of the 1980s, peaking at just over 80 per cent at the start of the 1990s (in 1993 it fell back to 59 per cent).

From 50–70 per cent in 1975–86 the proportion of nitrogenous fertiliser supplied fell rapidly to just 19 per cent in 1992, mainly reflecting the growing production capacity for N-fertilisers in developing countries and increasing demand for compound fertilisers. Raw materials for use in local fertiliser production were not supplied in significant quantities until 1992.

* DAC list of developing countries in appendix 4.

3.4 *Fertiliser aid efficiency*

Fertiliser prices and quality

An assessment of all fertiliser aid transactions (132) to the ten main recipients in the period 1985–92 showed that buying from the Netherlands and other ESCs had generally been efficient financially. The quality of product and packaging and the reliability of supplies were at least as important as price. For this reason, the cheaper sources outside the ESC group, e.g. TSP from the USA and urea from Eastern Europe, were hardly feasible alternatives for the buyers. In most cases recipient countries therefore had good value for money; the exception was Sri Lanka, where aid remained tied to the purchase of supplies in the Netherlands for longer than for other recipients. Since 1989, Sri Lanka's fertiliser aid has been procured against more realistic prices. The purchasing modality – through VIB or local purchasing organisations – did not affect the prices paid. Also, no negative price effect was found resulting from disbursement pressure, which appeared to be relatively small.

Management and organisation

• Appraisal of fertiliser aid

Fertiliser aid policy is implemented in accordance with the normal project cycle of the Directorate General for International Cooperation (DGIS). Important steps in that cycle for fertiliser aid are the appraisal of applications for aid and the *ex post* evaluation of the aid given.

Appraisal memoranda vary widely in their content, but over the years have become both longer and, particularly, more complete and informative. The establishment of the Project Committee in 1986 and the introduction of the checklist have played a part in this. Before 1986–87 all programme aid, including fertiliser aid, was approved on the basis of a short memorandum or even an abbreviated version thereof. In May 1989 a checklist was introduced to better structure the appraisal of programme aid. Even so, programme aid is not yet appraised in a uniform fashion.

About half of all appraisal memoranda refer to external advice, the main sources being the Food Supplies Purchasing and Sales Section (VIB) of the Ministry of Agriculture, Nature Management and Fisheries, and the Netherlands Economic Institute of Economics (NEI). This advice mainly concerns the appropriateness of the request for fertiliser aid with regard to the macro-economic situation of the recipient and to logistical matters. Regular but selective reference is also made to the conclusions and recommendations of evaluation missions. Internal advice and comments are supplied by the Technical Advice Department (DST/TA), the Macro-Economic Emergency Section of the Multilateral Development Cooperation and Special Programmes Department (former DMP/Cda); procedural matters are covered by the Project Committee.

Analyses of appraisal memoranda in the period 1985–91 show that recipient countries' macro-economic policies receive a relatively large measure of attention. Use is generally made of judgements reached by IMF and the World Bank regarding the extent to which programmes of structural adjustment have been accepted and implemented. Less attention is devoted to agricultural policy: little reference, if any, is made to recipient governments' policies on credit facilities or agricultural information, training and research services. Some memoranda cite policies geared towards increasing food production. It is noteworthy that few policy conditions are set: in only five countries were conditions attached to the aid provided.

Appraisal memoranda claiming that fertiliser aid benefits small farmers define the target group only in vague and general terms. Some deal with the likely impact on target groups, but again the formulation is very general (raising rural incomes, improving employment) and there is no consideration of the arguments and implications. Rarely is the place of women in farming discussed or the effects of fertiliser use and agricultural modernisation on their social and economic position.

Until 1991, environmental considerations played no significant part in the appraisal of fertiliser aid. Some appraisal memoranda evince lack of familiarity with fertiliser types and their use. A few refer to likely effects – increases in food production, progress towards self-sufficiency, improvements in rural incomes – but again there is little detailed argument; only in a few cases are the costs and benefits facing the individual farmer analysed or value/cost ratios indicated.

The emphasis of appraisal memoranda on macro-economic issues and the rather superficial way with which they deal with the effects of fertiliser aid on poverty alleviation confirms that this aid form is provided primarily as a macro-aid instrument. The underlying macro-analyses are mostly taken from the World Bank with little analytical input from DGIS.

- Purchasing and payment procedures

Most fertiliser aid has been supplied on a partially untied basis under the financial aid procedure. This requires open international tendering by the recipient country, some of which have delegated this responsibility to the Food Supplies Purchasing and Sales Section (VIB) of the Netherlands Agriculture Ministry, which follows the Procurement Guidelines. The Netherlands' role in the purchase of goods is limited to monitoring the operation of this procedure.

Fertiliser suppliers and recipients both take a predominantly favourable view of the part played by VIB. Bidders know that the delay between tenders being received and contracts awarded will be brief and that they run few risks in the area of market fluctuations. VIB generally manages to elicit competitive tenders from numerous suppliers and will act as broker only if there are strict payment guarantees; suppliers therefore do not need to cover themselves against late payment.

The countries making their own purchasing arrangements were mainly Asian: India, Pakistan, Sri Lanka and Bangladesh. The Philippines bought both through VIB and their national procurement agency.

All fertiliser transactions made in 1985–91 under the financial aid procedure were examined to determine whether the course of events was influenced by pressure to complete budget disbursement before the end of the fiscal year (in the Netherlands this corresponds to the calendar year). A small proportion (some 14 per cent of annual spending on fertiliser aid) of payments reflected disbursement pressure. A large part (just over 30 per cent of annual spending) is inherent to the project cycle.

In general, purchasing and payment procedures have been efficient due to the smooth functioning of NIO and VIB and of the procurement agencies in various Asian countries. The sometimes poor quality of appraisal memoranda has had no negative impact on procurement, payment, delivery and use of the aid. Where disbursement pressure did make itself felt, this had little or no adverse effect on aid efficiency.

• Past evaluations of fertiliser deliveries

In 1983 the Court of Audit examined the efficiency of fertiliser aid to India and its consistency with declared policy. Between 1985 and 1991, 22 evaluations were made of fertiliser aid deliveries. In 1994 the Court of Audit prepared a report on programme aid, including fertiliser aid.

In 1983 the Court of Audit had stated that no price comparisons could be made with regard to fertiliser aid to India, due to the absence of price checks. The Court further concluded that the poorest groups hardly benefited, because no conditions had been set to target the programme towards the poorest states or small farmers.

Finally, the Court questioned whether part of the fertiliser aid to India should not be qualified as support for the Netherlands fertiliser industry, in which case funding by the Ministry of Economic Affairs would have been more appropriate.

Fertiliser aid deliveries have not been evaluated in a systematic and uniform way, and DGIS's Technical Advice Department has not endeavoured to bring the terms of reference of these evaluations in line with one another. Terms of reference for evaluation focus mainly on macro-economic issues, but some ask a varying extent of attention for effects at the institutional and/or farmers' level. Most evaluation reports reviewed recipient governments' macro-economic policies, dealing with them in the context of the structural adjustment programmes (SAPs) of the World Bank and IMF. Quite often, however, they went beyond their terms of reference and devoted attention to domestic agricultural policy, the use made of counterpart funds, the role of intermediary organisations, and effects at the micro-level: the emphasis depending on the disciplinary composition of the mission. Intermediary organisations involved in the purchase and distribution of fertiliser were considered mainly from the viewpoint of efficiency.

The reports generally took a favourable view of the impact of fertiliser aid on the balance of payments and public finance (the fiscal effect of counterpart funds), although the significance of the Netherlands' contribution was sometimes questioned (as in the case of India). Other positive effects noted by the evaluations included increased foreign-exchange availability and increased export earnings from cash-crop production (Sri Lanka and Mali). An adverse effect mentioned, e.g. in connection with Kenya, was that aid received by the government inhibited privatisation.

At the micro-level, the reports concluded that for seven of the 12 countries covered by the evaluations, the aid did not adequately reach the target group of small farmers. Only three reports examined the position of women: in the case of India and Burkina Faso it was concluded that too little attention had been paid to women's needs and that greater efforts were needed to ensure their access to fertiliser. Conclusions regarding effects on foodcrop production were mixed; comments on the effects on export crops were all positive. Only three reports drew conclusions regarding the effects on farm incomes: these were considered positive in Mali, Pakistan and Sri Lanka. Where reports considered the type of fertiliser supplied, their comments were generally favourable. Three reports included conclusions as to environmental effects, in two cases favourable.

From their consideration of the efficiency of fertiliser aid it is clear that missions saw the organisation of local transport as the major problem, leading to delay, losses and excessive costs. Other problems were inadequate storage facilities, inefficient distribution and logistical bottlenecks.

The missions generally saw direct payment to suppliers by DGIS as a less effective and less efficient method than reimbursement of commercial imports by the government, since it impeded liberalisation of the fertiliser sector in the recipient country; reimbursement was a better instrument on macro-economic and management grounds and was seen as a step towards the complete untying of donor aid.

In 1994, the Court of Audit confirmed in its report on programme aid that DGIS lacked an adequate notion of the actual effects of programme aid, and did not dispose over a clear evaluative framework in which to measure possible effects on economic sectors. This underscores the above analysis of fertiliser aid evaluations. Due to the very limited institutional memory of DGIS, findings of past evaluations were not adequately fed back to underpin policy decisions. As a result, the targeting of programme aid instruments was insufficient, the choice between programme aid instruments (import support, balance-of-payments support and debt alleviation) haphazard, and no criteria had been developed to support choices for or against programme or project aid or the linking of the two. In his reply the Minister of Development Cooperation confirmed the shortcomings and stated that they were being remedied, inter alia through a manual for programme aid. This manual became available in 1994.

4 Macro-economic effects of fertiliser aid

4.1 *Introduction*

As part of this study, field investigations were carried out in Mali, Zambia and Bangladesh, which have been regular and substantial receivers of fertiliser aid from the Netherlands, receiving some 22 per cent of all such aid in the period under consideration. The three countries showed differences in agricultural practices, agro-ecological conditions, socio-cultural and economic circumstances, government policy, fertiliser use and procurement.

In analysing the macro-economic effectiveness of Netherlands fertiliser aid, the following aspects were taken into consideration: the relative value of fertiliser aid with regard to the deficit on the balance of payments and its fungibility, the policy relevance (broad policy agreement), and the use of counterpart funds.

4.2 *Balance-of-payments support and fungibility of fertiliser aid*

In this evaluation all fertiliser aid has been considered as balance-of-payments support, although funding for this aid form has come from various budget categories. Until 1985, fertiliser aid had been financed from appropriate budget items (Ia and Ie) for balance-of-payments support. Since then a wider array of budgets has been used, such as: rural development (Ia), programme support (If) and country and regional programmes (IIa and b). In 1991, balance-of-payments support was limited to debt alleviation and fertiliser aid thenceforward resorted under the country programme.

A country qualifies in principle for balance-of-payments support when the current account of its trade balance is negative without being compensated by other capital inflows such as remittances. Bangladesh, Mali and Zambia showed chronic deficits in the period studied. In 1993 Bangladesh had accumulated a currency reserve representing some six months-worth of imports, which disqualified it for further support. Mali is a different case, since it had relatively modest deficits on current account, while its overall balance of payments was only slightly negative, reflecting substantial remittances from Malians working abroad and aid flows.

The macro-economic significance of fertiliser aid was quite different in the three countries. In Bangladesh the value of fertiliser aid represented less than one per cent of the deficit on current account, which makes any impact assessment difficult if not superfluous. This, coupled with wide interest of the donor community to provide Bangladesh with fertilisers, leads us to the conclusion that fertiliser aid to Bangladesh can be considered fungible. In the case of Mali the Netherlands provided an important share of the national fertiliser supply: sometimes almost 100 per cent; its value, however, amounted generally to only two per cent of the current account deficit. As the overall balance of payments was not very negative and fertilisers were of paramount importance for the respective regional development organisations, fertiliser aid was probably fungible. The Netherlands contribution to the current account deficit of Zambia was more substantial: fertiliser aid represented some seven per cent. Despite this more sizable share, Netherlands fertiliser aid has probably been fungible in that Zambia received considerable sums of official aid and also imported fertilisers on a commercial basis.

4.3 *Policy agreement*

In the period 1985–92, the effects of structural adjustment started to take hold in the three case study countries. The Netherlands, like so many other donors, had increasingly made compliance to structural adjustment measures a basic condition to the provision of programme aid and hence subject of the annual policy discussions with the recipient. In 1990 the three countries had taken, or were taking, important steps towards fertiliser market liberalisation. Since then, however, programme aid to them has declined sharply and fertiliser aid has come to a complete standstill. The total annual aid budget for the three countries has also decreased. This cannot be explained from the degree of policy agreement between the Netherlands and Bangladesh, Mali and Zambia, but seems to be due merely to a shift in priorities on the side of DGIS.

Bangladesh

The economy of Bangladesh has long been characterised by extensive government regulation. Even in the late-1980s the Bangladeshi Government was slow to adopt structural adjustments. Under pressure from the donor community, some drastic measures were ultimately taken and since 1990/91 the government has increasingly deregulated markets. Agricultural policy has always been geared towards self-sufficiency in rice through the use of irrigation, HYVs and agricultural inputs. The provision of inputs has long been in the hands of parastatals. From 1978 onwards there has been a very gradual liberalisation of the agricultural inputs market, which accelerated in the late 1980s when it appeared that the operations of state organisations were grossly inefficient. Since then, farmers have considerably improved access to inputs due to greater competition among increased numbers of retailers.

Bangladesh has thus pursued food self-sufficiency, rural development and improvement of living conditions in rural areas; i.e. major themes of Netherlands' development policy. The provision of fertiliser aid, which was aimed at increasing food production and relieving pressure on the balance of payments, therefore seems to have had an adequate policy base.

Mali

Mali has gone through a period of rigorous economic restructuring which has substantially reduced the size and influence of the public sector. Apart from cotton, Mali's major exportable, all prices are deregulated. Heavy dependence on cotton, with unstable world market prices, leads to frequent balance-of-payments instability, but Mali's agricultural policy aims at diversification of agricultural production and exports. In the 1980s responsibility for implementing agricultural policy was gradually decentralised to regional development organisations, which thus gained an independent position vis-à-vis donors and farmers. Due to the liberalisation drive these regional organisations have started to return to their core tasks and to leave input trading, for example, to the private sector, although their operations have generally been efficient. This process is slowly gaining momentum, partly influenced by growing pressure from village associations.

The development priorities of the Netherlands' aid policy with regard to Sahelian countries: food security, ecological sustainability and rural water supply, have been broadly in line with those of the Malian government. Netherlands policy. Although the slimming-down of the government sector is progressing more slowly than desired by the donor community, the general view on Mali's performance has been fairly positive since 1989. There has thus been adequate justification for the provision of fertiliser aid particularly since the main recipient, the regional development organisation CMDT, has been operating efficiently. The momentum of structural adjustments in the 1990, however, coincides with the phasing-out of fertiliser aid by DGIS.

Zambia

Zambia has always put very strong emphasis on food security for all, an aim supported by substantial subsidies to producers, transporters, millers and consumers. This system became unsustainable when Zambian export earnings from copper fell in the 1970s. Subsequent attempts to enforce structural adjustments in the 1980s met with extreme reluctance on the Zambian side. Repeated failures caused irritation among the donor community and towards 1990 some were ready to withdraw their assistance. A subsequent change of government provided the opportunity to speed-up the long overdue restructuring of the economy and to end the disastrous agricultural pricing system. The dominance of the subsidy system rendered the fertiliser market unattractive for the private sector, while the government's distribution system was highly inefficient.

The common goal of food security for long formed an insecure basis for policy agreement between the Netherlands and Zambia. Towards the end of the 1980s, when the Netherlands increasingly took its cue from the World Bank and IMF, dissatisfaction with Zambia's weakly-based agricultural policy had grown, and fertiliser aid was being phased-out. After 1991, the Netherlands resumed its balance-of-payments support through currency support to the OGIL system, but total annual aid levels decreased considerably.

4.4 *Counterpart funds*

The counterpart funds generated by the sale of fertiliser aid to farmers provide recipient governments with additional revenue. While the Netherlands does not as a rule impose conditions on counterpart funds, exceptions are made. The Netherlands' influence on the disbursement of such funds has thus varied in different countries. In Bangladesh counterpart funds went unconditionally into the state budget: since the sums involved were relatively small (well under one per cent of the annual budget) the budgetary impact was limited. In Zambia 15 per cent of counterpart funds were used for the local costs of bilateral projects in Western Province. The remainder went into a special Finance Ministry account at the Bank of Zambia to counter the adverse effects of subsidy the removal. The precarious state of Zambia's public finances made it very difficult to meet these conditionalities, but the Netherlands has never put sanctions on non-compliance.

In Mali the sole beneficiaries of counterpart funds have mostly been two regional development organisations (ODRs), the *Compagnie Malienne pour le Développement* (CMDT) in the south-east (cotton) and the *Office du Niger* in the Niger delta (rice), which used them to meet operating costs and directly for rural development. The availability of counterpart funds has enabled the two organisations to create for themselves a rather independent position vis-à-vis the farmers and the restructuring policies of government and donors. In recent years the status of the ODRs is changing in that one third of counterpart funds now goes to central government and fertiliser markets are being liberalised.

4.5 *Projects complementary to fertiliser aid*

The ultimate effectiveness of fertiliser aid can be enhanced if efficient distribution and use in the recipient country can be guaranteed. In this connection it is important to know whether the Netherlands has coupled any project aid to its commodity aid for this purpose. In Mali, the Netherlands has consistently worked on a flexible project approach aimed at improving agricultural research, extension and production, in which fertiliser deliveries were well-integrated. Increased rice production substituted for imports and thus contributed directly to self-reliance. Moreover, the effectiveness of recipient organisations was enhanced by the counterpart funds that were put at their disposal. In Bangladesh and Zambia much less was done: the Netherlands has contributed to the construction of fertiliser godowns in Bangladesh to render fertiliser distribution more efficient; in Zambia, support has been provided to the ailing distribution systems through assistance to a logistical planning unit and technical advice to the Nitrogen Chemicals Corporation of Zambia only since 1989.

In view of the large sums spent on fertiliser aid, the Netherlands has generally done relatively little to improve local fertiliser distribution and use through a complementary project approach.

5 Micro-level effects

The contribution of a macro-instrument such as fertiliser aid to micro-level objectives can only be reviewed indirectly. The three case studies attempted to establish whether the effects of fertiliser aid had contributed to poverty alleviation through improved food security for the poor. Since fertilisers are used to maintain soil fertility and farmers only tend to use them if they are affordable, the ecological and financial sustainability of fertiliser use at the micro-level were also taken into account.

5.1 *Poverty alleviation*

The contribution of fertiliser aid to the relief of poverty is at best indirect: the poorest members of society – the (virtually) landless, single mothers, the destitute – do not have the land, capital or access to credit needed to benefit from fertiliser availability, and spend most of their income on food. It is assumed that where fertiliser aid has increased food yields and thus helped to improve food security through an expanded, cheaper and more stable supply, this can be regarded as indirectly helping to relieve poverty. There may also be positive employment effects caused by the more labour-intensive nature of modern methods of agricultural production.

With the exception of fertiliser supplied for the cultivation of cotton in southern Mali and of tobacco in Zambia, the bulk of Netherlands fertiliser aid to the three countries was used on food crops. Maize grown in rotation with cotton in southern Mali also benefited from the residues of that used on the cotton crop; maize surpluses improved market supplies.

In *Bangladesh* the cultivation of rice HYVs promoted through agricultural advisory services, fertiliser subsidies and the expansion of the area under irrigated cultivation, has brought about a considerable increase in food production. Most of the fertiliser supplied is used in rice growing by both large and small farmers and by both tenants and owners of land. The advent of modern varieties has above all led to an increase in dry-season production. Yield per hectare has expanded along with the area under cultivation. While prior to 1971 rice prices in Bangladesh had risen much more rapidly than the overall price level, between 1971 and 1985, after the introduction of modern technologies, the rate of increase was in line with general inflation and benefited all consumers including marginal farmers and the landless who have to supplement their own rice production with purchases on the open market.

Almost all fertiliser aid to *Mali* is used on the most profitable crops (irrigated rice and cotton) in the centre and south of the country: areas of relatively high agro-ecological potential. The development of these areas, where 35 per cent of the total population live, was the main goal of the Netherlands' development cooperation with that country since the late-1970s. The people of the two areas have benefited greatly from fertiliser aid, which was incorporated into broad and flexible programmes of regional development. The economic position of farmers, especially in the rice-growing area, has greatly been strengthened and there have been significant employment effects. Living standards in the area have risen markedly over the last 10–15 years and per capita income exceeds the national average.

Incentives introduced by the government of *Zambia* greatly increased the extent of commercialised farming in that country: in 1974 large farmers accounted for 70 per cent of all the maize marketed; in the 1980s their share fell to 30 per cent while that of small farmers rose to 70 per cent. This shift was marked by an increase in maize production and in fertiliser use. Zambian agriculture policy, however, endorsed by the Netherlands because of its strong emphasis on food security, was entirely based on heavy subsidies which eventually could no longer be afforded. In 1991, under pressure from donors, the IMF and the World Bank, Zambia set about the complete abolition of subsidies, so that fertiliser use was no longer financially attractive to farmers in marginal areas. While low food prices had benefited the poor, particularly in urban areas, they had been the result of pricing measures rather than of increases in productivity due to fertiliser use. World Bank data indicate that at the aggregate level the expansion in maize output between 1974 and 1989 was virtually entirely due to increases in the area under cultivation: despite increased fertiliser use, maize yields in terms of output per hectare actually fell over this period.

In Mali and Bangladesh, increases in food production can largely be attributed to the use of mineral fertilisers. Fertilisers applied to more profitable non-food cash or export crops can also have an indirect effect on food production through their residual effects on food crops grown in rotation. The case studies of Bangladesh and Mali also show that fertilisers come within reach of poorer farmers when their availability is certain, efficient and widespread. In most cases it is the male farmers who benefit from improved availability of fertilisers. Bangladesh has tried to remedy this situation through special credit programmes for female-headed households, but in Mali women depend on occasional small quantities given to them by their husbands. For the poorest farmers and landless without proper access to the required land, credit and knowledge, mineral fertilisers will remain out of reach. They are likely to benefit from lower food prices on the market if increased productivity through fertiliser use leads to increased marketable surpluses, which was the case in Bangladesh and Mali. The case for Zambia is different, since benefits that accrued to poor farmers and consumers were not based on real prices and resulting inefficiencies merely led to shifts in production patterns rather than to increased productivity. In Zambia and other countries with substantial input subsidies, structural adjustment measures usually take away these benefits, particularly affecting the urban poor since farmers in marginal areas often fall back on traditional farming methods.

Although fertiliser aid is not an instrument that directly benefits the poorest members of the society, it can be said for the three countries that small and poor farmers also have benefited from fertiliser aid.

5.2 *Ecological sustainability*

For the purposes of this study the concept of sustainability of aid results was operationalised by focusing on two aspects of fertiliser use: ecological sustainability (maintaining soil fertility) and financial viability (at the level of the farm). Since both depend very largely on relative prices, market organisation and government facilities such as advisory and credit services, the extent to which government policy has tended to promote sustainable agriculture was also taken into account.

Soil fertility

All three countries suffer deficiencies of one or more plant nutrients in the main food-growing areas which need to be replenished if the soil is not to be exhausted. As farming becomes more intensive it is increasingly difficult to maintain soil fertility solely by means of natural processes and organic matter; without mineral fertiliser, the nutrient shortfalls would have been more serious than they are. The soil's organic content also needs to be managed properly if inorganic fertilisers are to be used to the best effect and soil fertility is to be maintained. The level of organic matter in the soil is e.g. being depleted through alternative uses of organic materials: in Bangladesh, cowdung is used as fuel, and in Mali, cotton cake is transported elsewhere for use as livestock fodder.

Prudent fertiliser use is a precondition for ecologically-sustainable production. It must, for example, be balanced: the application of one nutrient (particularly nitrogen) over long periods leads to the depletion of others and can acidify the soil. In Bangladesh the long-term and unbalanced application of urea (nitrogen) has in certain cases led to deficiencies of phosphorus, zinc and magnesium. The shift from Nitrogen towards Phosphorus donations by the Netherlands has therefore been positive for soil fertility. In Zambia the use of certain types of nitrogenous fertiliser has compounded soil acidity in large areas of the country where levels were already naturally high.

Point pollution

Fertiliser is produced in Bangladesh and Zambia. The former has several factories producing urea and one producing triple superphosphate (TSP): the urea is produced relatively cleanly using natural gas, and older and less efficient plants are gradually being replaced. The TSP factory is obsolete and some air and water pollution has been found in the vicinity. Zambia produces ammonium nitrate, which is also used as an explosive in the copper mines; the factory concerned, in Kafue, discharges waste upstream of Lusaka's drinking water inlet and the resulting nitrate levels are a potential threat to public health. The production of natural rock phosphate in Mali has no environmental implications.

5.3 *Financial sustainability*

Government policy in the three countries has given high priority to fertiliser supplies, in the case of Bangladesh and Zambia to the point of heavily subsidising fertiliser prices (in Mali central government has never concerned itself explicitly with fertiliser supplies, while the regional development organisations have always charged realistic prices). Structural adjustment programmes under way in all three countries involve reducing the role of state organisations and phasing out subsidies. In Bangladesh this has not led to any fall in fertiliser use and availability has actually increased. In Zambia privatisation has led to marked changes in the areas where unsubsidised fertiliser is not a viable option for farmers, albeit total food production in normal years does not appear to have suffered. In Mali privatisation has yet to have any visible impact on fertiliser prices and availability, reflecting the dominant position still held by the regional development organisations.

For the purposes of this study fertiliser use is considered to be financially sustainable if it brings sufficient net gain to farmers, i.e. if the value-cost ratio of the additional yield achieved through fertilisers and the cost of the fertiliser is larger than one. Since account must be taken of possible risks involved in fertiliser use, a widely applied rule of thumb is that this ratio must be at least two. It is also the case that farmers who can afford mineral fertiliser tend to make greater investments in the long-term fertility of their land in the form of erosion-control measures, the use of organic material, crop rotation and so on.

The costs involved mean that mineral fertiliser is mainly applied to crops that are marketed and which farmers can be reasonably sure will fetch an adequate price. In some cases there have been – and may even still be – fixed or guaranteed minimum prices (cotton in Mali, maize in Zambia, rice in Bangladesh), but recent structural adjustment programmes make them increasingly difficult to sustain.

In *Bangladesh* the Green Revolution brought a huge increase in the use of nitrogenous fertilisers in particular. The government actively promoted fertiliser use and the introduction of irrigation techniques and hybrid seeds through subsidies and distribution by state agencies, a policy which made fertiliser use an attractive proposition for large numbers of farmers. Despite the abolition of input subsidies and the privatisation of distribution, the use of fertiliser has remained financially viable, i.e. the value-cost ratio remained higher than two, since input prices have not risen disproportionately vis-à-vis output prices. Population pressure and the small size of the average landholding mean that Bangladesh cannot afford any drop in productivity.

In *Mali* guaranteed markets and prices for farmers mean that the use of fertiliser in cotton-growing has always been financially viable. Price maintenance was made possible by the fact that the *Compagnie Malienne pour le Développement* restricted the total area under cultivation and used external funding to subsidise shortfalls when world-market prices for cotton were low. Price levels were therefore reasonably sustainable. Fertiliser use at realistic prices has also proved viable in intensively irrigated rice cultivation, with a sharp fall in subsidised rice imports from Thailand in the second half of the 1980s proving a major spur to farmers in the area covered by the *Office du Niger*.

In *Zambia* both fertiliser and maize were until recently subject to price controls. This ensured that fertiliser use was a viable option for small and emergent farmers, leading to a high level of commercialisation within these groups. The pricing policy was not sustainable, however, and now that realistic prices have to be paid the use of fertiliser in large-scale commercial maize-growing has again become relatively more attractive. It are the small farmers in more remote areas in particular that have fallen back on traditional crops or, here and there, on other cash crops such as tobacco and soya beans. Fertiliser use is now concentrated in the more fertile areas along the main roads and the line of rail.

In most developing countries the prevailing negative nutrient balances have necessitated the use of external inputs. In principle, the extracted soil nutrients can efficiently be replaced by mineral fertilisers due to their high nutrient content as compared with organic materials, the low nutrient content of which necessitates the application of some ten or more tonnes per hectare. The logistics and manpower involved in organic fertilisation are often prohibitive to the farmer, and the large-scale extraction of organic materials from the surrounding environment poses an ecological threat in itself. Governments have therefore actively stimulated the introduction and application of mineral fertilisers, often with the use of subsidies. In many cases this has led to neglect of the organic matter content of the soil and unbalanced fertilisation, rendering mineral fertiliser use unsustainable in the longer run. Improved soil management through balanced fertilisation and application of ecologically sound farm practices requires at least adequate knowledge on the part of the farmer and attractive margins between input and output prices, in addition to good market opportunities, credit facilities, title deeds to their land, etc. Therefore, even after fertiliser and food market liberalisation and the privatisation of state companies, governments still have an important responsibility to facilitate sustainable agricultural production.

Chapter 1 Design and scope of the study

1.1 Background

Fertiliser aid has long been an important component of Netherlands spending on development cooperation: between 1975 and 1991 a total of 3,600 million guilders went into this form of aid, representing six per cent of net official development assistance (ODA). Fertiliser aid is a form of macro-economic support: the foreign currency which it puts at developing countries' disposal helps relieve their balance-of-payments problems, while receipts from the sale of fertiliser by recipient governments contribute to official revenues. Fertiliser use can also bring benefits at micro-level (increased agricultural output, higher farm incomes, food security, reduced soil degradation, etc.).

Debates on fertiliser aid focus on three main issues:

- the role of the fertiliser industry (questions arise here regarding the tied nature of the aid and the rules of international competition);
- the environmental implications of fertiliser use (maintenance of soil fertility versus possible harmful effects);
- the impact of liberalisation on fertiliser prices and availability (the possible role of bilateral fertiliser aid in a situation in which government and semi-government agencies have been privatised or abolished).

Evaluations of fertiliser aid provided by the Netherlands have so far been limited in scope. In most cases their concern has been with commodity import support in general of which fertiliser aid formed part; topics addressed have been the impact in terms of reduced balance-of-payments and budget deficits, the macro-economic policies of recipient governments, the role of intermediaries, and efficiency, with micro-level effects generally receiving little attention. Since these evaluations were often concerned with only one or a small number of transactions their time horizon was short.

This study was prompted by a need for more information on the effects and significance of fertiliser aid at meso- and micro-level and on its role as an instrument of development cooperation.

1.2 Questions addressed

The following questions were addressed:
- How has Netherlands policy developed, and how far does it reflect the changing situation and needs of developing countries?
- What considerations are taken into account in the appraisal of applications for fertiliser aid and how effective are the management instruments at the disposal of the Directorate General for International Cooperation (DGIS)?
- How efficiently is fertiliser aid provided?
- How effective is fertiliser aid at macro-level?
- Is fertiliser aid an effective instrument for the relief of poverty?
- Does fertiliser aid contribute to sustainable development?

A major dilemma in the evaluation of fertiliser aid is that it has been regarded as both a fungible form of macro-aid and as a means with which to realise objectives at the meso- and micro-levels. It might be asserted that once the fungibility of aid is established, there is no longer scope for analysis at the sectoral or micro-level. The report does not enter into the complicated issue of fungibility in its various forms (aggregate or categorical) but uses the definition formulated in *Import Support* (IOV 1989). It is assumed that even fungible aid is not without economic and/or policy effects, which allows for analysis of its effects at the meso- and micro-levels.

With regard to sustainable development, the definition of the WCED report *Our common future* (the Brundtland report) has been taken and subsequently narrowed down for the purpose of this study. Sustainable development is defined as:

> a process of change in which exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. (WCRD 1987, p. 46)

In this study we focused on two aspects of sustainable development:
- ecological sustainability (the long-term maintenance of soil fertility and the role of fertiliser);

– financial sustainability (the extent to which farmers can afford to invest in maintaining soil fertility).

In both cases the role of government policy with regard to ecologically and financially sustainable development is taken into account.

The definition of poverty relief is based on the White Paper *A World of Difference*: alleviation of the situation of the billion or so people who live below the poverty line and who have little or no access to resources such as land and capital, to basic infrastructural and social services or to the processes of decision-making. Many of the poor are landless (who include large numbers of women and workers in the informal sector) or small farmers (women as well as men). For the purpose of this study the effect of fertiliser aid on poverty alleviation has mainly been regarded in terms of improvements in food security.

1.3 Approach and methods

The study comprised four components:
– an examination of mainly official documents;
– a review of the literature;
– interviews with experts and persons involved in the implementation of aid schemes;
– field investigations.

1.3.1 *Examination of documents*

The aim of this part of the study was to chart the processes of policy formulation and implementation involved in fertiliser aid. It comprised the following elements:
– an overview of policy development within DGIS and of the manner in which policy has been operationalised in country, region and sector documents;
– a quantitative overview of Netherlands-funded fertiliser aid since 1974, with information on types, prices, sources and destinations;
– an analysis of fertiliser-aid appraisal memoranda for the period 1985–91 and of the operation of purchasing procedures;
– an analysis of disbursements, involving a comparison of payment dates with the dates of signature of appraisal memoranda relating to fertiliser transactions in 1985–91;
– a comparative analysis of prices paid, 1985–91;
– an analysis of earlier evaluation material relating to fertiliser deliveries;

- an inventory of Netherlands-funded projects related to fertiliser issues (research, education, production, distribution etc.).

1.3.2 *Review of the literature*

Literature with regard to the following three topics has been reviewed:
- the agricultural significance of fertiliser (plant nutrients and soil fertility, the relationship between organic and inorganic fertilisers, efficiency of fertiliser use, the function and composition of the various fertiliser types, etc.);
- the main points of the international debate on the benefits and drawbacks of fertiliser use in economic, social and environmental terms in the context of sustainable development;
- supply and demand trends for different macro-regions in relation to different types of fertiliser, past and likely future trends.

1.3.3 *Field investigations*

Field investigations, which covered three countries, were directed at:
- the role and function of Netherlands fertiliser aid as a form of macro-economic aid;
- the efficiency of Netherlands fertiliser aid;
- the implications of fertiliser use for the relief of poverty;
- the implications of fertiliser use for sustainable development.

For operational and budgetary reasons it was decided to limit the case studies to three countries, to be selected on basis of the following criteria:
- the countries should have received substantial and/or regular fertiliser aid from the Netherlands;
- the countries should be sufficiently diverse in terms of agricultural systems, social, cultural and economic circumstances, agro-ecological conditions, government policy, fertiliser use and the purchasing and processing of fertiliser aid.

Application of these criteria led to the choice of Bangladesh, Zambia and Mali: in Bangladesh there is enormous pressure of population and natural soil-fertility levels are high; in Zambia, in contrast, population density is low and soil fertility fair; in Mali, both population density and the natural productive capacity of the soil are low.

The field investigations were contracted out to three missions, each comprising a Netherlands team leader and 5–7 local experts. Detailed terms of reference were drawn up and discussed with mission members. In the course of their investigations, which were carried out between November 1992 and January 1993, the three missions were visited by the Operations Review Unit's coordinating team. Their reports form the basis for the country sections included in this report.

The study was guided by an advisory group comprising external experts and officers of the DGIS, which met five times during the study period and commented on the various drafts. Further information on the organisation of the research, the methods used and the participants is given in appendix 1.

1.4 *Policy framework for the evaluation of fertiliser aid*

Despite its large volume, fertiliser aid has not figured prominently in the various policy papers. As will appear from chapter 3, White Papers and country policy documents give little if any particular attention to fertiliser aid and the Explanatory Memoranda accompanying the aid budget do not argue the case for this significant budget item. In fact fertiliser aid is explicitly mentioned only in the White Paper *Improving the Quality of Bilateral Aid* (1979) and the sector document *Fertiliser Aid* (1985). Both documents affirm that this aid form contributes towards the two main goals of Netherlands development policy; both also stress the need for complementary measures in the recipient countries. *Sustainable Agriculture* (1992) returns to the subject of fertiliser in relation to the productive capacity of the environment and takes further some of the ideas in *A World of Difference* (1990), which focused mainly on low-external-input sustainable agriculture.

There is thus no specific policy framework for the evaluation of fertiliser aid. Given, however, that it is a form of programme aid and must therefore assist in achieving the central goals of Netherlands development policy – the relief of poverty and progress towards economic self-reliance – the following framework was adopted for the purpose.

Import support, in this case fertiliser aid, is a form of programme aid primarily regarded as a macro-level instrument; it is provided on the basis of macro-economic criteria where there is broad policy agreement between the Netherlands and the recipient country. The main development goal it serves is that of promoting economic self-reliance. Fertiliser aid is thus assessed for its macro-economic effects; a major issue here is that of the tying of aid, which can adversely affect the efficiency of aid provision.

Progress towards economic self-reliance can also be seen as a precondition for the effective relief of poverty, the other principal goal of development policy. Several White Papers and memoranda have discussed the effects of fertiliser aid in connection with special target groups such as the rural poor, food security and rural development. Also, different pressure groups focused on the social effects of fertiliser aid and the parliamentary standing committee on development cooperation questioned its effects in this respect. The meso- and micro-level effects of fertiliser aid on institutions and individuals are therefore included in this evaluation. This is mainly done in the three country studies (Bangladesh, Mali and Zambia).

Over the years it has always been a policy goal that aid efforts should bring sustainable results, and since *A World of Difference* the issue of ecological sustainability has joined those of social, economic and cultural sustainability as a major focus of concern. Ecological sustainability has particular implications for fertiliser aid. The concept is operationalised in this report by focusing on three specific aspects of sustainability: ecological sustainability (in terms of maintaining soil fertility), financial sustainability (at the level of the farm), and the extent to which government policy tends to promote sustainable agriculture.

This interpretation of the concept means that the ecological consequences of fertiliser production in countries other than those in which it is used will not be considered. While attempts are increasingly made to determine such environmental costs at a global level and to include them in cost/benefit calculations, this is not yet general practice and it is beyond the scope of this study . Such costs would moreover need to be set against the macro-economic costs of the accelerating soil degradation which could result if fertiliser use were reduced in response to rising prices. The possible pollution generated by fertiliser production in the three countries covered by the study is being looked into.

1.5 Structure of the report

Chapter 2 provides a technical introduction to the use of fertilisers in connection with the maintenance of long-term soil fertility; to global developments in fertiliser use; and reviews the international discussion on sustainable agriculture since the onset of the Green Revolution. The development and implementation of Netherlands fertiliser aid policy is the subject of chapter 3. Relevant sections are discussed of the various White Papers, sectoral memoranda and successive versions of the country and region programmes as well as the policy debate in the Netherlands, as reflected in parliamentary questions and answers, General Chamber of Audit reports, and publications and responses from the Netherlands fertiliser industry. The description of Netherlands aid practice over the period 1985–91 focuses on the considerations taken into account in decision-making (the appraisal memoranda), the use made of evaluations of earlier fertiliser transactions, the operation of purchasing procedures and the nature of any support projects.

Chapters 4 and 5, which are based on field studies carried out in Mali, Zambia and Bangladesh, deal respectively with the macro- and micro-level impact of fertiliser aid. Chapter 4 focuses on the role and significance of fertiliser aid as a macro-economic aid instrument, while chapter 5 is concerned with the implications for the relief of poverty and sustainable development.

In chapter 6, finally, the results of this study are used to address the questions formulated in 1.1, on the basis of which conclusions will be drawn.

Chapter 2 Soil fertility, fertiliser use trends and sustainable agricultural production

2.1 Soil fertility

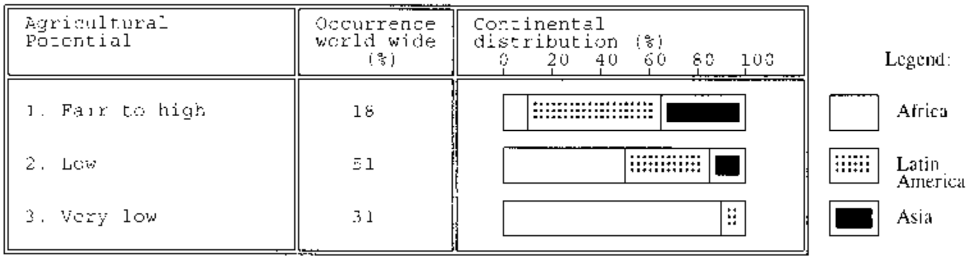
2.1.1 *Soil and soil fertility*

The soil is a vital resource for people, animals and plants. It is a dynamic medium comprising disintegrated rock particles, water, air, organic matter (humus) and living organisms. Soil formation involves physical, chemical and biological processes; it is also affected by climatic conditions, since the various processes are generally accelerated by high temperature and rainfall. Soils thus both form and degrade more quickly in tropical than in temperate zones.

A soil's fertility depends on its chemical and structural properties such as acidity, organic content, characteristics as a rooting medium (root room and root hold) and ability to retain nutrients and water. Less than a fifth of tropical soils show fair to high levels of fertility. These are mainly azonal soils, e.g. those formed on recent alluvial or volcanic sediment. Relatively fertile soils are to be found notably in Asia and Latin America (figure 1).

The rapid rate of soil formation and degradation means that around half of all tropical soils are severely weathered – i.e. retain (and are able to retain) little by way of plant nutrients – and therefore have little agricultural potential; moreover, the processes of degradation, which are aggravated by imprudent soil management, occur more quickly and are harder to reverse than in less weathered soils. Weathered soils are to be found particularly in seasonal and rainy climate zones, i.e. where average monthly rainfall exceeds 100 mm for 4.5–9.5 and 9.5–12 months of the year respectively (Sanchez 1976), mainly in Africa and Latin America.

Almost a third of tropical soils have very little agricultural potential: as well as lacking nutrients, they cannot retain enough moisture to ensure that plants are adequately supplied throughout the growing season. Such soils mainly occur in Africa's dry and desert climate zones, where average monthly rainfall exceeds 100 mm for less than 4.5 months of the year (Sanchez 1976).



Based on: Sanchez (1976) and van der Heide (1992).

Figure 1 Tropical soil types, by continent

2.1.2 *Plant nutrients and nutrient uptake*

Soils contain plant nutrients. Deficiencies in their nutrient content can be made good with inorganic fertilisers, but we first need to know what nutrients are needed and when.

The main elements required, apart from carbon, hydrogen and oxygen, are the following:
- macronutrients: nitrogen (N), phosphorus (P) and potassium (K), sulphur (S), calcium (Ca) and magnesium (Mg);
- micronutrients (trace elements): iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), molybdenum (Mo) and chlorine (Cl).

A deficiency of any one nutrient may be sufficient to restrict plant growth and reduce yields (see box 1).

Nitrogen is a very mobile element and essential to vegetative growth: its compounds are highly soluble in water and thus easily absorbed by plants. By the same token, however, they are easily lost from the soil through leaching or evaporation.

Phosphorus occurs mainly in fixed form in the soil and as such cannot be taken up by plants; well-developed root systems are therefore needed to seek it out. Phosphates play an important part in the setting of fruit and seeds.

Potassium, generally present in forms easily taken up by plants, plays an important role in respiratory and metabolic processes.

Box 1 Deficiency of a single nutrient as a limiting factor to plant growth

If factors such as water availability and crop management (e.g. weed control) do not limit growth, the deficiency of any single nutrient is sufficient to do so; crop yield cannot be higher than the most limiting soil nutrient permits.

The staves in figure 2 represent the different nutrients needed by plants in varying amounts. The yield of a crop is determined by the nutrient which is in shortest supply and therefore limits yield. In this figure that is Nitrogen (N). The yield level can only be increased by increasing the amount of the limiting nutrient (increasing the length of the stave). The yield will then increase to another level at which another nutrient or other factor becomes limiting.

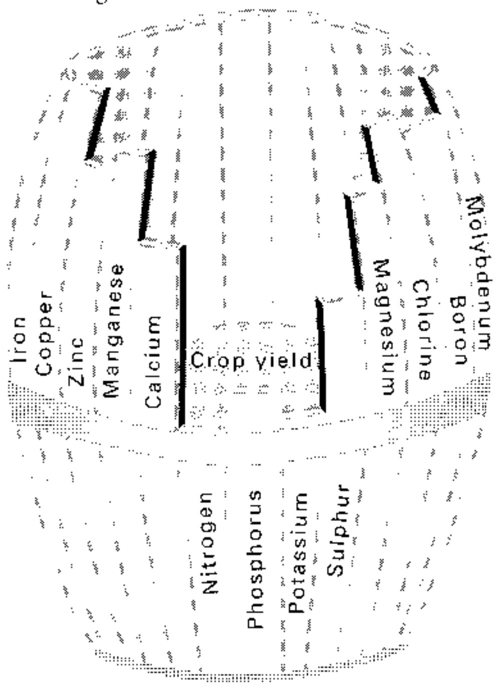
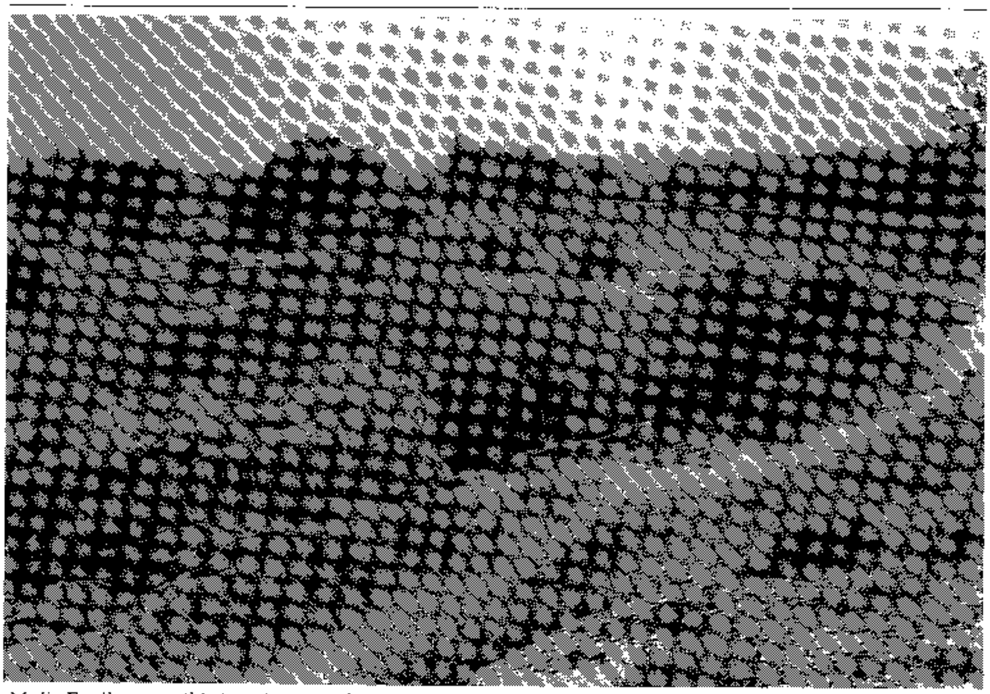


Figure 2 Crop yield cannot be higher than the most limiting soil nutrient permits

Supplying the missing nutrient through fertiliser application makes sense only until the top of the next stave is reached, i.e. until growth is limited by the deficiency of another nutrient; if the first nutrient continues to be applied the excess may leach out or run off. The balanced use of fertiliser is thus essential from the viewpoint of plant physiology as well as in ecological and economic terms.

Based on: 'Fertilizers and their use' (FAO 1970), in: H. van Reuler & W.H. Prins, *The role of plant nutrients for sustainable food crop production in Sub-Saharan Africa*, Association of Fertiliser Producers (VKP) 1993.



Mali: Fertile top soil is lost due to soil erosion.

Apart from small amounts absorbed from the atmosphere or falling rain, plants take their nutrients from the soil. How this is done and what determines their capacity to absorb nutrients depends on the form in which they occur in the soil and on rainfall and soil properties.

Soil characteristics such as organic content, acidity (pH value), structure and moisture-retaining capacity are the main determinants of plants' ability to absorb nutrients. There is a critical threshold for organic content below which uptake is no longer possible. This threshold, which varies from one soil type to another, is affected by climate: fairly even rainfall in adequate amounts maintains the soil's moisture content at levels that favour nutrient uptake while excessive rain may wash nutrients out of the soil.

2.1.3 *The nutrient cycle and ecologically sustainable production*

Most more or less natural ecosystems feature a closed nutrient cycle, with virtually all nutrients taken up by plants being returned to the soil as plant litter or after ingestion by animals; soil organisms then convert this material into forms in which it can again be absorbed by plants. If products are extracted from the system, as happens when crops are harvested, the nutrient cycle is broken and nutrients are lost. Rice yields of 2.5 t/ha, for example, involve the removal from the soil of 79 kg/ha of N (29 kg going into the grain), 16 kg/ha of P (6 kg going into the grain), and 81 kg/ha of K (5 kg going into the grain) (based on Van der Heide et al. 1992). Nutrients may also be lost through erosion (especially of fertile topsoil), leaching from farmland, evaporation or conversion by microbial action into gaseous forms which cannot be taken up by plants (denitrification).

Demographic, social and economic pressures have made increasingly heavy demands on the soil's nutrient stock, seriously disrupting the natural cycle and threatening a long-term loss of productive capacity.

A recent FAO study of Sub-Saharan Africa found dramatic rates of nutrient depletion (see table 1). This process – 'soil mining' – is one of the less visible factors underlying the precarious state of the continent's food supplies.

Table 1 Average N, P and K balances (kg/ha/yr) in farmland soils in some Sub-Saharan countries

	N		P		K	
	1982–84	2000	1982–84	2000	1982–84	2000
Benin	–14	–16	– 1	– 2	– 9	–11
Botswana	0	– 2	1	0	0	– 2
Cameroon	–20	–21	– 2	– 2	–12	–13
Ethiopia	–41	–47	– 6	– 7	–26	–32
Ghana	–30	–35	– 3	– 4	–17	–20
Kenya	–42	–46	– 3	– 1	–29	–36
Malawi	–68	–67	–10	–10	–44	–48
Mali	– 8	–11	– 1	– 2	– 7	–10
Nigeria	–34	–37	– 4	– 4	–24	–31
Rwanda	–54	–60	– 9	–11	–47	–61
Senegal	–12	–16	– 2	– 2	–10	–14
Tanzania	–27	–32	– 4	– 5	–18	–21
Zimbabwe	–31	–27	– 2	– 2	–22	–26

Source: Smaling (1993).

Nutrients may be added to the soil in several ways:

– natural processes (atmospheric deposition, sedimentation);
– agricultural practices:
  - including legumes in cropping regimes to enable the biological fixation of nitrogen;
  - applying fertilisers, both organic and inorganic;

- cultivating deep-rooted crops which bring nutrients into the topsoil from deeper layers, making them available to other crops, and retrieving nutrients washed down from nearer the surface;
- crop rotation and/or the inclusion in cropping regimes of fallow periods which allow soil fertility to recover;
- the use of fire in opening up new land, which rapidly frees a large number of nutrients, but also mean the loss of many nutrients (notably N and S) in gaseous form. Crop rotation and fire do not strictly speaking involve any addition of nutrients but rather make them more easily available to plants.

Ecologically sustainable production requires that nutrient losses be restricted or made good in such a way that the nutrient balance is maintained as far as possible.

2.1.4 *Fertilisers*

Fertilisers are all materials that are added to the soil with a view to maintaining or enhancing its productive potential.

Organic fertilisers are animal and human excreta and agricultural and domestic waste, composted or otherwise. While considerable amounts of organic waste are produced in developing countries, the expense of transporting bulky material whose nutrient content is low limits its agricultural use (Dalzell et al. 1987). Composted household waste is occasionally used in the vicinity of towns and cities, mainly in vegetable-growing, but there are concerns about the contamination of waste flows, e.g. by heavy metals.

Another danger is that the use of organics may simply displace the problem. The application of organic matter to farmland entails removing it from its original location; if this happens on too large a scale, the side-effects can be severe, including deforestation and the slow exhaustion of grazing lands.

Organic fertiliser can also take the form of *green manures*, i.e. trees, bushes, grasses, ground-cover plants, etc. which easily absorb large amounts of nutrients and store them in the form of organic matter. This is then dug or ploughed into the soil, where it is gradually converted into humus. Green manures may be planted on fallow land or alongside agricultural crops.

The application of organic fertiliser serves a dual purpose: it supplies nutrients and also helps to maintain or enhance the soil's organic content, thereby improving its structural and chemical properties and increasing the ability of plants to absorb nutrients. Since mineralisation – the decomposition of organic matter, freeing nutrients for absorption by plants – occurs more quickly at higher temperatures, the organic content of tropical soils is subject to rapid depletion. In fact the rate of mineralisation doubles with every 9°C rise in temperature, so that where eight per cent of organic material breaks down in a year at 27°C, i.e. tropical conditions, at 9°C the figure is only two per cent (Jenkinson & Ayanabe 1977). At such rates of decomposition the soil's organic content falls rapidly in the absence of appropriate management techniques and large amounts of organic matter must be added to maintain it at a useful level. Building up the organic content of tropical soils is thus inevitably a slow process.

Inorganic or *mineral fertiliser* can take the form either of a simple product containing a single nutrient (N, P or K) or of a compound product containing two or more; compound fertilisers used on cash crops also sometimes include trace elements, most commonly sulphur and boron. The production of the various types of fertiliser is the subject of appendix 2.

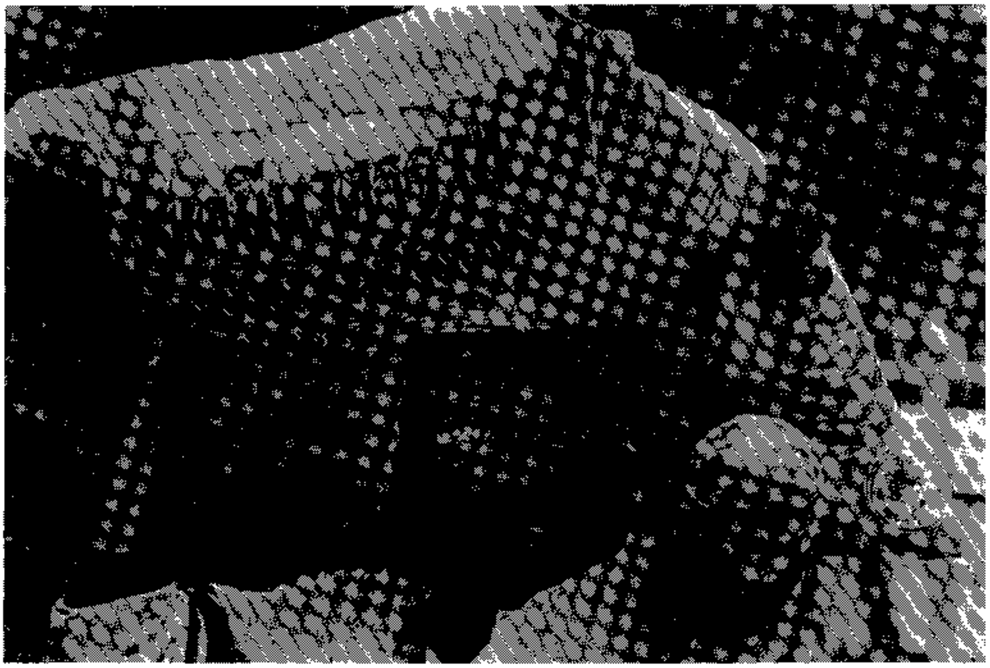
Virtually all *nitrogenous fertiliser* is produced synthetically by the fixation of atmospheric nitrogen at high temperatures. Production is possible wherever the necessary energy is available and therefore tends to concentrate where energy is cheap. The main nitrogenous fertiliser in the tropics is urea.

Phosphates are found in the form of rock phosphate in many developing countries, the main sources among them being Morocco, Jordan, Tunisia, Brazil and Togo. The raw material has to be crushed finely and/or purified for use in agriculture, and is often treated with sulphuric acid to increase the availability of phosphorus to plants. Some phosphate fertilisers are produced synthetically.

Potassium is mainly supplied in the form of crushed or processed salts (potash) from the beds of ancient inland seas. The main sources are Canada and Russia (Hignett 1967).

P and K fertilisers tend to be produced close to where the raw material is extracted.

While the soil's nutrient content is increased by applying inorganic fertilisers, its structure, which influences nutrient uptake, is not directly affected.



Thailand: A farmer in North-Eastern Thailand purchased Nitrogen in a Netherlands-financed cooperative shop.

2.1.5 *Use of inorganic fertiliser*

Phases in fertiliser use

The mobility of nitrogen compounds in the soil means that, as farming becomes more intensive, nitrogen is generally the first nutrient to be in short supply. Insofar as farmers in developing countries use a mineral fertiliser to make good that deficiency it is generally urea.

Where N availability is good, the eventual result of accelerated growth, harvesting of crops and removal of organic waste in both rain-fed and irrigated agriculture, is a deficiency of phosphorus. In the first instance, the shortfall is generally made good with a simple fertiliser such as single or triple superphosphate (SSP, TSP); as farming becomes more intensive, compound (NP) products such as ammonium phosphate (AP) and diammonium phosphate (DAP) are often used.

In intensive rain-fed agriculture in the tropics, K levels are maintained by the application of simple products such as muriate of potash (potassium chloride, KCl) or of compound NPK fertilisers (e.g. 15-15-15), sometimes combined with trace elements. NPK compounds are widely used in commercial farming.

Efficiency of fertiliser use

The agronomic efficiency of fertiliser use, defined as the yield increase generated by applying one unit of fertiliser (see box 2.2), is the outcome of many interacting factors, among them:

• Soil properties and climate
Plants' ability to absorb nutrients, and with it fertiliser efficiency, is affected by the soil's structure and by the quantity and quality of its organic content. Nutrient uptake also depends on adequate rainfall, preferably evenly spread.

• Farmers' management skills
What farmers decide to do in terms of crop selection and rotation, management of the soil's organic content, application (timing, types, amounts) of mineral fertiliser, ultimately affects the efficiency of fertiliser use.

• Timing and method of application
Applying organic matter together with inorganic fertiliser enhances the latter's efficiency by creating the conditions for a balanced supply of plant nutrients. The timing is crucial, since plants' nutrient needs change at different stages in their development: nitrogen is essential to vegetative growth, for example, while phosphorus plays an important part in the setting of fruit and seeds.

• Composition and amount
Applying a single nutrient to the soil tends to accelerate the depletion of others, and makes that nutrient less effective (e.g. continued nitrogen application can cause a deficiency of phosphorus which, in turn, reduces plants' response to nitrogen). The chronic over application of nitrogen promotes acid soils.

• Crop varieties
Improved varieties of wheat, maize and rice (with short stalks) show a better response to nitrogen in terms of increased yield than do traditional varieties.

The literature gives a minimum ratio for the agronomically efficient use of fertiliser on foodgrains of 1:10, meaning that 1 kg of nutrients must be converted into at least 10 kg of output. The overall efficiency of fertiliser use depends however not only on agronomic efficiency but also on the ratio of input and output prices (financial

Box 2 The agronomic efficiency of fertiliser use

The agronomic efficiency of fertiliser use is defined as the increase in yield per unit of fertiliser applied.

Three case studies in Bangladesh show the importance of applying fertiliser of the right type and in the right amount if agronomic efficiency is to be maximised.

The Karimganj (Noagaon) case study (1989–90) found the optimum NPKS formulation for three modern rice varieties to be 60-45-30-22.

Table 2 Karimganj: optimum NPKS formulas for three rice varieties

Fertiliser dose		Grain Yield (tonnes/ha)			Increase in Yield (kg/kg nutrient)		
N-P-K-S	Total	BR 14	BR 3	BR 11	BR 14	BR 3	BR 11
0-0-0-0	0	3.0	3.1	2.8	–	–	–
40-30-20-15	105	3.5	5.1	3.8	4.76	19.05	9.52
60-45-30-22	157	4.8	6.5	4.9	11.47	21.67	13.38
80-40-60-30	210	4.9	7.0	5.5	9.05	18.57	12.86

Source: FSRDP 1991.

The efficiency of various NPK formulations applied to sugar cane at the SRTI (Ishurdi case study) is shown in table 3.

Table 3 Ishurdi: efficiency of NPK formulas for sugar cane

Fertiliser Dose (kg/ha)		Cane Yield (t/ha)	Increase in Yield (kg/kg nutrient)
N-P-K	Total		
0-0-0	0	38.73	–
0-52-91	143	56.91	127.13
120-52-91	264	65.99	103.26
160-52-91	303	66.94	93.10
200-52-91	343	68.76	87.32
120-80-91	211	64.59	122.56
120-35-91	246	66.67	113.58
120-70-91	281	63.02	86.44
120-52-0	172	63.10	141.69
120-52-66	238	64.10	106.60

Source: SRTI 1986.

The efficiency of various formulations in wetland rice cultures (Chandina case study) is indicated in table 4.

(Box 2 continued)

Table 4 Missing element trial with N, P, K, S and Zn fertilisers for wetland rice culture, Comilla, 1990

	NPKS Zn	PKS Zn	NKS Zn	NPS Zn	NPK Zn	NPK S	NPK	NS	N	0
BORO										
Grain Yield (t/ha)	5.73	2.48	5.81	5.63	6.18	5.51	5.67	5.33	5.28	2.77
Yield increase (kg/kg nutrient)	13.45	–2.07	19.00	15.89	17.95	13.05	16.11	23.27	31.38	–
AMAN										
Grain Yield (t/ha)	5.42	3.47	5.06	5.27	5.27	5.45	4.97	4.88	4.74	3.66
Yield increase (kg/kg nutrient)	12.05	1.36	8.75	8.94	8.47	8.52	7.11	11.09	13.50	–

Source: BRRI (1992).

efficiency). The latter is usually depicted by the Value/Cost Ratio (VCR), based on the value of extra output generated by the use of fertiliser divided by the cost of the fertiliser required to achieve that extra output. In principle, fertiliser use is profitable when VCR >1, but in practice the VCR has to be (much) higher than two for a farmer to adopt the use of fertilisers, depending on the amount of risk he is willing or able to take. A VCR of e.g. six may still not be sufficient incentive for a remote farmer to use fertilisers if he considers the climatological and market risks too big. Crop or market failure may plunge him into a vicious circle of indebtedness once he does not repay his loan for the agricultural inputs. On the other hand, a farmer in a climatologically stable area, with sure market outlets, may find a VCR of two sufficient for the use of modern inputs, such as mineral fertilisers.

2.2 World trends in fertiliser supply and demand in relation to food production*

Between 1930 and 1960 world consumption levels of N, P and K increased at the same rate; their absolute levels of consumption were also the same. From 1960 onwards, however, the use of nitrogenous fertilisers began to increase more rapidly

* This section is based on the reports of Bumb (1989), FADINAP (1992), IFA (1992) quoted in appendix 3: The changing pattern of fertiliser supply and demand.

as a result of the Green Revolution, which brought the introduction of new varieties of wheat and rice in combination with the use of fertilisers and pesticides. The increase in fertiliser use was greatest in Asia, where it was associated with a massive increase in food production. The Green Revolution's impact was greatest in Asia because:

- ecological conditions were favourable;
- the same crop, rice (which responds well to mineral fertiliser), was the staple food in many Asian countries;
- there was a rapidly growing population to feed;
- a reasonably sound infrastructure was already in place (planning, research, training, information, purchasing and distribution).

Fertiliser use is expected to continue growing in Asia. Consumption levels in Sub-Saharan Africa are extremely low, reflecting the failure of the Green Revolution to take off there (table 5). Fertiliser use in Latin America grew rapidly up to 1987, thereafter it fell as fertiliser subsidies were cut in a number of countries (Louis 1992).

Table 5 Use of fertilisers (weighted averages of plant nutrients, kg/ha) in low- and middle-income countries in different regions of the world

	1970–71	1989–90
Sub-Saharan Africa	3.3	8.9
East Asia and Pacific	36.4	190.3
South Asia	13.5	68.9
Latin America and Caribbean	20.1	46.8

Source: World Bank, *World Development Report 1992*, quoted in: H. van Reuler & W.H. Prins (eds) (1993).

As table 6 shows, half of the absolute increase in food production in Sub-Saharan Africa has been due to increases in the area under cultivation. In eastern Asia, in contrast, the area under cultivation has risen by only ten per cent, indicating a rapid rate of intensification. In Europe that area has actually decreased.

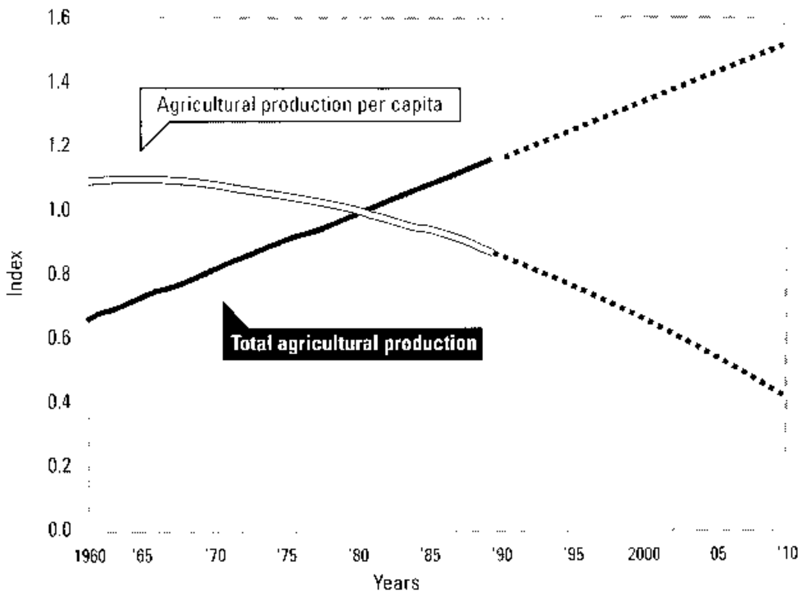
While food production in Asia and South America has at least kept pace with population growth, this is not the case in Sub-Saharan Africa where output per head is falling (figure 3).

The food-production problems that face Sub-Saharan Africa derive in large part from low product prices; these reflect, among other things, the more or less free use of scarce natural resources (notably land and water), which favours the adoption of extensive rather than intensive farming techniques.

Table 6 Contribution of increases in areas and in yields to growth of cereal production in developing and high-income countries, 1961–90

Country group	Current production 1988–90, average (10 mln ton)	Increase since 1961–63 (%)			Current yield, 1988–90 (t/ha)
		Total	Attibutable to		
			area increase	yield increase	
Sub Saharan Africa	57	73	47	52	1.0
East Asia	499	189	6	94	3.7
South Asia	261	114	14	86	1.9
Latin America	105	111	30	71	2.1
Middle East and North Africa	41	68	23	77	1.4
Europe and former USSR	336	76	−13	113	2.2

Source: H. van Reuler & W.H. Prins (eds) (1993).

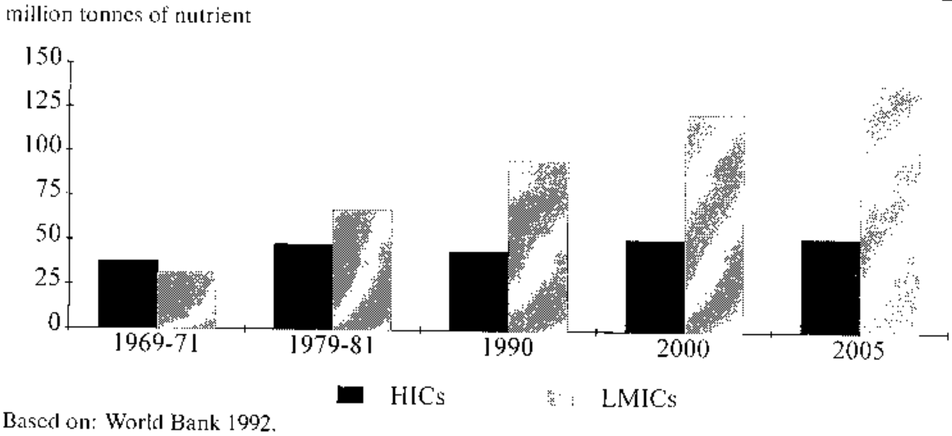


Source: *World Development Report 1992*, quoted in: Van Reuler and Prins (1993).

Figure 3 Total agricultural and per capita food grain production in Sub-Sahara Africa (production in 1979–81 = 1.0)

Long-term projections indicate a growth in fertiliser use world-wide of 2.2 per cent per year, reflecting growing demand for cereals. Fertiliser consumption in low- and middle-income countries (LMICs) has been growing as a proportion of total world consumption since 1970, a trend which is expected to continue (figure 4).

In 1991 world fertiliser output totalled some 152 million tonnes, over twice the 1970



Based on: World Bank 1992.
The figures shown for 1969–71 and 1979–81 are two-year averages (split years beginning in July); those shown for 2000 and 2005 are estimates.

Figure 4 Fertiliser consumption in HICs and LMICs, 1970–2005
(million tonnes of nutrient)

figure. The general trend hitherto has been for production to exceed consumption; while the World Bank expects the surplus to be somewhat smaller in the period to 2000, it is likely to increase again thereafter as production capacity grows. The increased output expected over the period 1991–2005 will be concentrated for 83 per cent in LMICs; the nutrients concerned are mainly nitrogen and phosphorus. Potash production will continue to be dominated by Canada and the countries of the former Soviet Union.

Fertiliser consumption in LMICs is structurally in excess of production, while in the richer countries there is a considerable excess of production over consumption (the surplus fluctuates between ten and 13 per cent of world output).

Notwithstanding short-term price fluctuations due e.g. to movements in the dollar exchange rate and specific events such as the Gulf War and the oil crisis, the general trend since 1965 has been one of falling real prices. In 1991 the World Bank expected fertiliser prices to show moderate increases through the decade, reflecting the narrower gap between supply and demand, falling again thereafter in response to an increase in production capacity. In the case of nitrogenous fertilisers, in fact, the fall started in the early 1990s as a result of the liberalisation of the fertiliser market in Eastern Europe.

Trends in fertiliser supply and demand are considered at greater length in appendix 3.

2.3 Sustainable agricultural development, issues in the international debate

Over time, development strategies have responded in various ways to problems associated with the rapid growth in world population and the production of food and other crops.

2.3.1 *The 1960s*

The Green Revolution, which began in Mexico in the 1940s with the introduction of new wheat varieties (with shorter stalks) in combination with fertilisers and pesticides, spread to other developing countries in the 1960s. Wheat production in India and Pakistan, for example, increased enormously, while in a number of rice-producing countries in South and East Asia parallel developments occurred under the influence of the International Rice Research Institute (IRRI) in the Philippines. The result was that in the developing countries concerned the increase in foodgrain production outpaced population growth for the first time in many years.

The Green Revolution nevertheless failed to take off in large parts of the world, notably Sub-Saharan Africa, due to a combination of factors:
- inadequate availability of water, nutrients, labour and other agricultural inputs and a deficient infrastructure in the areas of planning, research, training, purchasing and distribution;
- its focus on improved varieties of rice, wheat and maize meant that the Green Revolution had little to offer to traditional African agriculture (in which millet, sorghum, cassava etc. are the main crops);
- low population densities meant that the cost of fertiliser use was relatively high;
- the supply of fertiliser was not linked to the introduction of irrigation technology and other agricultural inputs, as was the case in Asia.

Despite achieving its prime purpose, i.e. the spectacular growth in food production as witnessed in many countries, notably Asia, the Green Revolution has attracted heavy criticism: the agricultural technologies of the West have not proven applicable without modification in the social, economic and ecological contexts of many developing countries.

Points of criticism come under two headings: socio-economic (1–2) and technical (3–6):
1. the widening gap between rich and poor farmers and the growing debt burden incurred by small farmers as a result of the high cost of fertiliser;

2. the increased dependence on the West, where most inputs originate;
3. the exacting ecological requirements of Green Revolution technology in terms of soil properties and water availability;
4. the narrow genetic base and susceptibility of some modern varieties to pests and disease;
5. the reduced production of straw for use as animal fodder and in building work;
6. the abandonment of the traditional use of manure and compost (which play a vital role in maintaining and improving the structure of the soil) in favour of mineral fertilisers (whose benefits are essentially short-term).

2.3.2 *The 1970s*

The enthusiasm for growth which marked the 1960s gave way in the 1970s to growing awareness of its inevitable limits. This was the central theme of the Club of Rome report (Meadows 1972), which saw the problem of growth in a finite system as the most fundamental challenge facing the world. For the Club of Rome, the Green Revolution was no more than a technical stop-gap which would not solve the problem of growing food shortages in the long run unless the underlying problem, exponential population growth, were tackled.

Based on a series of world models centred on various technological measures, the Club of Rome concluded that the basic behavioural pattern of the world system was one of exponential growth of population and capital investment (in services, agriculture and manufacturing industry) inevitably followed by collapse, irrespective of the technological fixes that might be adopted. The Club of Rome envisaged a sharp fall in world food output per capita between 2020 and 2050. To build a sustainable world able to meet the basic material needs of all, would require a switch from a growth to an equilibrium model in which the world's human population and its stock of capital goods were held constant. This could be achieved if technological measures were combined with a shift in our value system favouring the deliberate and considered control of growth. Finally, the Club of Rome report stressed the need for a sense of urgency lest ongoing exponential growth erode our chances of achieving ultimate stability.

The Club of Rome report was followed in 1979 by a study of the international food situation (Linnemann et al. 1979). With their Model of International Relations in Agriculture (MOIRA), the authors offered an international framework for describing the problems and opportunities associated with feeding a growing world population.

2.3.3 *The 1980s*

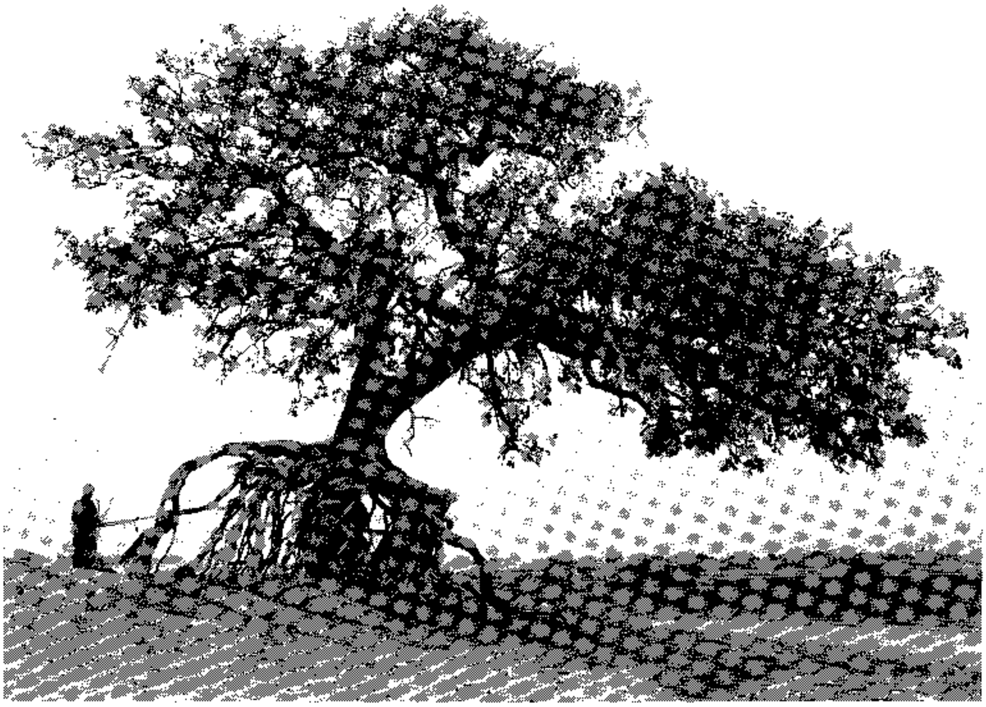
The Brandt Report (Independent Commission on International Development Issues 1980) gave a political dimension to the problems identified by the Club of Rome, stressing the importance of North–South dialogue. The fact that ecological and environmental problems affected the whole of humanity meant that North and South had common interests, necessitating changes in the pattern of international cooperation. In the absence of a global vision the planet's problems could only worsen.

With regard to food supplies the Brandt Report noted that agriculture could not be considered in isolation from the essential complementary role of growth in the manufacturing and services sectors. The following strategies were suggested as a way of putting an end to widespread hunger and malnutrition:
- developing countries' food policies should give top priority to increasing domestic production;
- agrarian reform should be introduced and appropriate farming systems developed;
- international foodstocks should be secured;
- the trade in food and other agricultural products should be liberalised;
- international institutions involved in farming systems research, should be given greater support.

The Report's prediction, based on assumptions of the International Food Policy Research Institute (IFPRI), was that fertiliser use would increase considerably as steps were taken to raise agricultural output in low-income countries; much depended, however, on the availability of fertiliser at affordable prices.

FAO thinking as reflected in *Agriculture: Toward 2000* (1981) was characterised by the focus on growth typical of the Green Revolution era. The FAO's conclusion, based on World Bank population estimates, was that when the world's population eventually stabilised (at around 10 billion, towards the end of the twenty-first century) global food needs would be around three times greater than in 1980; in other words, total food output needed to grow at 1.4 per cent per annum.

Most of the increased demand for food would be concentrated in the developing world: food production in the countries concerned would need to show a five-fold increase over the next century, equivalent to an annual growth rate of 2.2 per cent. The FAO urged a development strategy geared to themes of the Brandt Report, including the need for developing countries to make increased domestic



Mali: Wind erosion bared the roots of a tree near Djenné.

food production their top priority, and the creation of international trade and cooperation structures in line with developing countries' needs. The FAO also followed the Brandt Report in stressing the interdependence of North and South and the consequent need for international solutions to world problems.

The debate on sustainability which began in the late 1980s revisited the problem of growth in a finite system as described by the Club of Rome. The debate intensified with the appearance of *Our Common Future*, the report of the Brundtland Commission (World Commission on Environment and Development 1987). This report concluded that the world faced an environmental and development crisis involving the degradation of natural resources such as land, water and vegetation. The Commission considered poverty to be a major factor in resource degradation and stressed the links between economic and environmental factors at all levels.

The Brundtland Commission concluded that while the farming systems developed in recent decades had brought a considerable increase in food production, they were ill-adapted to a world facing environmental and development crises. The way ahead was sustainable development, which the Commission defined as 'development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.' The key lay in sustainable agricultural systems which paid due regard to human needs, technological capabilities, natural resources and production requirements in both the long and the short term.

The development strategies of the 1980s were strongly influenced by the structural adjustment programmes introduced in developing countries with a view to restoring economic balance. Those programmes emphasised market liberalisation, the ending of price controls and subsidies on fertilisers and foodstuffs, exchange-rate adjustments, the reform of inefficient public agencies and the diversification of production and exports. It is not yet clear what their long-term effects are likely to be.

2.3.4 *The 1990s*

Thinking on sustainability continued to develop in the 1990s. The new Club of Rome report, *Beyond the Limits* (Meadows et al. 1992), stressed the importance of working towards sustainable development. Noting that population, capital investment, resource consumption and environmental pollution were still growing exponentially, just as they had 20 years earlier, the report concluded that environmental resources were still not being used in sustainable ways and that in many cases the limits of sustainability had already been breached.

While options for the future had narrowed considerably over the preceding 20 years, the report's authors felt that certain viable choices were still open. What was needed was not just a series of quantitative changes in the world system but rather certain structural changes in the forces underlying growth, social goals and norms. Moreover, policies geared to sustainability needed to be put into effect without delay.

Debate on the environmental damage associated with intensive farming prompted more critical attitudes towards fertiliser use and a greater emphasis on ecologically sound techniques such as low-external-input sustainable agriculture (LEISA) and integrated plant nutrition systems (IPNS). LEISA has the following features (IAC 1993):
- resources that are locally available (on the farm or in the vicinity) are used so to maximise the synergetic effect;
- only those external inputs are used which are deficient in the local ecosystem;
- the goal is not to maximise production in the short run but to achieve a level of output that is sustainable in the long run.

Research is urgently needed into the scope for incorporating LEISA techniques into agricultural practice and into their possible limitations. IPNS is defined in *Agriculture towards 2010* as an approach to fertilisation which aims at optimising the use of all possible on- and off-farm sources of plant nutrients, comprising organic manure, biological fixation and mineral fertilisers (FAO 1993). The common feature of LEISA and IPNS is that the use of external inputs is geared to maximising the long-term benefits derived from the exploitation of local resources.

The Final Declaration (FAO 1991) of the Den Bosch conference, organised in 1991 as part of the run-up to the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, gave practical substance to the notion of sustainable development with recommendations for a Sustainable Agriculture and Rural Development (SARD) action plan. The central features of the plan are:

- integrated resource planning and management, at the community level and with popular participation;
- the adoption of practices that make optimum use of locally available resources and reductions in the use of external inputs, to be achieved through integrated plant nutrition systems (IPNS), integrated pest management (IPM), etc.;
- the diversification and integration of agricultural and other production systems (e.g. agro-forestry);
- research into different farming systems (such as LEISA), focusing on questions of sustainability;
- international cooperation (exchange of information, funding machinery, trade policy).

The Den Bosch declaration caused FAO to modify the policies previously set out in *Agriculture: Towards 2000*, as now reflected in *Agriculture: Towards 2010* (1993).

The need to promote SARD at the world level was recognised by government leaders at UNCED (Agenda 21, Chapter 14, 'Promoting sustainable agriculture and rural development'), but while the recommendations are broadly in line with those in the Den Bosch declaration they are formulated in less practical terms. Integrated plant nutrition systems are seen as an important way forward.

Chapter 3 The Netherlands' fertiliser-aid policy

3.1 Introduction: Netherlands fertiliser aid since 1970

Until 1973 financial aid, including fertiliser aid, was the responsibility of the Ministry of Economic Affairs and its main role was to promote Netherlands fertiliser exports. That responsibility was transferred to the Minister for Development Cooperation in 1973, since when development policy considerations have played a larger part in its disbursement.

Fertiliser aid has generally been funded under the Balance-of-Payments Support Programme and Country and Region Programmes, as well as occasionally from funds for rural development and programme support.

The *Balance-of-Payments Support Programme* was introduced in 1975 under the name 'Direct aid to the poorest countries and groups'; its purpose was to provide those countries that were hardest hit by economic crises with one-off injections of resources suitable for rapid disbursement.

Initially, it was required that the aid be used to fund vital imports with a view to bridging resource shortfalls of a temporary (cyclical) nature; later, account was also taken of the extent to which the policies of recipient countries were geared towards achieving enduring economic recovery. Programme funds were allocated to a number of countries, originally on an annual and later a two-yearly basis and did not form part of any longer-term policy concerning those countries. After 1991 the Programme was cut by about 25 per cent and the remainder used for debt relief. This meant a reduction in fertiliser aid for several countries in that an offsetting increase in the cash ceiling was not always available.

The *country and region programmes* have a longer-term perspective. Provision of commodity import support under these programmes depends among other things on the seriousness of the recipient country's economic situation and on the quality of its social and economic policies. Other considerations are the capacity of the recipient country to absorb project aid, continuity in country policy, and the need to ensure that part of the programme is in a form that can be rapidly disbursed.

The relationship between project and programme aid under the country and region programmes has always been a focus of debate. In the 1970s more than half of the bilateral aid going to Asian countries (other than Indonesia) comprised programme aid in the form of import support;* in the case of Africa and Latin America project aid predominated. Since the start of the 1980s the Netherlands has sought to reduce the role played by import support in aid going to Asian countries under the country and region programmes. In the case of Africa there has been a move in the opposite direction, with the share of import support rising from nothing to 40 per cent as a result of recipient countries' growing balance-of-payments problems and reduced capacity to absorb project aid (*Import Support*, IOV 1989). More import support has also been given to countries in Latin America.

A major focus of discussion has been the tying of fertiliser aid (i.e. the requirement that aid funds be spent on Netherlands products). As a member of the OECD Development Assistance Committee (DAC) the Netherlands has always pressed for far-reaching measures to untie aid. How the aid was tied depended on its form, the development status of the recipient country, and the degree of concessionality. This produced a situation in which policy on the tying of aid could differ from one country to another and even from one transaction to another within the same country. Technical aid grants have never been formally tied (see *A World of Difference*, pp. 323–24).

In the mid 1970s international agreement was reached on partial untying, initially in relation to financial aid loans (see table 46, appendix 7, for the relative proportions of grants and loans). Until 1989 such grants were partially untied either if the recipient was classed among the least developed countries (LDCs) in the DAC/OECD classification, or in the case of specific budget categories such as balance-of-payments support. Grants to non-LDCs were tied or partially untied following consultation with the recipient countries.

* Programme aid is defined differently in the various policy documents. In *A world of difference* (p. 318), it is defined as general financial support to a developing country provided through balance-of-payments support or budget support. The most important instruments mentioned in this connection are: general budget support (local-cost financing), structural adjustment or sectoral adjustment loans, import support, food and emergency aid and various modes of debt relief.

If aid is partially untied, the goods in question may be procured in the donor country, but in the recipient country itself, or in other developing countries on the DAC's Eligible Source Countries list (the 1993 list is shown in appendix 4). The ESC list is included in the DGIS rules and guidelines for the procurement of goods and works with financial development assistance from the Government of the Netherlands. The list is subject to change in line with official decisions reached by DAC.*

In 1989 it was decided to offer all financial aid in partially untied form, so that the same policy would apply to all recipient countries. There has recently (1993) been a further shift towards untied aid provision, in that, in the framework of the Special Programme of Assistance for Africa (SPA), the Netherlands undertook to untie all aid to countries covered by the Programme.

3.2 Fertiliser-aid policy formulation

The evolution of policy in respect of fertiliser aid is reflected in White Papers and sectoral documents and country and region policy plans, and in answers to parliamentary questions. The fertiliser industry and other interest and pressure groups have sought to influence policy from their various standpoints, considered below.

3.2.1 *White Papers by Ministers for Development Cooperation (1973–91)*

Successive Ministers for Development Cooperation have made known their intentions in White Papers. Fertiliser policy forms part of policy on commodity import support as set out in the following documents:

1976 *Bilateral Development Cooperation: Concerning the quality of Netherlands Aid*
1979 *Improving the Quality of Bilateral Aid*
1984 *Regauging Bilateral Policy*
1985 *Development Cooperation and Employment*
1989 *Quality, A Challenge for the 90s*
1990 *A World of Difference: New Frameworks for Development Cooperation in the 1990s*
1993 *A World in Conflict: Exploring the Limits of Development Cooperation*

* Changes that have taken place in the DAC list since 1985 are: the removal of Spain and Portugal in 1986; the inclusion of China in 1992 and five Central Asian countries of the former USSR in 1993. On 1 January 1996 six countries will be removed from the list because they are no longer considered as aid recipients: Singapore, Qatar, Kuwait, Brunei, the United Arab Emirates and the Bahamas.

Bilateral Development Cooperation: Concerning the Quality of Netherlands Aid (1976)

This document gave priority to the relief of poverty, with aid efforts being targeted towards specific sections of the population in the countries concerned. Fertiliser aid was not specifically mentioned but two matters were covered which affected fertiliser deliveries, namely, purchasing procedures and the tying of aid. Guidelines for the procurement of goods are drawn up by DAC and, with a view to promoting self-reliance, *Bilateral Development Cooperation* stressed that wherever possible responsibility for procurement should rest with recipient countries. The policy was that aid funds should in principle not be tied, provided that the decision to untie was jointly taken by a sufficiently large number of donors; it was also argued that some measure of tying was justified by Netherlands economic interests. The ministers for Economic Affairs and Development Cooperation should jointly decide whether to untie aid if Netherlands and foreign tenders showed a wide disparity.

Improving the Quality of Bilateral Aid (1979)

Alongside the continuation of aid policies geared to poverty relief, this document stressed the encouragement of economic processes in developing countries: the quality and effectiveness of bilateral aid could be improved by helping developing countries move towards economic self-reliance. This was referred to as the twin-track policy.

Fertiliser aid was relevant to both tracks. Under poverty relief it was considered crucial that the poorest groups would have access to goods that met basic needs, i.e. consumption goods and inputs (e.g. fertiliser). Negotiations with developing countries were to include consultations on this and on necessary complementary measures. Programme aid in general was seen as geared to the promotion of economic self-reliance, and preference should go to supplying goods that exploited or rehabilitated existing capacity, e.g. raw materials, spare parts and agricultural inputs.

Regauging Bilateral Policy (1984)

This document sought to integrate the earlier twin-track policy into one of structural poverty relief. Given that measures to alleviate poverty could bear long-term fruit only if development activities had a sound economic foundation, *Regauging Bilateral Policy* stressed the need to gear bilateral aid to achieving lasting improvements in economic structures at the national level. No further relaxation of rules governing the tying of aid was to be considered. It was a policy aim that recipient countries should derive maximum benefit from Netherlands development funds. The coalition agreement therefore stated that price and quality differences resulting from the tying of aid should not disadvantage developing countries and should remain within acceptable limits.

Prior to the issue of *Regauging Bilateral Policy* the policy had been one of non-involvement in the management and disbursement of counterpart funds generated by the sale of goods supplied as aid. An exception was now to be made in cases where the recipient government itself proposed that such funds be paid into a special account and used to cover the local costs of bilateral projects.

Development Cooperation and Employment (1985)

This document recognised promotion of the interests of Netherlands industry as an element of development policy. It stressed that the structural alleviation of poverty continues to be the principal objective of Netherlands development policy, to be achieved in part through the promotion of productive employment in developing countries. A secondary goal was added, however, i.e. the promotion of employment and economic development in the Netherlands. Further study of Netherlands ability to supply development-related goods could lead to adjustments in the choice of regions and sectors targeted by Netherlands policy.

Quality, A Challenge for the 1990s (1989)

The aim of promoting national economic interests through development cooperation was given lower priority in this document: use would be made of Netherlands firms where the interests of industry coincided with those of development cooperation, but the latter would guide both policy and practice wherever they diverged. A change of government occurred shortly after publication of this document.

A World of Difference (1990)

This document sought to develop new policy against a background of fundamental shifts in the international situation: the collapse of the communist world, the ecological threat, and the globalisation of economic and social processes. Not only development policy but the development process itself was in crisis, and the increasing gap between growing poverty and growing affluence was generating a structural dualism in the world economy and in national economies. *A World of Difference* stressed the structural relief of poverty, stating that sustainable progress depended on the strengthening of autonomy and self-reliance among weak and marginalised groups in society, including women: the alleviation of poverty from the bottom up, development for and by local people. The development of rural areas, where the majority of those in absolute poverty live, became a focal point. Programme aid would continue to play a major role, being regarded as an 'ideal' form of support for sound social and economic policies; controls on how it was used were seen as necessary only where the Netherlands was unable fully to endorse the recipient country's policies. This document was the first to draw attention to the environmental effects of fertiliser use, introducing low-external-input sustainable agriculture (LEISA) as an alternative to modern methods and noting that marginal farmers cannot afford the large-scale use of modern agricultural inputs. In the broader context large inputs of fertiliser and energy were considered unsustainable since fertiliser is manufactured using non-renewable resources and contributes significantly to the greenhouse effect. The implicit conclusion was that fertiliser deliveries did not contribute to sustainable development. Policy on the tying of aid was that disbursement in Third World countries was to be actively promoted. In this connection the document referred to the coalition agreement which laid down that, in deciding whether to make use of Netherlands industry, demand and not supply should be the crucial factor.

A World in Conflict (1993)

This document followed on from *A World of Difference*, focusing on conflicts caused by the developments analysed therein. While the earlier document had dealt chiefly with the crises in the development process, policy and thinking, *A World in Conflict* focused on the increasing likelihood of violent conflict over access to environmental resources, particularly in poor countries and regions where population growth was fastest and the scope for applying modern technology least. The traditional distinction between emergency humanitarian aid on the one hand and structural development cooperation on the other was becoming blurred.

A World in Conflict stressed the need to develop a range of LEISA techniques for the various ecological zones and for areas with differing intensities of land-use and varying extents of degradation of natural resources. Ways by which to improve agriculture in areas where high levels of external inputs are usual were also to be sought.

3.2.2 *Sectoral memoranda*

Two sectoral memoranda of relevance to fertiliser aid have been issued: *Fertiliser Aid* (1985) and *Sustainable Land Use* (1992). The latter takes further some of the points covered in *A World of Difference*.

Fertiliser Aid

This document, which dealt with the background to and trends in Netherlands fertiliser aid over the period 1974–85, saw it as a form of programme aid. Since most of the fertiliser supplied was used in cereal-growing, including by small farmers, it was considered that the aid contributed to the relief of poverty and was thus in keeping with the twin-track policy of alleviating poverty and promoting economic self-reliance. The fact that it could be disbursed relatively rapidly made it a valuable means of balance-of-payments support; moreover, it helped the structural relief of poverty by increasing the output of food crops. The document took a positive view of the effects of fertiliser aid: it was an essential input into the vital process of increasing food production in developing countries and, despite shortcomings in distribution, training and information, and credit provision, had brought about a considerable increase in agricultural output.

Fertiliser Aid, which was issued following parliamentary questions on fertiliser aid to India, attempted to sharpen fertiliser-aid policy and included several concrete recommendations:

- fertiliser aid to India and Pakistan should be phased out due to growing local production capacity, while aid to Bangladesh, Kenya, Tanzania and Sri Lanka should be continued;
- multi-year agreements should be concluded with recipient countries, and aid should be reduced gradually when necessary;
- agreements should be concluded with recipient countries on complementary measures that targeted relevant groups and where designed to enhance the effectiveness of fertiliser use. Such measures, if necessary to be financed from counterpart funds, could include assistance to national fertiliser centres, research and training projects targeting particular groups, improvements in storage and distribution, and the expansion of fertiliser use in more fertile areas;
- programme aid should be given in the form of fertiliser aid where there were demonstrable benefits to food production;
- the efficiency of fertiliser aid should be enhanced by such means as monitoring the fertiliser sector in the recipient country and international prices, joint elaboration

with the Ministry of Agriculture of certain specific aspects of fertiliser use, and the maintenance of close contacts with the fertiliser industry.

The 1985 memorandum devoted virtually no attention to the role of fertilisers in different farming systems or to environmental aspects of their use, and did not consider fertiliser policy as an element in the rural policies of the developing countries concerned. It did, however, propose that aspects of fertiliser use in rain-fed agriculture should be further studied.

Sustainable Land Use

This document defined sustainable land use as optimal exploitation of the environment's carrying capacity from the viewpoint of agricultural production and resource conservation. It queried the one-sided view of LEISA given in *A World of Difference* and set it in a less absolute perspective. *Sustainable Land Use* stated that a major part of the Netherlands aid programme is geared to the development of agricultural systems in which external inputs such as fertilisers and pesticides play an important part; only a small amount of aid goes into the promotion of alternatives. If the goal is a policy that deals with matters relating to ecological sustainability in an integrated fashion , then it is not enough to support LEISA projects only: the insights emerging from LEISA research must also be applied to agricultural activities that make intensive use of external inputs.

There was considerable debate as to the ability of LEISA techniques to meet the rising demand for food in the short term. Increases in food production had hitherto largely been achieved by using modern agricultural methods in areas where economic and ecological conditions were favourable. What was needed was a balanced combination of sustainable farming systems with high and low levels of external inputs, depending on the specific ecological context. Alongside the accumulation of LEISA expertise and the development of techniques for the sustainable management and conservation of ecologically sensitive areas, the policy targets included promoting ecologically sound agricultural methods in production systems based on the intensive use of external inputs, with a view to stimulating the sustainable use of natural resources while maintaining or raising levels of productivity.

In response to questions from the Standing Committee on Development Cooperation, the Minister took the view that fertiliser supplies to Asian countries should be limited on environmental grounds. The Minister's initial impression was that fertiliser use was excessive in African countries, but this was disputed by ecological experts during a study day in 1992. The Minister subsequently stated in Parliament that Africa would probably need more rather than less mineral fertilisers.

3.2.3 *Country policy plans*

The first series of country policy plans were drawn up in 1985; revised versions of the plans were issued in 1988–89 and 1992. Below, fertiliser-aid policies for nine of the ten main recipients are considered (the exception being the Philippines)

Africa: Kenya, Mali, Sudan, Tanzania, Zambia

A shift from project to programme aid has been seen as desirable, with programme aid being brought to 50 per cent of the cash ceiling. The policy background to the choice of fertiliser as an aid instrument has received little or no attention in the policy documents relating to these recipient countries. The 1985 document on Sudan saw fertiliser aid as support for the agricultural sector. To provide small farmers with the means of production was preconditional to food security, and fertiliser was to be supplied to them through the Agricultural Bank of Sudan. In the case of Kenya, food production was to be promoted by facilitating the supply of agricultural inputs in sufficient quantity and of appropriate types through the funding of imports; fertiliser aid was vital to productive agriculture, though the degree to which small farmers had benefited was uncertain (1989).

A start was made in 1988 on the multi-year planning of programme aid for Tanzania, to which three-quarters of the funds would be earmarked.

In 1986 it was decided to channel import support for Zambia through the auction of foreign currency; fertiliser aid was excepted from this decision and continued to be funded directly. Part of the aid to Tanzania and Zambia was channelled through the Open General Import Licence (OGIL) system, reflecting ongoing privatisation. These funds could be used for fertiliser imports, and the system was to be extended in the future. Fertiliser aid for Zambia was intended to enable better use to be made of the country's agricultural productive capacity; policy mainly targeted the small-farm sector, but large private farms were also eligible for help with funding for imports (1985). Following Zambia's break with the IMF and World Bank, it was decided in 1989 to provide import support only for stimulating food production. The policy document for 1992–95 devotes greater attention to other means of increasing output such as crop diversification and the integration of livestock and crop production systems; the use of mineral fertiliser is considered to be financially unviable.

Under the current document relating to Mali (1992–95), programme aid (35 per cent of the aid package) previously funded under the balance-of-payments support programme, is to be continued using regional funds. Fertiliser aid would be supplied until 1993, being seen as a suitable instrument for channelling support to the two target areas for Netherlands aid (covered by the *Compagnie Malienne pour le Développement des Textiles et des Fibres* and the *Office du Niger*).

Asia: Bangladesh, India, Pakistan, Sri Lanka

The Netherlands policy has been to cut programme aid as a proportion of the total going to the four Asian countries, though this does not generally reflect the wishes of the governments concerned. Here, too, fertiliser aid is seen as a form of programme aid, mainly in support of food production and improvements in food security.

Fertiliser has traditionally figured large in the aid programme to Pakistan, funded with a view to promoting national self-sufficiency in staple foods and contributing to rural development. Support for the fertiliser sector formed part of a broader policy which also included funding for a training centre. In line with the findings of the 1987 evaluation mission the policy was to supply nitrate-phosphate (NP) rather than nitrogen, phosphorus and potassium (NPK) fertiliser, since the former was more likely to benefit small farmers.

Fertiliser aid to India included support for cereal production as well as balance-of-payments support. The 1989–92 policy document devoted 25 per cent of the aid budget to fertiliser aid, reflecting the importance of fertiliser in food production and past experiences of generally satisfactory distribution and use. The document referred to favourable comments by evaluation missions on the efficiency of fertiliser deliveries and their distribution among various categories of farmers. Fertiliser aid to India ceased in 1993.

The purpose of supplying agricultural inputs to Bangladesh and of supporting the national fertiliser industry was to support that country's policy of diversifying agriculture and working towards food self-sufficiency. The policy for 1992–95 is to continue supplying fertiliser (triple superphosphate, TSP), unless the Bangladesh government opts to have all programme aid channelled through the Secondary Exchange Market.

Policy documents relating to Sri Lanka do not argue the case for fertiliser aid.

3.2.4 *Parliamentary answers*

In 1989 nine questions were tabled in the Lower House regarding the tying of fertiliser aid, the types of fertiliser supplied, and their possible environmental effects (see appendix 5). Asked whether agreement existed with or within the Netherlands fertiliser industry, the Minister replied that no agreements had been reached on quantities to be supplied or prices to be charged, and that there was no evidence that such agreements existed within the industry (notably NSM Chemicals and DSM Chemicals).

The remaining questions concerned the environmental effects of fertiliser aid and its role in the relief of poverty. It was confirmed that evaluation reports had dealt with the possible acidifying effect of fertilisers on certain soils: in virtually all cases acid soils were the result of natural processes of soil formation rather than of fertiliser use. The low level of fertiliser use in developing countries meant that adverse environmental effects were unlikely in the short term. Asked whether he would promote training and information schemes covering environmental implications of fertiliser use with a view to minimising damage due to unsound practices, the Minister stated that support was given to bilateral and multilateral projects with that purpose (including the FAO fertiliser training and information programme). He further stated that evaluations of fertiliser aid generally covered the economic aspects of its use in relation to principal crops.

A further question concerned the proportion of fertiliser aid that reached small farmers. The reply was that only limited information was available. Three examples were given of their share in total fertiliser use: in Bangladesh (holdings of less than 2.5 hectares) 37 per cent; in Kenya (smallholders) 43 per cent; and in Zambia 70 per cent.

In 1992, following the presentation of the country and regional policy plans to the Lower House, the Standing Committee on Development Cooperation tabled a number of questions on the subject of fertiliser aid. The Committee asked if the Association of Fertiliser Producers (VKP) was right in concluding that prices were not tracked and that the Netherlands industry could not participate in tenders or compete with producers from Eligible Source Countries (in the case of payment by reimbursement). Whether or not national producers were eligible as suppliers depended on the payment procedure and the product sought. With regard to fertiliser use in Pakistan the Minister commented that the expected benefits had not been achieved, partly due to lack of training and research provision. Finally, the Committee asked the Minister not to reduce the already low allocation for fertiliser aid in 1991 and to ensure that the home industry had the opportunity of benefiting.

3.2.5 *Netherlands fertiliser industry*

The Netherlands fertiliser industry, profiled in appendix 6, mainly produces nitrogenous and compound fertilisers (for which non-N components are imported). The industry's financial position worsened sharply in the mid-1980s through falling sales and rising production costs (higher natural gas prices). DGIS-funded purchases represent a small proportion of total fertiliser exports: in 1979–83 the figure averaged 14 per cent; in 1986–91 it still averaged six per cent of total exports and 4–5 per cent of exports to non-EU countries (Central Bureau of Statistics).

In 1982 the industry began to press for the removal of OPEC states from the Eligible Source Countries list, alleging that their low energy prices constituted unfair competition. The Minister's response was given in the 1984 policy statement *Regauging Bilateral Policy* which stated that Government is in favour of partial untying and retention of the ESC list, but that active steps will nonetheless be taken to ensure that national producers are not excluded as a result of unfair competition.

The 1985 memorandum *Fertiliser Aid* prompted a number of comments from the VKP, whose members include the five multinational enterprises with production facilities in the Netherlands in 1992 (Amsterdam Fertilisers, Hydro Agri, DSM Agro, Kemira and Zuid Chemicals). VKP criticised the shift from programme to project aid as running counter to the principle that aid should be disbursed in accordance with the recipient country's wishes and called for reappraisal of the ESC list in the light of possible dumping by oil-producing countries; attention also needed to be focused on agreements relating to the tying of aid. VKP further proposed that the scope for multi-year agreements relating to DGIS-funded fertiliser deliveries be investigated. These points were the subject of considerable debate, but virtually all suggestions were eventually rejected by the Minister for Development Cooperation.

A World of Difference (1990) also prompted a reaction from VKP to the effect that the document's criticisms of fertiliser use and claims regarding adverse environmental effects were ill-founded. VKP stressed the positive aspects of intensive farming and the value of large-scale agriculture in securing food supplies. It also emphasised the importance of maintaining an efficient Netherlands and European fertiliser industry in the face of unfair competition. The Association was critical of the policy

The Netherlands: Urea ready for export from the DSM factories in Geleen.

document's statement that disbursement in the donor country raised costs (see also appendix 10).

The Minister for Development Cooperation replied that there had been no categorical condemnation of fertiliser use. However, fertiliser aid did need to be integrated better into agricultural development programmes, and fertilisers needed to be used effectively and prudently. The Minister also pointed out that fertiliser aid was of limited significance to Netherlands manufacturers (less than four per cent of output) and that multi-year agreements, as proposed by the industry, were unnecessary. Moreover, the progressive untying of aid helped to reduce upward pressure on prices.

In its response to the sector policy memorandum on sustainable land use, VKP endorsed the principle of sustainable agriculture but felt that the role of mineral fertilisers in this connection was insufficiently recognised.

Parallel to its dialogue with the Minister, the Association asked a group of independent researchers to investigate the role of organic and inorganic fertilisers in the agriculture of Sub-Saharan Africa, focusing on environmental effects and on food production. The research involved two case studies of Ethiopia and Malawi, and dealt with the impact of structural adjustment and market liberalisation on the fertiliser sector. The report was completed in 1993.* A brief ceremony was held to mark its formal acceptance on behalf of the Minister for Development Cooperation by the Deputy Director of DGIS, who reaffirmed an earlier undertaking by the Minister to draw the World Bank's attention to the need for a workshop on problems facing the fertiliser industries of developing countries as a result of structural adjustment programmes.

The report's main conclusion was in line with an earlier ministerial response to representations from the fertiliser industry, namely, that the supply of fertiliser needed to be better integrated into agricultural development programmes. It also urged donors to make greater effort to develop a variety of instruments of fertiliser policy, including legislation, marketing training, research, information and training provision, and credit programmes, and called for the establishment of an independent group of prominent national representatives of farmers, dealers, importers and government to oversee a fair transition to a liberalised market (box 3).

The focus of the debate between VKP and the Minister for Development Cooperation has thus shifted from issues of export promotion and competitiveness to the development of agricultural policies in Third World countries which facilitate an increase in balanced fertiliser use.

3.2.6 *Responses from pressure groups*

In 1982 the National India Working Group (LIW) issued a report which criticised Netherlands fertiliser aid to India (Landelijke India Werkgroep 1982) and whose main purpose was to check in how far aid provision accorded with declared policy. LIW concluded that fertiliser deliveries to India did not bridge a temporary deficit, but were a form of long-term import support which, moreover, did not promote progress towards economic self-reliance in general or self-sufficiency in fertiliser supplies in particular. Nor was there any benefit to the poorest sections of society: the LIW report cites the conclusion of a DGIS mission that 80 per cent of supplies went to large commercial farmers. The use of organic fertilisers was an alternative for small farmers. LIW urged the Minister to concentrate on other forms of aid which would benefit the poor or on programmes aimed at making organic fertilisers available to small farmers in particular.

* Reuler, H. and W. H. Prins (eds) (1993), *The role of plant nutrients for sustainable food crop production in Sub-Sahara Africa*, Leidschendam.

Box 3 A summary of concluding remarks in 'The role of plant nutrients for sustainable food crop production in Sub-Sahara Africa'

The problem of food production with regard to the agricultural input supply in Sub-Saharan Africa seems to concentrate on the provision of reasonably priced mineral fertilisers at the right place and time, combined with sufficient attention for research and extension in promoting an adequate use of organic fertilisers. The provision of mineral fertilisers through parastatals has mostly proven to be inefficient and problematic, and led to substantial financial, economic and social costs. The most efficient and therefore cheapest method by which to market fertilisers is probably through a viable and competitive private sector, kept in check by a measured amount of government control in order to prevent excessive profits, adulteration, exploitation and monopolisation. The many countries in Sub-Saharan Africa which have embraced structural adjustment programmes involving the liberalisation of fertiliser markets and the privatisation of parastatals demonstrate the political commitment among African states to give the private sector a chance to operate in African fertiliser markets.

The insecurity involved in such a liberalisation process might be greatly reduced if the process were monitored by an entity with sufficient political weight, which could keep all actors on the fertiliser market in check, whether public or private sector. That entity should enforce the conditions that allow profitable fertiliser trade on a competitive market, thus ensuring the highest possible efficiency and lowest prices, while at the same time closely watching the farmers' interests in the framework of macro (food) policies. Such a high-powered entity, e.g. a fertiliser advisory board, would consist of influential representatives from the Ministries of Agriculture, Trade and Finance, importers, traders, (former) parastatals, and so forth. Perhaps a donor representative could also participate on an ad hoc basis. The board should not become another bureaucratic layer. It is there only to protect the interests of those involved in the fertiliser sector while looking at the stated macro-objectives of food security for all, a fair income distribution and economic growth. If clear rules and regulations for the fertiliser trade are drawn up and enforced by legislation, the private sector will have sufficient trust to engage in normal commercial risks, governments will pursue non-efficiency goals with regard to fertiliser (e.g. in marginal areas) while leaving the best serviceable areas to the private sector, and the donor community will provide either budget or commodity support to boost fertiliser supply.

In its response DGIS stated that fertiliser aid was already being reduced and that this process would continue. It disputed that fertiliser aid was inconsistent with the policy of targeting particular groups, and felt that not only those who used the fertiliser should be considered but also the impact on food production.

In 1994 LIW wrote to Parliament expressing its concern about the reduction in aid levels to India; to have any effect on the Indian poor, aid should be raised to

Tanzania: Application of tobacco fertiliser on a plantation in Morogoro.

significant levels and concentrated on a few states only. Import support should be abolished in favour of direct poverty alleviation. The fact that the Netherlands continued to provide fertilisers to India from 1990 through 1992 is attributed by LIW to disbursement pressure.

In 1984 a report on fertiliser aid was published by the Ecology Trust and the Netherlands Volunteers Liaison Group (Van Noordwijk & Nijsten 1984). The authors considered that such aid did not meet the official goals of development policy, namely, the relief of poverty and progress towards self-reliance; it did, however, serve to support the Netherlands fertiliser industry. Fertiliser aid was at best a stopgap: the use of fertiliser caused the spread of diseases in plants and animals, created dependence on Green Revolution technology, could cause pollution, and tended to widen the gap between rich and poor.

In 1986 the Forum for Research on Multinational Enterprises (SOMO) published a book on the international structure of the fertiliser industry and the role played by the Netherlands government (Heerings & Smit 1986). SOMO argued that government had an interest in maximising fertiliser production capacity and that aid-funded fertiliser shipments and reduced natural gas tariffs were means to that end. The main function of fertiliser aid was export support; it did little or nothing to strengthen the capacity of developing countries in the area of fertiliser production. In 1992 a further SOMO paper by Heerings stated that the Netherlands was increasingly leaving the fertiliser imports to market forces, providing NGOs with an opportunity to influence national fertiliser policies towards more environmentally friendly methods.

In his dissertation *Geven is Nemen* (Giving is Taking, 1988) Hoebink assesses Netherlands fertiliser aid to Sri Lanka and Tanzania between 1974 and 1985. The main reasons for the rapid growth in fertiliser aid after 1975, in his opinion, were increasing demand from developing countries, the problems facing the Netherlands fertiliser industry, and the speed with which such aid can be disbursed.

3.3 Netherlands fertiliser aid 1976–93

The following data were checked for each fertiliser delivery:
- DGIS transaction number;*
- destination;
- country of origin (based on certificate of origin);
- year of delivery;
- type of fertiliser;
- price and weight;
- price basis: cost insurance freight (cif), free on rail (for), free on board (fob), or free on truck (fot);
- loan or grant;
- financial or technical aid procedure;
- role of the Agriculture Ministry's Food Supplies Purchasing and Sales Section (VIB) at Hoensbroek.

The most important findings are summarised in nine tables (appendix 7):
- Net official development assistance and fertiliser aid, amounts and percentages (1975–93);
- Sources of Netherlands fertiliser aid: the Netherlands versus other Eligible Source Countries (1975–93);
- Fertiliser shipments not sourced in the Netherlands, by country of origin (1985–93);
- Fertiliser-aid shipments by type (N, P, K, NP, NPK, raw materials, trace elements) (1985–93);

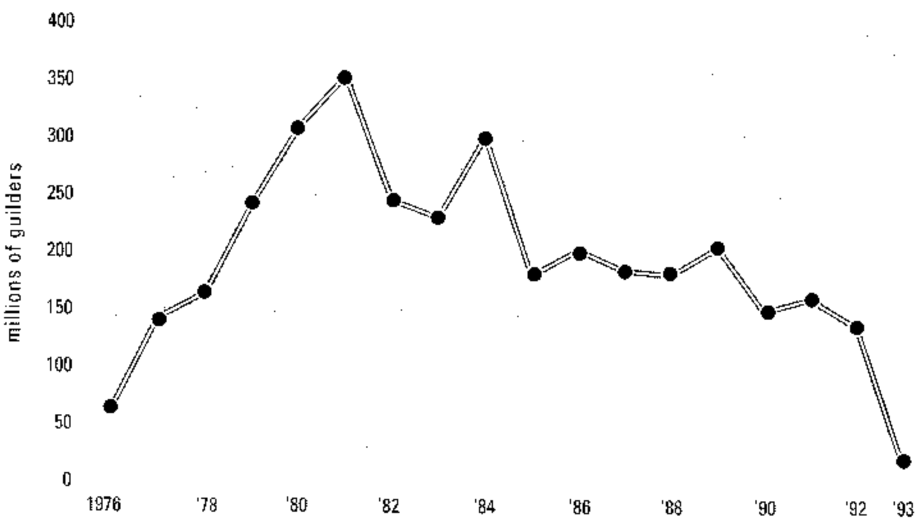
* These are the so-called 'FOS numbers' of DGIS' Financial Accounting System for Development Co-operation.

- Sources of fertiliser shipments, by fertiliser type (1985–93);
- Fertiliser shipments by recipient country and year (1975–93);
- Aid procedure: financial versus technical (1985–93);
- Funding: grant or loan (1985–93);
- Tendering procedure: through VIB or otherwise (1985–93).

The statistics for 1975–84 are based on the policy document *Fertiliser Aid* drawn up by DGIS in 1985; those for 1985–92 are based on information from the Netherlands Investment Bank for Developing Countries (NIO) and VIB. Since the material comes from two different sources, some tables cover the whole period 1975–93 while others only cover 1985–93.

3.3.1 *Volume and destination*

Over the period 1975–93 spending on fertiliser aid totalled Dfl 3,600 million; the annual total rose from Dfl 62 million in 1976 to a peak of Dfl 352 million in 1981. Thereafter it declined to some 200 million in 1985, at which level it remained stable through the second half of the 1980s. From 1990 to 1992 the annual levels were stable at a somewhat lower level of approx. Dfl 150 million before dropping significantly to just over 20 million in 1993 (figure 5). The proportion of the



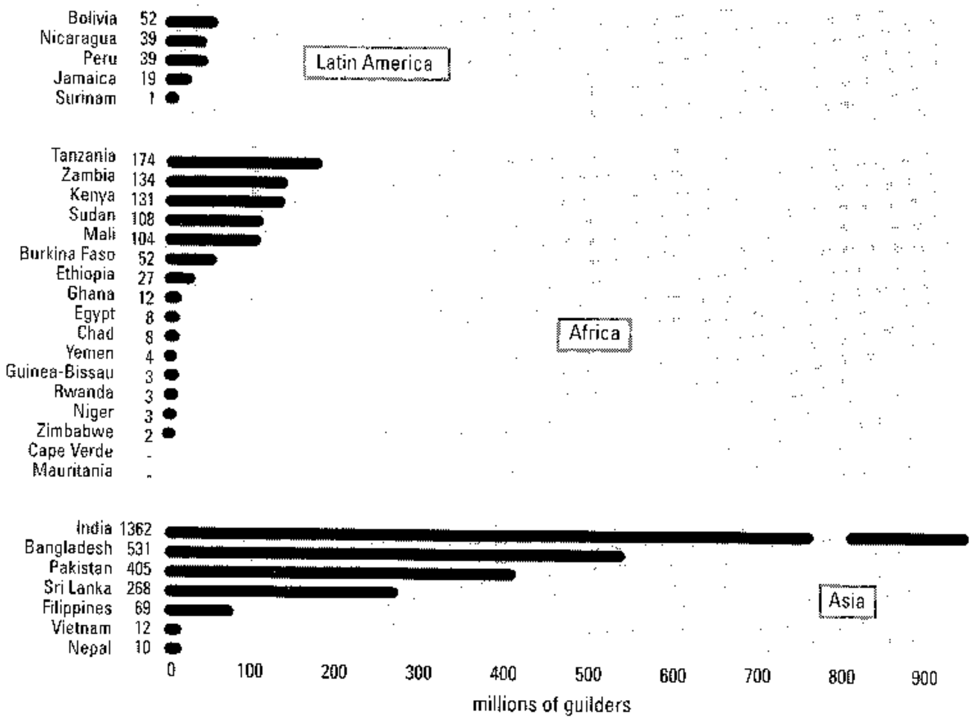
Sources: Food Supplies Purchasing and Sales Section (VIB), Ministry of Agriculture, Nature Management and Fisheries, Netherlands; Investment Bank for Developing Countries (NIO); *Sectoral Memorandum on Fertiliser*, 1985.

Figure 5 Spending on fertiliser aid, 1976–93 (millions of guilders)

development budget devoted to fertiliser aid rose steadily over the period 1975–81 from three to almost ten per cent of net ODA; thereafter the figure gradually fell back to between four and five per cent in the period 1985–90. In 1993 the share plummeted to below one per cent (see table 39, appendix 7).

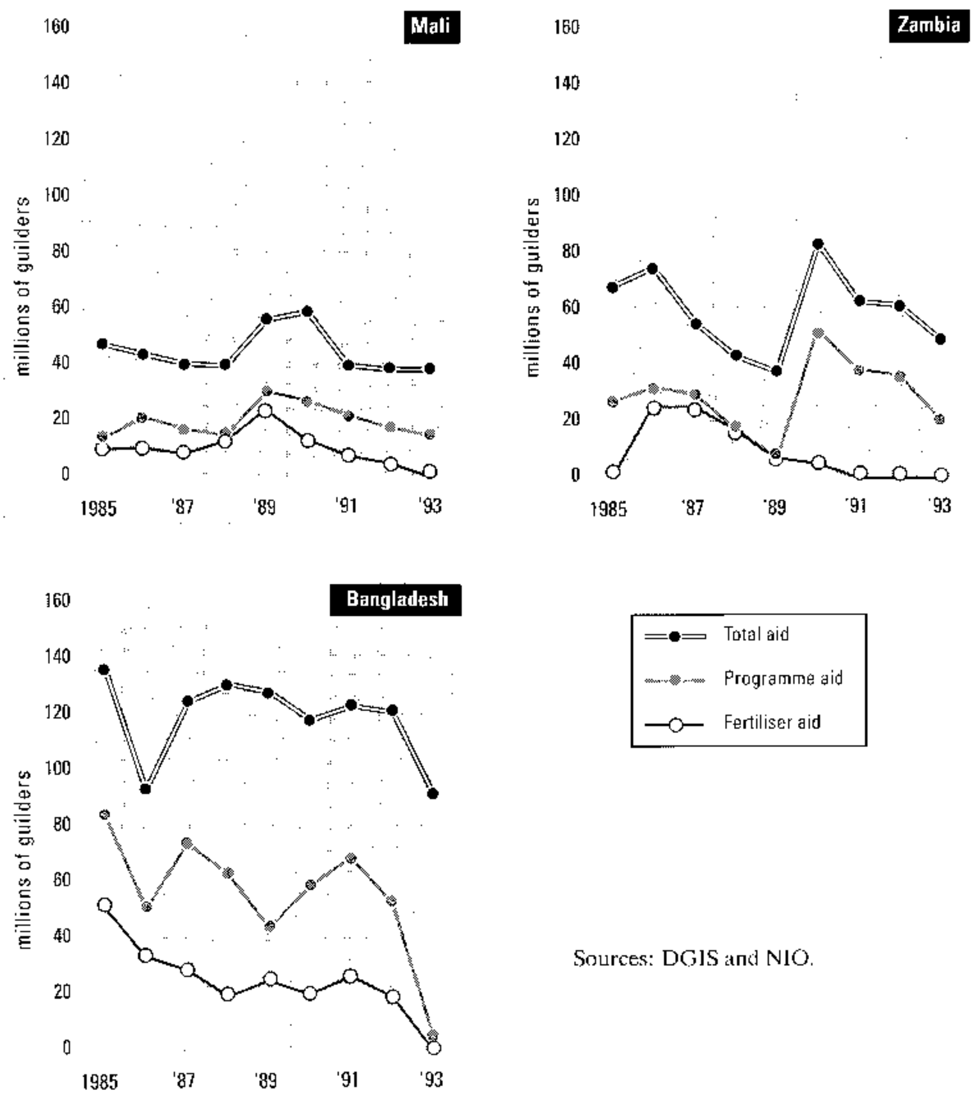
Of the fertiliser aid given between 1975 and 1993, 2,700 million guilders (74 per cent) went to Asian countries, 800 million (22 per cent) to African countries and only 100 million (four per cent) to Latin American countries. While there have been shifts in the pattern of allocation, aid to Asia has always been the largest component, fluctuating between 67 and 100 per cent in the period up to 1985, falling to 51–62 per cent between 1986 and 1989, to rise again in 1990–92 to 81 per cent. No fertiliser aid went to Asia in 1993.

The temporary fall in fertiliser aid to Asia was offset by an increase in that going to African countries, which received 35–43 per cent of the total over the same period. Recipients in Latin America together accounted for between zero and eight per cent of the total annual amount of fertiliser aid provided.



Sources: VIB and NIO.

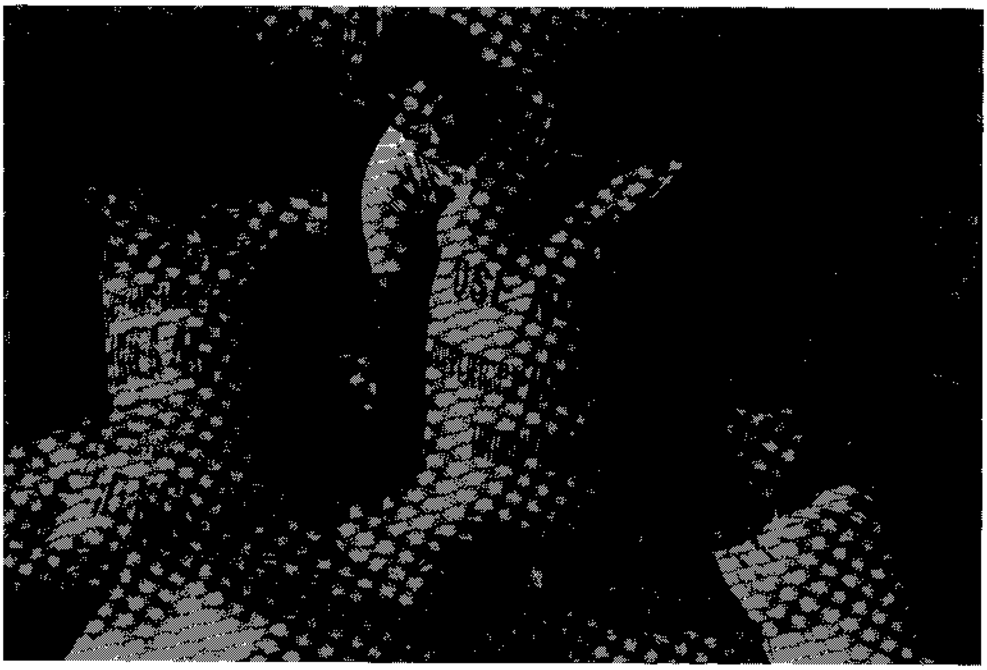
Figure 6 Fertiliser-aid shipments by country, 1975–93 (millions of guilders)



Sources: DGIS and NIO.

Figure 7 Fertiliser aid in relation to total and programme aid for Bangladesh, Mali and Zambia in the period 1985–93

The ten countries receiving most aid were, in order of the amounts received, India, Bangladesh, Pakistan, Sri Lanka, Tanzania, Zambia, Kenya, Sudan, Mali and the Philippines, accounting between them for 93 per cent of the total. Bangladesh, Mali and Zambia have been the subject of case studies within the cadre of this evaluation. Figure 7 shows the declining trend in programme aid for these countries, particularly after 1990, which explains the recent fall in fertiliser-aid levels. This is also known to be the case for several other main fertiliser-aid recipients.



The Philippines: An increasing amount of fertilisers, particularly urea, is produced in Eligible Source Countries. The urea depicted above was imported by the Philippines from Indonesia, where it was produced with technical assistance of Netherlands producers.

3.3.2 *Origin*

The source of aid-funded fertiliser supplies has always been a matter of concern and debate. In the case of tied aid only fertiliser produced in the Netherlands and carrying a certificate of origin could be supplied; in the case of partially untied aid the fertiliser could come from the Netherlands or other Eligible Source Countries.

Netherlands manufacturers produced 72 per cent of the fertiliser supplied as aid over the period 1975–93 (see table 40, appendix 7); the proportion from other ESCs rose steadily from only two per cent in 1975 to 40 per cent in the second half of the 1980s, peaking at just over 80 per cent at the start of the 1990s (in 1993 it fell back to 59 per cent).

Fertiliser was obtained from 27 ESCs (other than the Netherlands) between 1985 and 1993 (see table 41a, appendix 7), 87 per cent of it coming from Morocco, Indonesia, Tunisia, Jordan, Iraq, Turkey and Senegal. Morocco, Tunisia and Senegal supplied phosphate fertilisers, Indonesia and Iraq nitrogenous fertilisers, Turkey both phosphates and nitrogenous fertilisers, and Jordan muriate of potash (MOP, KCl). Fourteen per cent of ESC-sourced fertiliser was bought in the Gulf states, eight per cent coming from Iraq alone; overall, 59.5 per cent came from ESCs in the Middle East and North Africa, 18 per cent from Asia, 11 per cent from African countries, four per cent from Latin America and six per cent from Europe (Turkey) (grouping based on *Country Classification*, World Bank 1992).

Fertiliser to the value of Dfl 4.7 million (0.7 per cent) was obtained from non-ESCs such as Israel and the former Soviet Union; these shipments, which went to technical aid projects, represent a negligible proportion of the total.

3.3.3 *Composition*

The majority of deliveries (50–75 per cent) made between 1975 and 1986 comprised nitrogenous fertilisers (urea, ammonium sulphate, calcium ammonium nitrate, ammonium nitrate); after 1986 the proportion of N fertiliser fell rapidly to 13 per cent in 1993, mainly reflecting the growth in production capacity in developing countries and the increasing demand for compound products (see table 7). NPK deliveries increased sharply from an average of three per cent of the total in 1975–85 to 29 per cent in 1986–90; in 1992 the figure fell back to four per cent in favour of raw material deliveries, rising again to 11 per cent in 1993. See also table 42, appendix 7. The figures for 1975–84 are taken from *Fertiliser Aid* (1985). In tables 7 and 42, 12 per cent of the fertiliser is not defined and falls into the category 'miscellaneous'; the true figures for each fertiliser type may therefore be higher.

NPK fertilisers have been delivered in 24 formulations. As well as the usual 15-15-15 and 17-17-17, other formulations such as 14-23-12, 10-20-20 and 25-15-5 (sometimes with trace elements) have been supplied, mainly for use on export crops. In addition, liquid compounds have been supplied which are particularly suitable for use in advanced horticulture.

Raw materials for use in local fertiliser production were not supplied in significant quantities until 1991–92. In 1991 phosphoric acid worth Dfl 69 million sourced in Morocco was supplied to India. The following year, phosphoric acid, rock phosphate and muriate of potash worth Dfl 74 million was supplied, also to India. Small quantities of trace elements have occasionally been supplied.

While producers in the Netherlands supplied the bulk of nitrogenous fertilisers delivered, their share in the total fell sharply from 97 per cent (Dfl 117 million) in 1985 to just 50 per cent (Dfl 13 million) in 1992. Phosphate deliveries as well

Table 7 Types of fertiliser supplied (in percentages), 1975–93

Year	N	P	NP	NPK	Miscellaneous		
1975	56	6	5	–	33		
1976	43	–	52	–	5		
1977	73	4	–	1	22		
1978	70	3	14	3	1		
1979	51	9	10	1	27		
1980	54	12	9	1	24		
1981	74	10	–	7	8		
1982	20	40	20	6	14		
1983	49	23	6	9	13		
1984	69	10	8	5	8		
	N	P	NP	NPK	Raw materials	Trace elements	Unknown
1985	66	30	–	4	–	–	–
1986	50	16	1	24	5	1	3
1987	30	20	7	39	4	–	–
1988	45	13	21	21	–	–	–
1989	34	11	17	36	2	–	–
1990	17	19	27	28	9	–	–
1991	14	22	18	4	42	–	–
1992	19	17	7	4	53	–	–
1993	13	.	74	11	–	..	2

Fertiliser types:

N: Urea
Ammonium sulphate (AS)
Calcium ammonium nitrate (CAN)
Ammonium nitrate (AN)

P: Triple superphosphate (TSP)
Single superphosphate (SSP)
Double superphosphate (DSP)

NP : Diammonium phosphate (DAP)
Nitrate/phosphate (NP: 23-23, 30-30, 17-50)

NPK : Nitrogen, phosphorus, potassium
(NPK, 24 different formulations)

Raw materials : Rock phosphate,
phosphoric acid, potash

Trace elements: Boron (B), Zinc (Zn)

as all raw materials and trace elements mostly came from ESCs other than the Netherlands.

3.4 Fertiliser-aid efficiency

Fertiliser-aid policy is implemented in accordance with normal DGIS procedures which are geared to the project cycle. Important points in that cycle include the appraisal of aid proposals (culminating in an appraisal memorandum), the purchasing and payment of fertilisers, and the *ex-post* evaluation of aid activities (culminating in an evaluation report). To complete the review of fertiliser-aid efficiency, two important issues have been evaluated in some detail: disbursement pressure and the price level of Netherlands-financed fertiliser aid vis-à-vis prevailing price levels on the world market.

Fertiliser aid is considered below as balance-of-payments or import support although this aid form has been funded from various budgets. Before 1985, fertiliser aid was generally financed from the appropriate budget categories for balance-of-payments support: Id and Ie. Since then, funding has shifted toward country and regional budgets (Cat. II) and rural development (Ia) and programme support (If), each of which had its own conditionalities (DGIS Guidelines for Programme Aid, 1994). This shift may well have resulted from the decision taken in 1985 that unspent funds could no longer be transferred from one budget year to the next, making it necessary to exhaust budgets at the end of the financial year. Many such funds have probably been converted into fertiliser aid lest they be lost to the recipient country. This may explain the peak in fertiliser-aid disbursements in 1984 (figure 5). Fertiliser aid was a convenient and flexible way by which to relieve budget pressure, whereby the conditionalities of the various budgets played a lesser role. Whether or not the aid was provided under the technical or financial aid procedure became more important. In 1991 it was decided that all fertiliser aid should be brought under the country and regional budgets and that balance-of-payments support be restricted to debt relief in order to improve transparency.

3.4.1 *Appraisal of proposals for fertiliser aid*

Sixty-three appraisal memoranda relating to 18 recipient countries have been reviewed for the period 1985–91. All were favourable, with funds being committed. The same analytical approach was applied throughout, whereby more recent policy themes were also examined, such as environmental effects and women in development.

3.4.1.1 *Structure and procedure*

Appraisal memoranda have altered markedly over the years. Before 1986–87 fertiliser deliveries were approved on the basis of a short memorandum or an abbreviated version thereof (the first page) with very little by way of information or explanation. A marked change occurred after establishment of the Projects

Committee in 1987, since when requirements have been tightened and memoranda have become more standardised. In May 1989 a checklist was introduced for the appraisal of programme aid, since the structure of Guidelines Set 3 ('Appraisal') was not satisfactory for this purpose. Even so, programme aid is not yet appraised in a uniform fashion; both the checklist and Guidelines 3 are applied when memoranda are compiled. In 1994, when fertiliser aid had been virtually phased-out, DGIS issued guidelines on programme aid which were based on existing practices as these had evolved over previous years. The merit of that document is the description of the various macro-oriented instruments for programme aid and their appraisal framework.

Memoranda have to be approved by several DGIS sections and initialled to indicate consent to the financial activity concerned. This is standard procedure and is followed with reasonable precision. Before the advent of the Projects Committee, approval was required of the department head together with the officer responsible, and the Development Cooperation Budget Inspectorate of the Financial Affairs Department (FEZ/IR); thereafter, proposals had to be approved by the Projects Committee, chaired by the Deputy Director-General. Since 1986, approval has also been required of the Technical Advice Section of the Sector Policy, Spearhead Programmes and Technical Advice Department (DST/TA). Where fertiliser supplies are funded under balance-of-payments support, further approval is required of the Macro-Economic Emergency Section of the Multilateral Development Cooperation and Special Programmes Department (DMP/Cda).

About half of all appraisal memoranda refer to external advice, the main sources being the Netherlands Institute of Economics (NEI) and the Agriculture Ministry's Food Supplies Purchasing and Sales Section (VIB). Regular reference is also made to the conclusions and recommendations of evaluation missions. Many memoranda discuss evaluation findings at length, albeit the material is sometimes used selectively and not always accurately. The fact that evaluation material is often used as legitimation in appraising an activity was noted in the report *Evaluation and Monitoring* (IOV 1993).

A fertiliser supervisory group of ten experts on various aspects of fertiliser use in developing countries, was set up early in the 1980s on the initiative of the Agriculture Ministry, but has never played a role of any significance. A coordinated exchange of knowledge and experience among the various DGIS sections involved in fertiliser aid was also lacking. Frequent staff transfers have prevented the development of an institutional memory in this field.

Internal advice and comments are supplied by DST/TA, (former) DMP/Cda and the Projects Committee. DST/TA sometimes advises on the type of fertiliser to be supplied; in a few cases substantive appraisal has been impossible because it was not known how much or which type was to be supplied. The Projects Committee's comments are chiefly procedural. If funds earmarked for balance-of-payments support are used to finance fertiliser aid, implementation has often already begun, the aid having been committed in the course of policy consultations. The Committee then refrains from substantive comment as being redundant (e.g. in 1988–89 in relation to Mali, Sri Lanka and India).

3.4.1.2 *Content*

Appraisal memoranda vary widely in content, and over time have become longer and more informative. The macro-economic policies and situation of recipient countries are given considerable attention, judging by the number of memoranda dealing with the topic and ranging from one paragraph to nine pages. Use is generally made of judgements reached by IMF and the World Bank regarding the extent to which structural adjustment programmes have been accepted and implemented. All IMF/World Bank judgements are favourable and without reservations; judgements by Netherlands experts, when available, tend to be more critical.

Fertiliser aid has occasionally been given even without endorsement of the recipient country's economic and social policies. Fertiliser aid was committed to Yemen and Sudan even though their macro-economic policies were deemed unsatisfactory (1991). Yemeni economic policy did not qualify for programme aid but an exception was made for the Emergency Recovery Programme. Aid to Sudan was being wound down, but fertiliser aid was deemed to have a structural role in support of small-scale agriculture and was for the moment to continue; two years later it was again committed even though 'the political situation is tense and may have major consequences for economic and social policy, dooming all development efforts to failure.' Dissatisfaction at the Zambian government's determination to retain subsidies eventually led to the phasing-out of direct fertiliser funding by the Netherlands.

The macro-economic policies of recipient countries are sometimes not considered in appraisal memoranda even though they might have invited criticism. Several memoranda relating to Sri Lanka, for example, failed to mention that country's unsatisfactory economic policies prior to 1990; attention was only devoted to this topic following the introduction of the checklist in 1990, by which time Sri Lankan policies had met with IMF and World Bank approval.

Less attention is devoted to agricultural policy than to macro-economic policy in the appraisal of fertiliser deliveries. Memoranda make little if any reference to recipient government policies on agricultural credit, information, training and research services. Some memoranda cite policies geared to increasing food production, but fail to mention cash crops policy, even where the fertiliser is directly intended for use on such crops. Policy on farm prices and subsidies is given a fairly large measure of attention. Liberalisation of the fertiliser market and privatisation of state-run undertakings generally represent elements in the economic restructuring process. These adjustment programmes, supported by the Netherlands, play an important part in the appraisal of fertiliser-aid applications, which tends to focus on the abolition of subsidies.

Socio-economic factors (such as the position of small farmers and of women, and patterns of rural land ownership and control) are mentioned in only 13 per cent of appraisal memoranda; where these points are considered, the judgements reached are predominantly negative, even though all the examined memoranda led to the commitment of funds.

Few policy conditions are set: in only five countries were conditions attached to fertiliser aid, even though there were others (e.g. Sri Lanka) where the political or economic situation was comparable. In four cases those conditions related to the recipient government's economic policy (reduction of subsidies, liberalisation of the fertiliser market, etc.). In Sudan the political situation prompted a decision to phase-out the aid entirely.

The checklist for programme aid appraisal uses the recipient country's macro-economic policies as the basis on which to decide the level of intervention: the more favourable the assessment of those policies, the less reason to influence what happens to the aid at a lower level. This is why the micro-level and expected micro-level effects are accorded a relatively minor role in such appraisal.

Appraisal memoranda either fail to define target groups or do so in vague and general terms, with an attempt to estimate the number of small farmers who will use the fertiliser. Memoranda relating to Bangladesh for many years justified the assertion that most fertiliser users were small farmers by referring to International Fertiliser Development Centre figures showing that 62 per cent of users were small farmers, 22 per cent intermediate and 16 per cent were large farmers. DST/TA pointed out that as small farmers formed the great majority, it was hardly surprising that user numbers in this category were large. In Pakistan small farmers were estimated to account for 60 per cent of fertiliser use, in India 57 per cent, and in Kenya

50 per cent. The figures are rarely supported in any way, and are even repeated year after year. According to the relevant memoranda, small farmers in Zambia account for two-thirds of fertiliser use, although a 1987 evaluation concluded that 90 per cent of Netherlands-supplied fertiliser went to large commercial farmers. In Egypt, the fertiliser does not go to small farmers (less than two *feddan*) but to those with more than ten *feddan* (i.e. 4.2 hectares) and between four and 320 glasshouses. It is sometimes suggested that the fertiliser will indirectly benefit smallholders, or that there is no evidence that small farmers cannot afford to buy fertiliser at normal prices.

Some memoranda deal with the likely impact on target groups but the formulation is very general (raising rural incomes, improving employment) and arguments or evidence is not given. There is no discussion of the place of women in agriculture or of the effects of fertiliser use and agricultural modernisation on their social and economic position.

In the past environmental considerations have not played any significant part in the appraisal of fertiliser aid. Little consideration has been given to benefits in terms of soil improvement or to potential damage.

The commitment to provide fertiliser aid has generally been given without consideration of the arguments for, and implications of, using particular types of fertiliser; arguments where cited range from price through demand on the part of governments and farmers to competitiveness of the Netherlands industry's products (Pakistan). Some memoranda evince lack of familiarity with fertiliser types and uses (in several cases the types are said to increase food production when they are more likely to be applied to export crops).

The effectiveness of fertiliser aid depends on its impact on farm output and rural incomes. A few memoranda refer to likely effects – higher food production, progress towards self-sufficiency, improvements in rural incomes – but again there is little detailed argument. Only occasionally are costs and benefits for the individual farmer analysed or value/cost ratios given.

Bottlenecks in logistics and distribution which adversely affect the efficiency of fertiliser aid are mentioned in one-fifth of the memoranda, with problems noted in transport, storage, customs clearance and smuggling. Lack of research and deficiencies in the transfer of knowledge are sometimes cited as limiting factors. Memoranda generally mention the organisations in developing countries responsible for purchasing and/or distribution, but do not assess their operation.

One-fifth of appraisal memoranda attach conditions to the use of counterpart funds generated by the sale of fertiliser. In Asia (with the exception of the Philippines) no such conditions are attached: counterpart funds generally go to the Finance Ministry and are treated as normal government revenue. In the Philippines they are paid to the Agriculture Ministry for use in agricultural development projects and agrarian reform support services.

Conditions requiring the use of counterpart funds for particular development-related purposes are more commonly imposed in of African countries. In Tanzania until 1985 they were destined for use in the second phase of a project involving the construction of fertiliser storage facilities, but due to serious financial problems the Tanzania Fertiliser Company was able to hand over little of the cash. In Sudan counterpart funds were paid into a special account of the Agricultural Bank of Sudan and used for the construction of agricultural services units in selected areas where small-scale horticulture is practised; 45 such units were built using funds generated by fertiliser deliveries in 1986–90. In 1987 it was agreed with Zambia that 15 per cent of counterpart funds would be used to meet the local costs of projects in Western Province, but little came of this due to Zambia's huge financial problems. The situation in Mali was unusual in that the management of counterpart funds was largely in the hands of regional development organisations. In Bolivia, finally, counterpart funds were used to meet the local costs of the FAO project.

3.4.2 *Purchasing and payment procedures*

3.4.2.1 *Guidelines for the procurement of goods and services*

Guidelines and responsibilities in this area are laid down in the DGIS procedural manual. Goods supplied under financial aid procedures are governed by these guidelines under partially untied loans and grants by the Netherlands; these were agreed in 1975 in the framework of DAC.

1985 Guidelines

Most fertiliser aid has been supplied on a partially untied basis under the financial aid procedure. Open international tendering is required subject to the following rules:*

* Guidelines were also issued in 1985 for methods of procurement other than open international bidding, such as small procurement, standardisation, limited number of qualified suppliers, informal competitive procurement and single supplier. In 1992 a distinction was made between international competitive bidding (all amounts over one million guilders) and the other types: limited international bidding, international shopping and direct contracting.

- only ESC suppliers (and the Netherlands) may bid for contracts;
- responses to the invitation to tender must be received within six weeks;
- commercial factors other than price may be taken into account in deciding which tender is to be accepted.

The Netherlands' role in the procurement of goods is limited to monitoring the operation of the procedure. DGIS is entitled to make comments or recommendations at all stages; it may also entrust the task of monitoring to an advisor or observer.

Under the financial aid procedure the recipient country may authorise the Food Supplies Purchasing and Sales Section (VIB) of the Ministry of Agriculture to undertake purchasing. VIB follows the guidelines and its recommendation on the awarding of a contract is submitted, via DGIS and the Netherlands Embassy, to the recipient government. Checks on quantity and quality are made by an organisation with international recognition in this area, such as e.g. SGS.

In 1992 the procedures and Guidelines were brought into line with those of the World Bank. The new rules and guidelines differ from the earlier version in that they include binding rules. Tied aid is no longer included, pre-shipment inspection is mandatory for all deliveries, and a 'clean report of findings' is a precondition for payment; they also specify the responsibilities of DGIS and embassy staff more clearly.* An additional rule is that, before a contract is signed, it must be approved by DGIS which reserves the right to withhold funding if the contract does not meet the guidelines or if it finds the conditions unsatisfactory. Finally, the new Guidelines no longer deal specifically with the role of VIB.

The DGIS section responsible for purchasing (CTR/GD) recently embarked on a policy of decentralisation and professionalisation. A staff unit has the job of supervising and monitoring purchases; it also monitors the work of the purchasing organisation (e.g. VIB) to which procurement is contracted out. Implementation is being decentralised to the embassies, which may appoint a procurement adviser for this purpose.

* The new guidelines for the procurement of goods, works and services (June 1992) set out the respective responsibilities of the DGIS country sections and of Netherlands embassies in developing countries. The embassies have the job of checking that the procurement procedure complies with the Guidelines, while the DGIS must ensure that the tender documents meet with project requirements and check that the bid offering the best value for money has been accepted.

Examination of documents

Relevant official documents were examined to check that fertiliser deliveries complied with the 1985 Guidelines. Almost all deliveries are funded under the financial aid procedure (see also appendix 7, table 45), whereby responsibility for disbursement rests with the recipient and financial transactions are conducted through the Netherlands Investment Bank for Developing Countries (NIO). Some countries themselves take on responsibility for operating the tendering procedure while others delegate it to VIB.

In a few cases, representing a few per cent of the total budget for fertiliser aid, funding was provided under the technical aid procedure, whereby contracts are concluded and payment is ordered by DGIS; procurement is entrusted to VIB. Countries that have received fertiliser aid funded in this way are Burkina Faso, Ethiopia, Ghana, Sudan, Chad, Yemen, Nicaragua and Mauritania. Reasons for using this procedure may be that small quantities are needed for technical aid projects or that it can be completed more rapidly. In view of the small amounts involved no further consideration is given to these recipient countries.

3.4.2.2 *Purchasing procedures*

Fertiliser procurement is organised differently in the 10 main recipient countries (see figure 8 and appendix 8).

Tying of supplies

Five of the 10 main recipients were classed in 1991 as least developed countries (LDCs): Bangladesh, Mali, Sudan, Zambia and Tanzania. India was on the list until 1985 and Zambia joined it in 1991. In the case of the three non-LDC recipients in Asia (India, Pakistan and Sri Lanka) fertiliser deliveries have been funded variously with loans and grants; the aid was used to purchase fertiliser in the Netherlands in a number of years in the period 1975–91. India early expressed a preference for tying its imports to Netherlands suppliers, citing the time lost and extra costs incurred in making international price comparisons. Thanks partly to hard bargaining by the Minerals and Metals Trading Corporation of India (MMTC) India was always able to obtain Netherlands fertiliser at favourable prices. (One reason for higher prices under open international tendering is that suppliers cover themselves against exchange-rate risks.) The Netherlands insisted that aid-funded goods be procured

Figure 8 Fertiliser shipments: payment, tying, purchasing, evaluation of tenders, awarding of contracts, 1985–92

	India	Pakistan	Sri Lanka	Bangladesh	Philippines	Kenya	Sudan	Mali	Tanzania	Zambia
Tying: tied or partially tied	Partially untied	Partially untied	Until 1989 de facto tied,[1] then partially untied[2]	Partially untied	1987 and 1989, partially untied[3]	Partially untied	Partially untied	Partially untied	Partially untied	Partially untied
Purchasing organisation	MMTC and in 1989, VIB	FDFI	VIB and CFC	1985–91 BADC; 1992, VIB	VIB and NAFC	VIB	VIB	VIB	1985 and 1987 TFC; other years VIB	1986 NAM-BOARD; other years VIB
Awarding of contracts	1985–88, shortlist of Netherlands producers; 1989–91, ICB	ICB and negotiation with Netherlands producers	1985–88, shortlist of Netherlands producers; 1989–91, ICB	1985–91, ICB	1987 and 1989, ICB, 1988, LIB	1985–90, ICB	1985–91, ICB[4]	1985–91, ICB	1985–89, ICB	1986–90, ICB
Evaluation of tenders	Tender committee; regular advice from VIB and price check on reimbursement	Tender committee; price check by VIB only in 1987	1986–88, price check by VIB; 1989–90, evaluation by VIB	Tender committee; involvement of Netherlands expert in 1987	1987, NAFC; 1988, price check by VIB; 1989 advice from VIB on evaluation	VIB	VIB	VIB together with recipient organisations	1985, DGIS officers; 1986–89, VIB	1986, NAM-BOARD, 1987–90, VIB
Payment: reimbursement or direct payment	Reimbursement and direct payment	Direct payment	Reimbursement and direct payment	Direct payment	Reimbursement and direct payment	Direct payment	Direct payment	Direct payment	Direct payment	Direct payment

ICB: international competitive bidding.
LIB: limited international bidding.

[1] Procured in the Netherlands.
[2] With the exception of a reimbursement claim in 1986 for fertiliser from Eligible Source Countries.
[3] In 1987 the Minister for Development Cooperation gave preference to suppliers from the region. In 1988 tenders were sought from a shortlist of ASEAN countries.
[4] Recipient organisations often request small quantities of specific fertilisers. The result may be that only one tender is received.

through open international tendering and in 1989 MMTC's tendering documents were amended, particularly regarding the tying of supplies, with the help of technical advice from VIB. Even so, India continued to source fertiliser mainly in the Netherlands.

Until 1989 fertiliser aid for Sri Lanka was partially tied to procurement from Netherlands suppliers; Sri Lanka obtained all its supplies from the Netherlands, with the exception of one reimbursement claim for fertiliser bought from other Eligible Source Countries in 1986. For a number of years a rule was applied whereby the price disadvantage incurred by Sri Lanka as a result of procurement in the Netherlands rather than other ESCs was kept below 15 per cent.

In 1987 a trading company criticised DGIS's policy on the tying of aid and sought information on rules governing fertiliser aid to Sri Lanka. The DGIS response was that rules could vary from one department and section to another, since application of the Guidelines and VIB involvement depended on the outcome of negotiations with the recipient country. A year later the preferential margin of 15 per cent of fob price for Netherlands producers, and the failure to seek international tenders, were also criticised by DGIS's own Technical Advice Section (DST/TA). In 1989 policy inconsistency on the tying of aid (grants to non-LDCs could be provided as tied aid under the country programme and as partially untied aid as balance-of-payments support) led to the decision that all aid be partially untied. This decision was also prompted by price checks by VIB, which showed that prices paid were well above world-market levels (see also 3.4.5 and appendix 10).

Fertiliser supplied to Pakistan has been funded both from grants and from loans. Formally, the aid was partially untied and international tendering took place; informally, a preferential margin of 15 per cent was applied in favour of Netherlands producers. The minutes of the progress review meeting (late 1987) on bilateral cooperation with Pakistan include the following note on procurement: 'In practice only Netherlands producers – specifically DSM Chemicals – have been asked to tender, to the exclusion even of Netherlands firms able to supply fertiliser from other developing countries sometimes at much lower prices.' Pakistan opted for Netherlands suppliers on grounds of reliability, quality and prompt delivery (see also appendix 10).

In 1985 a Netherlands manufacturer sought approval for a system of bilateral negotiation, without tendering, for the supply of urea to Bangladesh. This did not go ahead as the Ministry of Agriculture announced that the supply of urea was to cease in view of sufficient local production capacity. The Bangladesh Agricultural

Development Corporation had been contracted to buy only triple superphosphate (TSP) or raw materials for its manufacture. All aid supplied in the period under consideration was on partially untied terms.

Debates on the tying of aid have played a lesser role in relation to the Philippines and recipient countries in Africa. The aid was at all times partially untied. Even in the case of Kenya and Zambia, non-LDCs and therefore among the 'richer' developing countries, all financial aid grants were provided on untied terms.

Purchasing organisations

The tendering procedure may be operated by the recipient country itself or delegated to VIB. In practice DGIS country sections determine whether VIB is to be involved and inform the recipient country accordingly. Between 1985 and 1991 deliveries for which VIB organised international tendering accounted for one-third of all spending on fertiliser aid. VIB was particularly active from 1987 to 1989: in 1987 42 per cent of fertiliser supplied was obtained under contracts awarded by VIB, in 1988 51 per cent and in 1989 60 per cent. In other years the majority of tenders were organised by the recipient countries.

A predominantly favourable view is taken of the part played by VIB. Bidders know that the delay between tenders being received and contracts awarded is brief and they run few risks in the area of market fluctuations. VIB generally manages to elicit keenly-priced tenders from numerous suppliers and will act as broker only under strict payment guarantees; suppliers therefore do not need to cover themselves against late payment. In Mali the regional development organisation CMDT would like to obtain its commercial supplies through VIB but has been unable to provide the necessary payment guarantees. There has been criticism from Tanzania, which had problems with the supply of fertiliser bags (they were of poor quality and follow-up deliveries were late); moreover, VIB's attempts to find a solution were said to have 'caused only harm and confusion'. In Bangladesh problems arose in 1982 when BADC was bypassed for the first time: a series of mishaps in procedures and delivery meant that VIB involvement did not produce the expected efficiency gains.

The countries making their own purchasing arrangements were mainly Asian: India (MMTC), Pakistan (Fertiliser Imports Department FID), Sri Lanka (Ceylon Fertiliser Company CFC) and Bangladesh (Bangladesh Agricultural Development Corporation BADC), until 1991. The Philippines bought through both VIB and the National Agricultural and Fishery Council (NAFC). VIB played a greater role in relation to African countries, organising all tendering activities between 1985 and 1991 in the case of Kenya, Mali and Sudan. In Zambia the procedure was operated by Namboard, but the problems encountered led to the task being subsequently undertaken by VIB. The Tanzanian Fertiliser Company itself submitted tenders in 1985 and 1987.

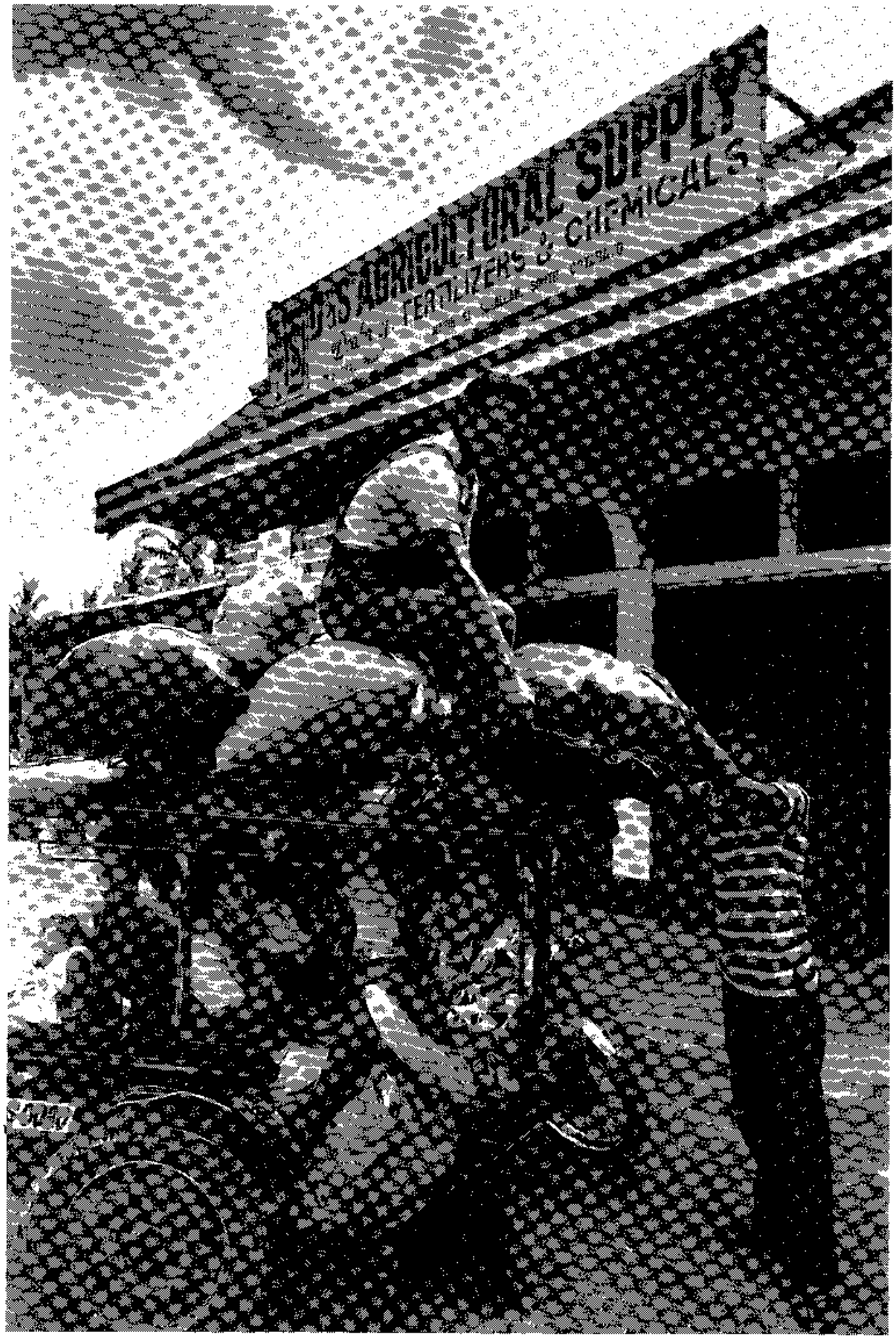
Letting contracts

Suppliers may be chosen in various ways. Competitive tendering is one possibility, with or without restrictions on categories of applicant; a shortlist may be drawn up in advance. Tenders may be sought internationally or, in the case of tied aid, in the Netherlands only. Direct negotiation is also possible, with no tendering procedure.

In the case of India, Pakistan and Sri Lanka suppliers have been chosen in various ways. India and Pakistan had clear procurement policies favouring Netherlands producers. Direct negotiation with Netherlands producers was sometimes used (Pakistan, FID), while in India the MMTC invited tenders from shortlisted Netherlands producers. In 1988 the Indian requirement that bidders must be producer/suppliers was attacked by fertiliser dealers; DGIS's response, given in the same year, was that tendering procedures were determined in consultation with the developing country concerned and that differences could therefore arise in the rules governing publication of invitations to tender, for example.

In the case of Sri Lanka three procurement modes have been used, depending on the method of payment and the degree of tying of aid: international tendering, tendering from a shortlist, and direct negotiation. In 1987 the only tender received came from DSM Chemicals, at prices which VIB found to be far above world-market levels. DGIS asked that further tenders be sought, but in view of the procedures involved Sri Lanka preferred to re-negotiate with DSM.

In 1988 the Philippines restricted potential tenderers to producers covered by the ASEAN Marketing Agreement. To prevent upward pressure on prices, VIB recommended that in future tenders be invited from ESC and Netherlands suppliers without restriction. This was done in 1989, enabling a strong negotiating position to be established vis-à-vis the ASEAN countries. In the case of African recipient countries and Bangladesh, all procurement over the period 1985–91 involved international tendering, with ESC and Netherlands suppliers able to submit tenders.



The Philippines: Fertiliser retail outlet in Mindanao.

Evaluation of tenders

Where VIB undertakes purchasing it evaluates the tenders received, advises on which should be accepted, and submits its report to the recipient government for approval. In such cases it is normally the only agency undertaking technical appraisal of tenders, to determine which offers the best value for money. Price is not the only factor taken into account:

- Mali (1985) and Zambia (1986) are examples of countries which preferred the certainty of a producer/supplier to the potential uncertainty of a dealer, who might enter into contracts without having the necessary commitments from producers.
- India contracted with Netherlands producers to supply fertiliser at prices higher than those obtaining in the Gulf states because the authorities preferred to spread urea purchases to avoid becoming excessively tied to one or a few producers.
- The quality of the product may also be a factor. The Kenyan Grain Growers' Cooperative Union telexed a request for calcium ammonium nitrate (CAN) of Netherlands origin rather than a cheaper Turkish alternative: 'Offer us Netherlands material, our farmers are used to your Netherlands material, the offer to be given to DSM Utrecht.'
- Finally, DGIS procedures themselves may stand in the way of lower prices. In 1991 the BADC in Bangladesh asked that new tenders be invited as the world market price of TSP had fallen well below that sought in the lowest tender. DGIS's legal section concluded that this would be contrary to regulations and VIB saw no reason not to award the contract to the lowest tender.

Countries that operate their own tendering procedures generally have committees to assess tenders. Formally, no further negotiation is allowed once a tender has been accepted, but while post-tender negotiations (PTN) are not accepted by the Netherlands, they are normal practice in India, Pakistan and Bangladesh. It may therefore be that some further price bargaining takes place after tenders have been accepted.

VIB advice is sometimes sought on the awarding of contracts, especially in countries which have received tied aid and where the preferential margin of 15 per cent was applicable. In the case of Sri Lanka, VIB concluded that while prices were above world-market levels, they were within the 15 per cent limit. (As appendix 10 shows, this was true only of the commoner fertiliser types; others, such as ammonium sulphate and triple superphosphate, were dearer by more than 15 per cent.)

Payment

Payment may take place in one of two ways: direct payment, whereby the instruction to pay the supplier directly is given to the Netherlands Investment Bank for Developing Countries (NIO) immediately after shipment has taken place, and reimbursement, whereby the recipient country pays the supplier and reclaims the cost from NIO.

Reimbursement has been the more common procedure in Asian countries: India, Sri Lanka and the Philippines have all used it. In India only in 1986 and 1990 was the supplier paid directly. In 1989 and 1990 the Philippines used the procedure to fund deliveries of fertiliser under the Marketing Agreement between the government and suppliers in the ASEAN region. Sri Lanka has used both methods, apparently on an ad hoc basis.

Under the reimbursement procedure claims are submitted with relevant documentation to DGIS, whose role is limited to having them checked by NIO before payment is made. In practice, its role is greater than this: in the case of India, for example, the Netherlands monitored tendering and the conclusion of contracts even under the reimbursement procedure. In this situation reimbursement differs little from direct payment, except that the cost is initially borne by the recipient government.

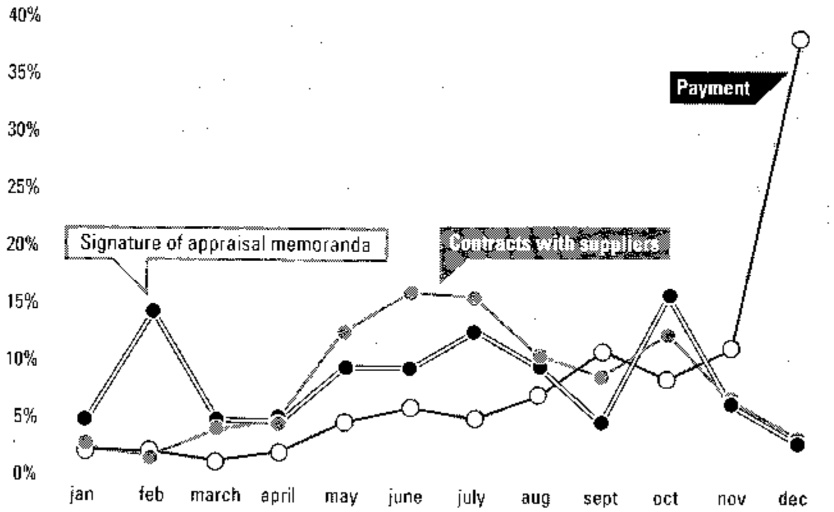
Once reimbursement has taken place, DGIS checks that the prices paid were reasonable, with the aid of price checks by VIB. VIB has played an active role under this heading, notably in relation to the Philippines: in 1988 it concluded that Indonesian and Malaysian prices were acceptable, with only the Middle East a potential source of cheaper supplies at cif prices, while in 1989 it found that the cost of urea purchases had been reimbursed at realistic prices.

VIB has not been involved in all reimbursement claims from India and Sri Lanka. In 1986 it issued formal comments on the price agreed between NSM Fertilisers and MMTC in India, and in 1989 it looked at prices charged by DSM/Windmill for NPK fertilisers, finding them to be above world-market levels (DSM's NP prices were in line with world levels). MMTC rejected these criticisms: it had made its own price comparisons with the help of information from Sulfex, an organisation which tracks international fertiliser prices and contracts. In 1986 VIB reported favourably on prices paid under the reimbursement procedure by Sri Lanka, with the exception of a urea shipment from Indonesia.

3.4.3 *Disbursement pressure*

Policy documents regularly refer to the speed with which fertiliser aid can be disbursed, and it is seen an ideal way of mopping up any remaining aid funds before the end of the fiscal year (which in the Netherlands corresponds to the calendar year). All fertiliser-aid deliveries made in 1985–91 under the financial aid procedure have been examined to determine whether the course of events was affected by pressure to complete budget disbursement before year's end. The analysis (see figure 9 and appendix 9) focused on:

- dates of signature of appraisal memoranda;
- dates of contracts with suppliers;
- payment dates (direct payment or reimbursement).



Sources: NIO, Fertecon, DGIS.

Figure 9 Dates of signature of appraisal memoranda, of contracts with suppliers and of payment, 1985–91

The following points should be borne in mind:

- 106 transactions took place over the period 1985–91 but only 63 appraisal memoranda were available for examination, mainly because full memoranda were not required in respect of fertiliser aid until 1988; that position changed with the establishment of the Projects Committee and the amendment of Guidelines Set 3 (Appraisal). The trend shown in the figure is representative of the period 1988–91, and there is no reason to suppose matters to have been radically otherwise in earlier years.

- Fertiliser expenditure under the financial aid procedure between 1985 and 1991 amounted to Dfl 1,505,848,454; expenditure in respect of which appraisal memoranda were retrieved amounted to Dfl 879,920,067, 58.4 per cent of the total.

A relatively large proportion (38 per cent) of payments are made in the month of December (72 per cent direct payment, 28 per cent reimbursement claims); the value of December payments is also quite large, at 31.7 per cent of the annual total. It was established that 14 per cent of appraisal memoranda signed in the last three months of the year resulted in payments being made in the same year, indicating some disbursement pressure. The sum involved is Dfl 127,367,291, just over 14 per cent of the total value of transactions for which appraisal memoranda are available; deducting reimbursement claims leaves Dfl 54,357,745, 6.9 per cent of the total.

The proportion of the budget affected by disbursement pressure is thus fairly small, around 14 per cent; the expenditure concerned represents about one-third of payments made in December. For the rest the December peak is inherent in the annual project cycle: this comprises identification, appraisal, the obtaining of tenders, the awarding of contracts, in some cases the production of the fertiliser to be supplied, and payment, with the latter taking place wherever possible in the same year as the rest of the cycle.

Disbursement pressure on transactions seems to have had little adverse effect; relatively high prices were paid only in the case of Sri Lanka, but these were due to aid being tied rather than to disbursement pressure (see appendix 10). The three country case studies made it clear that delivery dates were convenient as regards respective crop calendars.

While transactions resulting directly from disbursement pressure are relatively few, they represent a heavy workload at the year's end for VIB, NIO and the staff concerned within DGIS. The most rapid procedures may then be chosen: the reimbursement method was selected in more than half of all cases of disbursement pressure. Actual examples are given below.

The 1985 delivery to Mali had to be completed and payment made by the end of December. The contract with the cheapest supplier (a dealer) was cancelled and a higher-priced tender (from a Netherlands producer) accepted because the former could not deliver before 15 January and payment could thus not take place until 1986. In December 1989 fertiliser was supplied to Mali despite a mission report noting that deliveries for *Office du Niger* farmers at that time made little sense when the material was not needed until mid-1990; however, the mission also noted that storage was not a problem.

In 1987 an additional mission was sent to Kenya, specifically to ensure that delivery would be completed by the end of December.

In 1985 pressure of time led a Netherlands producer to negotiate directly with Pakistani authorities in order to speed-up the tendering procedure. This had started late, causing DGIS repeatedly to press the Pakistani authorities to apply for payment from NIO before the end of the year and to suggest measures such as payment in advance (which did not occur). The 1990 Agreed Minutes note that Pakistan had not sought tenders for the supply of NP fertiliser worth five million guilders (provided as balance-of-payments support) to ensure that the funds were disbursed by the end of December 1990.

In November 1989 VIB was asked to obtain tenders for fertiliser aid to India: early delivery was required to ensure that earmarked funds were not left unspent at year's end.

There are also examples of disbursement pressure leading to the reimbursement of fertiliser costs rather than the issue of an invitation to tender. In 1988 reimbursement was used in the case of Kenya to ensure the timely expenditure of funds that could not be carried over to 1989.

In 1988 the Philippine government was initially to have funded fertiliser supplies in full, seeking reimbursement thereafter; pressure of time, however, led to part of the sum being paid directly to the producer.

3.4.4 *Past evaluations of fertiliser deliveries*

Between 1985 and 1991 22 evaluations were made of fertiliser aid (see bibliography). Evaluation missions visited 12 countries (Burkina Faso, Kenya, Mali, Sudan, Tanzania, Zambia, Bolivia, Bangladesh, India, the Philippines, Sri Lanka and Pakistan), and evaluations per country ranged from one to three. Between them these countries received 94 per cent of fertiliser aid provided over the period (see appendix 7, table 44b).

Evaluations of Netherlands-financed projects concerned with fertiliser policy, distribution and use in the period 1985–91 have also been closely scrutinised in the cadre of this study. In total 27 projects were listed world-wide, subdivided into:

FAO Fertiliser Programme (6), Logistics and Distribution (5), Policy Support (4), Fertiliser Industry (4) and Soil Research and Services (8). These projects are discussed at length in appendix 11.

In 1983 the Netherlands Court of Audit examined the efficiency, and consistency with declared policy, of fertiliser aid supplied to India. In 1994 it evaluated Programme aid, the results being sent to Parliament in December 1994. In the following the Court of Audit Report will first be discussed, after which the reports of evaluation missions will be examined.

3.4.4.1 *The Netherlands' Court of Audit Reports*

In 1983, following examination of the relevant documents, the Court of Audit found in 1983 that since the Netherlands had made no price comparisons, it was not known whether fertiliser had been obtained on the most advantageous terms from India's viewpoint, given that aid was partially tied. The Court further concluded (on the basis of the January 1981 report *Fertiliser Mission to India*) that the poorest groups had seen little benefit, even though conditions could have been set to ensure that the programme aid targeted the poorest states or special schemes for small farmers. Finally, the Court queried whether some part of the aid given to India should not be classed as support for the Netherlands fertiliser industry and thus be funded by the Ministry of Economic Affairs.

In his response the then Minister for Development Cooperation noted that fertiliser deliveries had always been a large element in programme aid, reflecting on the one hand India's great need for fertiliser for food production and, on the other, the Netherlands fertiliser industry's ability to supply on internationally competitive terms. The Minister stated that prices were in fact monitored and compared: movements in fertiliser prices on the world market were monitored by the Ministry of Agriculture and Fisheries, which made the data available to DGIS.

The Minister saw fertiliser aid as contributing towards self-reliance, one of the two aims of the twin-track aid policy, by increasing food production and strengthening India's balance of payments. The Netherlands fertiliser industry was able to supply on competitive terms and the tying of aid had not been a problem from the viewpoint of Indian procurement policy.

Finally, the Minister drew attention to the provision of the Coalition Agreement that, in working towards the objectives of development cooperation, advantage would be taken of the strengths and capacities of Netherlands industry and society.

The 1994 report of the Court of Audit concerned programme aid in the period 1988–93, of which fertiliser aid was an integral part. The Court concluded that the policy relevance of programme aid in general was not clear. Accounts did not show exactly how much money was allocated to programme aid in total, or to its composite parts: import support, budget support and debt relief. Criteria on which to appraise the merits of the various forms of programme aid against other aid forms, or to link up with project aid, were not well-developed. Nor was the choice for a particular programme aid modality sufficiently argumented. Only limited results could be discerned in targeting programme aid to specific sectors and tying arrangements led occasionally to high prices.

The Court moreover concluded that DGIS had little knowledge of the actual effects of programme aid in the various economic sectors, nor had it an adequate appraisal system in which expected effects were explicitly formulated. This, in combination with a weak institutional memory, prevented adequate feedback of evaluation results into policy formulation and implementation.

The Minister replied that his department was well aware of these issues and that new guidelines had been prepared, comprising criteria for the appraisal of programme aid proposals (1994).

The Court of Audit results largely support IOV's findings with regard to fertiliser aid, particularly in the field of appraisal. Insufficient knowledge of the intended and actual effects of fertiliser aid led to a situation in which terms of reference for evaluations were not consistent, hence evaluation results had little effect on actual fertiliser-aid practice. The fertiliser-aid reports are discussed at some length below.

3.4.4.2 *Evaluations of fertiliser aid*

Evaluations and evaluators

The main points covered in the 22 evaluations were identified and analysed; however, no judgement is given regarding their content, conclusions and recommendations. Three types of evaluation may be distinguished:
- nine evaluations were specifically concerned with fertiliser aid;
- nine were concerned with commodity import support, of which fertiliser aid formed part;
- four focused on the procurement procedure, checking whether it had been correctly implemented and price comparisons made. These evaluations were

concerned solely with procedural matters and are therefore excluded from the following analysis.

The main organisations carrying-out evaluations on behalf of DGIS were the Netherlands Institute of Economics (NEI) and the Food Supplies Purchasing and Sales Section (VIB) of the Agriculture Ministry; others included the Institute of Agricultural Economics (LEI-DLO), Educational Training Consultants (ETC) and Haren Soil Fertility Institute (IB-DLO). DGIS itself has also carried out many missions. The organisation carrying-out the work is important since it affects the approach taken by the mission: NEI evaluations focus mainly on economic matters; those carried out by IB-DLO are concerned more with agronomic and ecological factors. Evaluators with a background in economics tend to predominate; experts in agriculture and logistics are also regularly involved.

Points covered in terms of reference and evaluations

Both terms of reference and evaluation reports have been examined to determine the extent to which they covered a list of relevant points and to which evaluation reports covered the points raised in terms of reference (table 8).

Table 8 Points covered in terms of reference and evaluations

	TORs[1]		Evaluation reports		
	Yes	No	Yes	No	Slight
Macro-economic situation	10	7	12	5	1
Macro-economic policy	9	8	10	7	1
Agriculture policy	6	11	11	2	5
Role of intermediaries	11	6	17	1	–
Macro-level impact	7	10	6	10	2
Micro-level impact	7	10	13	3	2
Environmental impact	5	12	3	15	–
Counterpart funds	5	12	11	7	–
Efficiency	8	9	14	3	1

[1]The terms of reference for one evaluation could not be retrieved.

Terms of reference were not limited to the evaluation of past aid but also involved identifying new import-support activities, with missions regularly being asked to evaluate or identify supplementary project aid. Certain issues regularly figured larger in mission reports than in terms of reference, namely, agricultural policy, the use of counterpart funds, the role of intermediary organisations and micro-level effects; under this last heading, reports tended to focus on the effects on production rather than on the economic and social position of the target group.

Finally, missions were sometimes asked to determine whether fertiliser aid was additional or fungible (i.e. replaced imports which would have been made anyway).

• Policy issues

Aspects of the macro-economic situation described include foreign debt, increasing exports, balance-of-payments problems, economic crises, devaluation, inflation, government budgets, production and GNP and exchange-rate trends. The attention devoted to these topics varied widely. Macro-economic questions are considered at greatest length in the NEI reports.

Most reports look at recipient countries' macro-economic policies, relating them to the Structural Adjustment Programmes of IMF and the World Bank. Consideration is given to their implications for the liberalisation of production and commercialisation of imports, restructuring of the financial sector, rationalisation of government finances, exchange-rate adjustments including devaluation, decentralisation of nationalised undertakings, inflation control, restructuring of the public sector, abolition of subsidies and reform of the tax system.

Missions' terms of reference devote less explicit attention to agricultural than to macro-economic policy, and the two are not always easily distinguished in reports. References to agricultural policy are concerned mainly with prices and subsidies. When the evaluations were carried out, many of the countries operated systems of fixed crop prices (India and Zambia, for example) aimed at ensuring food security in the cities, and most had fixed fertiliser prices. The fertiliser sector was generally still state-regulated. In some countries a start had been made on market liberalisation, but fertiliser was often excluded from such measures as import liberalisation or the abolition of subsidies. Other aspects of agricultural policy considered, albeit to a very limited extent, are improvement of the use and distribution of means of production among small farmers, credit policy, and promotion of food production.

• Role of intermediary organisations

In 10 of the 12 countries where evaluations were carried out, procurement (importation) was through the public sector (parastatals or ministries); in nine countries distribution to wholesalers was still state-run. Subsequent distribution to farmers' organisations, cooperatives and distribution centres had been privatised in six countries. Reports were mainly concerned with the efficiency of intermediary organisations involved in procurement and distribution.

• Effects of fertiliser aid

While reports often conclude that the impact of aid specifically from the Netherlands cannot be measured with any precision, the macro-level effects of fertiliser aid in general are nevertheless adjudged positive. The impact on balance of payments and government finances (the budgetary effect of counterpart funds) generally attracts a favourable assessment, albeit the relative significance of the Netherlands' contribution is sometimes queried (as in the case of India). Other positive effects are increased availability of foreign currency and increased export earnings from cash crops (Sri Lanka and Mali).

An adverse effect mentioned in connection with Kenya, for example, is that fertiliser aid can inhibit privatisation of the fertiliser industry: it sustains government involvement and can thus impede the development of an efficient fertiliser sector with private importers, distributors and sellers alongside the cooperative sector.

Together with often lengthy accounts of the macro-economic situation and macro-economic policy, reports frequently deal with one or more of the micro-level effects of fertiliser aid, even though this is not always requested in the terms of reference. The effects considered are on production, production systems, farm incomes and employment. Judgements regarding micro-level effects, in contrast with those at macro-level, tend to be adverse: negative conclusions are drawn on one or more of the points mentioned in reports relating to seven of the 12 countries. More positive conclusions are to be found regarding effects on rural employment and improvements in productivity.

Adverse conclusions usually concern failures to reach the target group of small farmers. Missions reach negative conclusions on this point in respect of at least five countries.

Three reports examine the position of women: in India and Burkina Faso too little attention had been given to women's needs and greater efforts should be made to ensure their access to fertiliser; in Mali the aid had had no measurable effect under this heading.

Conclusions regarding effects on the production of food crops were mixed. While fertiliser is accorded a major role in the achievement of food self-sufficiency in India, in Mali the impact is limited; in Tanzania fertiliser is not seen as a strategic factor in assuring local food supplies as little if any is used in maize cultivation. Comments on the effects on cash crops were all positive.

Only three reports draw conclusions regarding effects on farm incomes, with positive effects being noted in Mali, Pakistan and Sri Lanka. In the case of India the conclusion is that income differentials have widened as a result of fertiliser use.

Where reports consider the type of fertiliser supplied their comments are generally favourable.

Three reports include conclusions on environmental effects, in two cases favourable.

• Efficiency of fertiliser aid

Under this heading it was examined what consideration missions gave to procurement procedures and competition rules, transport and distribution, price and quality, and promptness of delivery. Most reports dealt with one or more of these factors. Missions clearly see the poor organisation of local transport as the major problem, with delays and losses leading to high costs. Other problems include inadequate storage facilities, inefficient distribution and logistical bottlenecks. Further obstacles to the efficient delivery of fertiliser aid are increased state intervention, the inefficient operation of parastatals, heavy subsidies leading to inefficient use, and the lack of any coherent fertiliser policy.

Where the tendering procedure was operated by VIB (which procured 34 per cent of the fertiliser provided between 1985 and 1992) missions always reach a favourable judgement. This applies to Kenya, Mali, Zambia and Bolivia. (See also box 4.)

With regard to payment procedures (direct payment or reimbursement) missions' views are mixed. Direct payment is seen as a less effective and efficient instrument than reimbursement as it impedes liberalisation of the fertiliser sector in the recipient country and can succeed only with thorough preparation and effective incorporation into macro-economic policy. An advantage mentioned is that, under direct payment, Netherlands exporters are involved in the tendering procedure. Reimbursement is seen as a better instrument on macro-economic and management grounds and as a step towards the liberalisation of donor aid. Other arguments for reimbursement are its speed and flexibility. A recent evaluation report on India

Box 4 Fertiliser-aid procedures and efficiency with regard to Bangladesh, Mali and Zambia

Bangladesh

Bangladesh has received fertiliser aid under the financial aid procedure, implying that a Bangladeshi organisation will organise the tender and follow it through completely. The Bangladesh Agricultural Development Corporation was responsible for this task until 1992. BADC could start tendering after approval from the Netherlands and embassy staff closely monitored the procedure. This has mostly been an efficient arrangement, since Bangladesh always paid reasonable prices for its fertiliser imports. BADC became increasingly inefficient, however, particularly with regard to internal distribution. In 1992 the Netherlands circumvented BADC by appointing VIB to organise the tendering in response to the drive for import liberalisation and reduction of the state's involvement in fertiliser importation and distribution. This experiment failed in that fertilisers arrived too late due to a series of mistakes and mishaps.

Deviations from regular practice have been attempted on both sides, but to no avail. In 1985 the Netherlands fertiliser industry succeeded in its quest to offer fertiliser aid (urea) under tied aid arrangements to Bangladesh, but the Bangladeshi authorities refused to accept it. In 1988 the Bangladeshi authorities requested re-tendering with lower quality conditions to enable suppliers of cheap fertilisers to participate in the tender. This was refused by the Netherlands as the first tender had been carried out correctly and had attracted sufficient bidders.

Mali

Mali has actually received fertiliser aid under the technical aid procedure since its regional development organisations have consistently asked VIB to organise tender procedures, with an exception in 1984. Both the Netherlands and Mali have been satisfied with this arrangement. CMDT even requested VIB to assist in tendering for commercial imports.

Zambia

Zambia also received fertiliser aid under the financial aid procedure, but the companies entrusted with tendering responsibility, first NAMBOARD and later ZCF and NCZ, were rather ineffective and had to operate in a fertiliser sector that was inefficiently organised. Annual demand estimates were not linked to the actual requirements of farmers, state transport companies were inefficient and expensive, deliveries were often late, resulting in huge carry-over stocks from one year to another. In 1986 Zambia and the Netherlands agreed to involve VIB in tendering procedures. The inefficiency of internal fertiliser distribution did not improve until 1991, however, when the sector was liberalised and government ceased to provide fertilisers to areas where its use was not financially viable without strong government support in the form of transport and producer subsidies.

(1992), however, considers reimbursement an elaborate way to boost the balance of payments: the developmental effect would be the same if funds were transferred directly to the central bank of the recipient country.

In 1987 an NEI evaluation mission found that Netherlands producers often coordinated their tenders. Also, in 1987, price checks carried out by VIB indicated that prices paid for fertiliser from a Netherlands supplier were above the estimated world-market price. The tendering committee of the Pakistani Agriculture Ministry noted that prices for grant-funded fertiliser were always higher than 'cash ruling prices' and that, in the case of tied grant-funded shipments, suppliers did not offer any substantial discount. The Netherlands fertiliser industry subsequently permitted discounts. The evaluation report urges that either the rule of partial untying be applied to Pakistan or that only those commodities be supplied for which there is a standard international price (see also appendix 10).

Specific evaluations of the tendering procedure have been made in Bangladesh and the Philippines on two occasions; in both cases it was operated by the recipient government. The evaluations focus on efficiency aspects of deliveries, e.g. price setting, procurement, delays, and port facilities and capacity.

Fertiliser supplies to the Philippines had come from Malaysia and Indonesia under an ASEAN marketing agreement; according to the missions the prices paid were reasonable. The reports on Bangladesh also look at policy on prices and subsidies and at micro-level effects; in substantive terms, however, they are less informative as they do not consider policy aspects and the effects of the aid cannot yet be measured.

Missions' recommendations

Terms of reference sometimes list points on which recommendations are sought and give missions the task of identifying a subsequent phase. With one exception the reports that concern themselves with continuation of an activity reach a positive conclusion. The exception, Zambia (1988), recommends that fertiliser aid be scaled-down in favour of aid for education and health care. A mission to Mali urges a ceiling on fertiliser deliveries in view of 'the large sums generated as counterpart funds and the limited absorptive capacity of the beneficiary organisations.'

Many recommendations are geared to improving efficiency and eliminating bottlenecks: most are concerned with logistics and distribution, others focus on the price and subsidy system.

Options are suggested and proposals made for supplementary technical assistance aimed e.g. at improving efficiency. Reports relating to seven countries include recommendations for technical aid geared to a more balanced fertiliser programme. Recommendations relate to improvements in distribution, projects concerned with information, training, technical assistance and research, and support for local production.

Recommendations regarding the use of counterpart funds (credit funds, environmental measures, rural development, compensation for the withdrawal of fertiliser subsidies, local costs) are made in relation to seven countries. In a number of cases greater clarity is urged regarding the monitoring and disbursement of counterpart funds; only one mission recommends non-intervention with a view to avoiding further interference in the recipient country's economic planning.

3.4.5 *Comparisons of fertiliser prices*

Since evaluation reports, including those by the Court of Audit, often refer to the absence and difficulty of international fertiliser price comparisons, it was decided to undertake such a comparison in the cadre of this study. For this purpose the British organisation FERTECON was approached, which keeps track of fertiliser prices negotiated world-wide on basis of ICB. FERTECON was asked to provide a range of reasonable prices for various fertiliser types prevailing in a month in which a contract was signed for fertiliser delivery under the Netherlands aid programme. IOV undertook to analyse these data for deliveries to the ten most important recipient countries in the period 1985–92.

It is often said, and some evaluation reports confirm this, that commodities supplied as aid are often more expensive than those obtained through commercial transactions. This is because commodity aid is often fully or partially tied to suppliers in the donor country, who thus benefit from a preferential margin (generally 15 per cent) over current international prices. The Netherlands has long worked for the untying of aid, however, and since 1989 none has been provided on fully tied terms: funds may now be disbursed in any of a large number of Eligible Source Countries. With the following price analysis it is hoped to shed some light on Netherlands fertiliser-aid price levels, fully or partially tied, compared to other transactions of the same or similar fertiliser products. Two questions were to be addressed: were higher-than-normal prices paid for fertiliser supplied under the Netherlands aid programme, and did the procurement modality have any effect on price levels?

It quickly became clear that international fertiliser price comparisons are difficult indeed: they are hampered by the heterogeneous nature of the product, which varies in terms of formulation, product and packaging quality, and distances between producer and user as well as price distortions due to competitive strategies, monopoly situations, post-tender negotiations, etc. The exercise is reported in detail in appendix 10, which also explains the means used to obtain a reasonably reliable comparison.

The conclusion from the analysis nevertheless seems clear: given the requirement of ICB (as against direct negotiation) buying from Eligible Source Countries has been price efficient. It also became apparent that the quality of product and packaging and the reliability of supplies are at least as important as price. In most cases recipient countries have thus had good value for money; the exception is Sri Lanka, where the aid remained longest tied to procurement in the Netherlands and which can thus serve as an instance of higher costs due to tying.

Fertiliser aid to Sri Lanka was evaluated in an Operations Review Unit Report in 1983. In its discussion of efficiency the report did not focus on international price comparisons; that tied aid cost more than partially or wholly untied aid was taken for granted. To maintain importers' interest in tied aid shipments, the Sri Lankan government offered a discount of 8–10 per cent on the counterpart funds to be repaid. The report noted that only 15 per cent of Netherlands fertiliser aid was fully tied at the time of the evaluation; the fact that fertiliser continued to be sourced mainly in the Netherlands, even in subsequent years, could well be entirely due to the gross inefficiencies of the Sri Lankan distribution system. As well as price reductions on tied aid given to importers, prices were subsidised to the tune of 25–80 per cent, tenders were dealt with inefficiently, import planning functioned poorly, importers worked inefficiently, bureaucracy was excessive, and there was little familiarity with the international fertiliser trade. There were thus no commercial pressures to exploit international price differences.

Mali, Zambia and Pakistan also paid relatively high prices, but here the cause was not the tied nature of the aid. The main factors were high transport costs resulting from monopolies (Mali), the importation of small quantities (Zambia), and/or very specific formulas (Pakistan and Zambia). It was interesting to note that the neighbouring countries Mali and Zambia charged high fob prices in the knowledge that overseas suppliers had to face higher transport costs. This advantage did not constitute full profit to them, however, but concealed manufacturing inefficiencies and a sometimes rather high import component of their products. It was also striking that Middle Eastern producers were not very prominent as a source; they were apparently very selective in their bidding, and therefore did not pose the threat to European manufacturers that was feared when they were included in the ESC group.

The purchasing modality, whether through VIB or local purchasing organisations, did not appear to have affected the prices paid. This can be attributed to the fact that countries with little expertise in this area, particularly in Africa, generally made use of VIB services, while the purchasing organisations of large importers operated efficiently with the exception of Sri Lanka.

More detailed information on fertiliser prices is given in appendix 10.

3.5 Efficiency of Netherlands fertiliser aid

Various aspects of the efficiency of fertiliser aid have been discussed above: organisation and management (particularly appraisal of requests, procurement and payment procedures, evaluation of deliveries); cost-efficiency (international price comparison) and project aid aimed to support a more efficient fertiliser use (discussed in appendix 11).

In section 3.2 it became clear that fertiliser-aid policy in the Netherlands derives mainly from policies on programme aid in general. Fertiliser aid is considered predominantly as a form of import support. The logistics, i.e. procurement and shipment to the recipient country, have been efficient because procedures for commodity aid are usually clear and laid down in elaborate manuals, guidelines and checklists. VIB in particular adhered strictly to these guidelines. Payment procedures through NIO were smooth, both direct payment and reimbursement. If aid was granted under the financial aid procedure, regular price and procedural checks were made by VIB, which also provided advice to the recipient and DGIS during the tendering procedure.

The appraisal memoranda on which decisions to provide fertiliser aid are based are not always limited to the essentials for this macro-instrument: broad policy agreement between recipient and donor, clear deficits on the balance of payments, and a need for imported fertiliser. During the 1980s memoranda became increasingly informative and often referred to the intended effects of fertiliser aid at the micro-level, e.g. poverty alleviation for certain target groups, agronomic efficiency of food production, food security and environment. This is clearly a result of the fact that fertiliser aid, unlike currency aid, makes it possible to indicate the various effects of total fertiliser supply, to which Netherlands aid has contributed, on sector and micro-levels in the recipient country. An opportunity is thus created, for authors of appraisal memoranda, to link fertiliser aid to other objectives of the Netherlands aid programme in addition to economic self-reliance.

The terms of reference for fertiliser-aid evaluations as well as the evaluation reports themselves also reflect this ambiguity: sometimes TORs include effects on sector and micro-levels, and sometimes evaluators include such information without being asked to do so. Evaluations are generally positive about the effects of fertiliser aid on the macro-level; they consider fertiliser products to be adequate and their prices, as far as comparisons were possible, acceptable. In a few cases fertiliser prices were considered too high. When looking beyond the arrival of donated fertilisers in the recipient country, however, evaluation reports became much more critical. The efficiency of local distribution was often (extremely) low and the target groups of the Netherlands aid programme (e.g. the landless, women, rural and urban poor) were usually not likely to be among fertiliser users.

In view of the noted inefficiencies in fertiliser distribution and use, an inventory has been made of Netherlands-funded projects that were specifically designed to support fertiliser policy formulation, logistics, research, extension and use. For the period 1985–91, 27 such projects were identified, most of them in Sub-Sahara Africa. Evaluation reports, insofar as they were available for these projects, were particularly positive with regard to national and regional projects supporting fertiliser policy formulation. Projects on soil research, demonstration and extension often suffered from a rather narrow focus which impeded acceptance rates among farmers and therefore the sustainability of the projects. With regard to improving the physical infrastructure for fertiliser distribution, the projects have been successful, albeit their financial and institutional sustainability is questioned.

On the basis of international price analyses it was confirmed that price efficiency, in terms of value for money, was adequate in most cases, Sri Lanka being a notable exception. It was also established that disbursement pressures were relatively small and did not lead to price inefficiencies. Since recipient countries can determine the choice of fertiliser type, it was not considered apt to compare prices with those of other types of fertiliser. It should be noted, however, that some requested formulas were very expensive and intended for use with particular cash crops, such as tobacco. This raises the question of whether more simple and therefore cheaper formulas would have been more efficient in reaching the intended target groups and more supportive of food security. These issues will be addressed in chapter 5 where the effectiveness of fertiliser aid is discussed in the cases of Bangladesh, Mali and Zambia.

Chapter 4 Macro-economic effects of fertiliser aid

Fertiliser aid has mainly been intended by the Netherlands as a form of macro-economic support, though in some cases appraisal memoranda also refer to objectives at sectoral and micro-levels. Programme aid in general, and fertiliser aid in particular, is geared to helping recipient countries make progress towards economic self-reliance, one of the overall goals of Netherlands aid policy over the years. In this chapter we consider only the macro-economic effects of fertiliser aid in the three countries covered by this study, Bangladesh, Mali and Zambia. The subsequent chapter will deal with the implications of fertiliser aid for the relief of poverty and sustainable development, being other central themes of Netherlands development policy.

4.1 Fertiliser aid: a hybrid aid form

The IOV report *Import Support* (1989) noted the general difficulty of measuring the effectiveness of programme aid. At the macro-level the Netherlands contribution is not generally traceable, partly on account of its fungibility. Fungibility, which contrasts with 'additionality', refers to the extent to which aid takes the place of expenditures which the recipient country would have made in any event, either using its own resources or with help from other donors.* Its fungibility means that the disbursement of programme aid is not in principle susceptible to donor influence; fertiliser aid, involving as it does currency support tied to the purchase of a particular commodity, is thus a hybrid aid form.

The DGIS *Guidelines on Programme Aid* (1994), based on a series of earlier policy documents, note that since 1990 the Netherlands, along with other donors, increasingly links programme aid with the effective and efficient implementation of

* This definition is a simplification of the complex realities which underly the concept of fungibility. White (1994) distinguishes e.g. categorical and aggregate fungibility, which each have different economic and policy effects.

structural adjustment programmes. This implies that specific effects will no longer be formulated for this form of aid, it being considered that they cannot normally be measured. (In the case of fertiliser aid, however, one could envisage estimating its contribution to food security.) Since 1990 the Netherlands has funded fertiliser aid from Budget Category II (Country Programmes) only; previously, several categories had been tapped for this purpose.

It is against this background that the following evaluation of the macro-economic effects of Netherlands fertiliser aid is set. Throughout the period covered by this study the overall objective may be said to have been to help recipient countries progress towards economic self-reliance. The criteria for offering the aid were a reasonable extent of policy agreement between donor and recipient and a proven need for balance-of-payments support. The budget category drawn upon used to depend on the organisational arrangements on the recipient side, but since 1990 fertiliser aid has been funded only from the Country Programme category. To determine the macro-economic effects of fertiliser aid, the value of import support in the form of fertiliser aid is considered, focusing first on the existence and nature of balance-of-payments deficits and on fungibility of the aid.

The Netherlands' decision to offer import support, which is considered fungible in principle, in the form of fertiliser aid, suggests a desire to exercise a measure of control at sectoral or micro-level, implying the existence of other objectives as well as that of promoting economic self-reliance. As mentioned before, appraisal memoranda occasionally refer to objectives other than economic self-reliance, such as poverty alleviation and environmental sustainability. The implications of fertiliser aid for the relief of poverty and for sustainable development were therefore also considered at sectoral and micro-levels in Bangladesh, Mali and Zambia. These case studies are described in chapter 5.

4.2 Import support and the fungibility of fertiliser aid

Persistent balance-of-payments deficits can greatly hamper a country's economic development by preventing the import of goods needed to maintain and enhance the productive capacity of people (food), manufacturing industry (raw materials) and agriculture (inputs). Balance-of-payments deficits are usually due to trade deficits, whereby a country's export earnings are insufficient to pay for vital imports, whether for cyclical or structural causes. The programme of balance-of-payments support was mainly intended to help deal with cyclical deficits, temporary shortfalls due e.g. to oil-price movements or to fluctuating world market prices for developing countries' main export products. Its purpose was to protect countries from longer-term damage caused by short-term disruptions in the flow of imports, which would cause sub-optimal use of import-dependent production capacity.

A recipient country must be willing to make serious efforts to tackle such disruptions. It should pursue economic and social policies that minimise the likelihood of their occurrence and cushion their impact on the most vulnerable groups in society. That willingness is an aspect of the policy agreement which must underlie programme aid, a topic to which will be returned in section 4.3. Where confidence in that willingness is absent, a form of programme aid will be chosen which allows the donor some measure of control. This is the subject of section 4.4, which focuses on the use of counterpart funds.

It will now be considered whether the three countries' balance-of-payments position justified the provision of import support and whether the fertiliser aid supplied was fungible or additional in nature. The period covered, 1985–92, is that on which the country studies concentrated. With regard to the balance-of-payments position, decisions to provide programme aid are usually based on the balance of the current account: import and export of goods and services. If that balance is negative, the shortfall might be matched by capital inflows, such as remittances and aid. The *ex ante* position of the overall balance of payments, reflected by monetary reserves, will therefore also be taken into account.

Two of the three countries, Bangladesh and Zambia, faced large and chronic deficits on the current account of the balance of payments. Until 1975 Zambia was still earning large surpluses from copper exports but in the 1980s the country ran annual deficits of several hundred million US dollars (the 1985 figure was almost US$ 400 million). Bangladesh, whose population is 13–14 times that of Mali or Zambia, faces a structural deficit of over 1,000 million dollars. Mali too faced current-account deficits, of a little over FCFA 100,000 million (or around US$ 300 million). The picture with regard to the visible trade balance (goods only) is very different: Mali and Bangladesh imported more than they exported over the entire period, running up trade deficits of US$ 200–400 million and US$ 1,600–2,200 million respectively, while Zambia's visible trade balance was in surplus to the tune of US$ 175–566 million.

4.2.1 *Bangladesh*

Bangladesh's great need for hard currency to cover its current-account deficit is all too evident from its deficit on the current account. The value of Netherlands fertiliser aid has been equivalent to less than one per cent both of the balance-of-payments deficit and of the trade deficit. Given the high level of donor interest in Bangladesh and the small value of fertiliser aid supplied relative to the size of the deficits, the aid can be said to have been fully fungible.

Table 9 Bangladesh: Balance of payments, 1986/87–1990/91 (millions of US dollars)

	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93 (est.)
Commodity exports	1,000	1,176	1,281	1,486	1,721	1,994	2,500
Commodity imports	2,620	2,986	3,375	3,759	3,600	3,463	4,000
(Foodgrains)	271	491	374	343	315	265	222
(Fertiliser)	25	46	108	74	98	117	131
Visible trade balance	–1,620	–1,810	–2,094	–2,273	–1,879	–1,469	–1,500
Invisible trade balance	– 151	– 144	– 123	– 108	– 26	– 21	– 35
Current balance	–1,771	–1,954	–2,217	–2,381	–1,905	–1,490	–1,535

Source: *Bangladesh Economic Survey* 1990/91 and 1992/93.

Foodgrains are a large item on Bangladesh's import bill, averaging 10–15 per cent of the total; volumes have ranged between one and three million tonnes a year. Fertiliser imports have averaged between one and three per cent of total imports in value terms.

Given the size of the balance-of-payments deficit, the relief afforded by Netherlands fertiliser aid is inevitably slight in relative terms. It has generally averaged around US$ 15 million a year, equivalent to only one per cent of the deficit. In relation to total fertiliser imports, however, the Netherlands contribution has been considerable (around 20 per cent), but fertiliser imports have been relatively small owing to the substantial domestic fertiliser production in Bangladesh. Figures for Netherlands fertiliser aid to Bangladesh are given in table 10.

To determine whether the aid was indeed fungible, we need to consider the willingness of other donors to supply fertiliser (or hard currency for its purchase). Other major donors of fertiliser to Bangladesh have included Canada, Norway, the United States, Denmark and the Asian Development Bank (ADB). Donor efforts are coordinated by the International Fertiliser Development Centre (IFDC).

Table 10 Value and composition of Netherlands fertiliser aid to Bangladesh, 1985–91

	1985	1986	1987	1988	1989	1990	1991
Aid flows							
Total aid (millions of guilders)	149	100	132	142	140	130	134
Fertiliser aid (millions of guilders)	52	34	29	20	26	21	27
(% of total aid)	35%	34%	22%	14%	20%	16%	20%
Fertiliser aid by type							
Urea ('000 tonnes)	4	–	–	–	–	–	–
TSP ('000 tonnes)	102	78	75	45	51	58	78
Phosphoric acid ('000 tonnes)	–	20	21	–	10	–	–
Total	106	98	96	45	61	58	78

Source: *Bangladesh Economic Survey* 1990/91.

ADB supplies fertiliser on loan terms, prior to 1988 in the framework of projects and programmes and thereafter in the form of policy-based loans conditional on the removal of fertiliser subsidies. In principle, Bangladesh is free to determine how the import support is used but ADB is considering attaching environmental conditions to fertiliser imports. The remaining donors supply on grant terms but generally set their own conditions as to type and source; in practice, most of the fertiliser supplied consists of TSP and urea.

Canada and the former Soviet Union are the only countries where potash is extracted, and Canada (the largest donor after Japan and the US) has been a regular donor of potash to Bangladesh. Canada, however, is primarily interested in land and water projects. Norway has supplied mainly urea and TSP, regarding this as a satisfactory form of aid. The aid is tied to procurement from Norwegian suppliers, who enjoy a preferential margin of ten per cent. Norway produces no TSP and provides it via import funding, with the requirement that it be sourced in other developing countries. For many years Denmark supplied domestically-produced TSP, but conversion of the Danish plant to the manufacture of compound fertiliser has cooled enthusiasm for TSP aid (which is now sourced in the US). A Danish mission has identified a major need for compound fertilisers, but due to uncertainty as to the required formulation, deliveries have yet to begin. Denmark intends phasing-out fertiliser aid unless agreement is reached on this point.

The position with regard to the US is somewhat different. The US has supplied fertiliser aid to Bangladesh (formerly East Pakistan) since the 1960s, albeit in recent years volumes have been reduced in favour of aid under the heading of policy advice.

Such aid has taken the form of major contributions to the local IFDC, which has emerged as the main centre dealing with fertiliser statistics and as an adviser to both donors and the Bangladesh government on fertiliser use, marketing and imports. USAID has recently sought to promote imports of diammonium phosphate (DAP), which provides a better basis for the manufacture of compound fertiliser than does urea. The US is a major producer of DAP.

It can be concluded that the chronic structural deficit on Bangladesh's current account justified the provision of import support. In the past there has been widespread donor interest in supplying fertiliser, albeit some donors' enthusiasm has cooled due to domestic economic or commercial factors and a narrowing base for policy agreement. The size of the Netherlands' share in the total indicates that Netherlands fertiliser aid was in all probability fungible, since in its absence other donors would have helped to meet Bangladesh's import needs with fertiliser or hard currency. In 1993 and 1994, Bangladesh did not receive programme aid from the Netherlands since *ex ante* assessments of its monetary reserves showed them to be satisfactory.

4.2.2 *Mali*

Here the issue of fungibility is less straightforward. Despite considerable trade deficits (table 11), Mali's *overall* balance of payments has not been seriously in the red, reflecting substantial capital inflows in the form of balance-of-payments aid and remittances from Malians working abroad.

The value of Netherlands fertiliser aid has generally amounted to one to two per cent of the current balance deficit. The relatively small deficit on Mali's overall balance of payments leads us to conclude that fertiliser aid provided by the Netherlands was fungible; at the same time, the Netherlands share in total fertiliser aid was considerable, ranging from 33 to almost 100 per cent. Between 1984 and 1992 the Netherlands supplied roughly ten million guilders' worth of fertiliser a year, with an exceptional peak of 23 million in 1989. Some 65 per cent of the fertiliser bought with Netherlands funds was sourced in the Netherlands even though the aid was partially untied. Almost half of all fertiliser supplied comprised NPK formulas with special supplements for cotton cultivation; the remainder consisted mainly of urea, with diammonium phosphate (DAP) making up some five per cent.

The Netherlands has been seen as the major fertiliser donor, others regard fertiliser aid as very much a Netherlands affair; only Japan has occasionally supplied it on a

Table 11 Malian balance of payments, 1985–90 (1000 millions of FCFA)

	1985	1986	1987	1988	1989	1990
Commodity exports	79.1	71.2	76.9	74.9	85.9	93.8
(Total farm exports (fob))	60	49	59	57	71	78
Commodity Imports	147.6	117.4	100.8	107.0	108.1	117.7
(Food imports)	82	30	15	21	14	73
(Imports of fertiliser, pesticide and agricultural equipment)	61	64	60	63	70	73
Visible trade balance	– 68.5	– 46.2	– 23.9	– 32.1	– 22.2	– 23.9
Invisible trade balance	–100.5	– 90.1	– 80.6	– 84.6	– 87.8	– 92.3
Current balance	–169.0	–136.3	–104.5	–116.7	–110.0	–116.2

Source: *Balance-of-payments Statistics Yearbook 1992*, p. 426, in: Marysse et Rénard (1992), *Evolution macro-economique et ajustement structurel au Mali, 1981–91*. (IMF International Financial Statistics of November 1994 do not provide updates beyond 1990.)

Table 12 Value and composition of Netherlands fertiliser aid to Mali, 1985–91

	1985	1986	1987	1988	1989	1990	1991
Aid flows							
Total aid (millions of guilders)	51.4	48.0	44.1	45.6	62.2	67.8	52.3
Fertiliser aid (millions of guilders)	9.9	10.9	8.9	12.7	23.9	13.9	7.7
(as % of total aid)	19.2	22.7	20.1	27.9	38.4	20.4	14.8
Fertiliser aid by type (tonnes)							
Urea	12,000	–	5,288	3,910	4,600	20,105	2,960
NPK 15-15-15	–	–	–	–	–	285	7,920
NPKSB	–	20,102	10,358	15,289	29,190	400	435
DAP	–	–	–	–	3,000	3,050	1,000
Total	12,000	20,102	15,646	19,199	36,790	23,840	12,315

Source: Netherlands Investment Bank for Developing Countries

significant scale. The French *Caisse Centrale de Coopération Économique* (CCCE) provided the *Compagnie Malienne pour le Développement des Textiles et des Fibres* (CMDT) (cotton) and the *Office du Niger* (ON) (rice) with considerable amounts of funding which is used among other things to provide input credits. Together with the Netherlands, CCCE is thus an important pillar of these two regional development organisations. The two donors are familiar with each other's work. In the view of CCCE the Netherlands has not made sufficient effort to use its aid as a lever with which to force improvements in the management of CMDT in particular.

Other donors such as the European Union, USAID and GTZ concern themselves mainly with dryland and small-scale agriculture, while the Canadian International Development Agency (CIDA) is involved in an integrated development project in Nioro du Sahel. CIDA also appears to have shown interest in a project for the production of *phosphate naturel du Tilemsi* (PNT) granules.

To recapitulate, Mali's *overall* balance of payments was only modestly in deficit since substantial remittances and aid flows largely made up for the structural deficits on the current balance. Aid was channelled through two regional development organisations (ODRs). The lack of interest on the part of other donors in supplying fertiliser aid does not mean that they are opposed to this form in principle, but rather that the Netherlands is seen as a sufficient provider. Given the vital importance of fertiliser supplies to the two ODRs (with cotton the main export crop and rice a major import substitute) and the large amount of support that Mali receives from donors (amounting to 20 per cent of GNP), it can reasonably be assumed that in the absence of Netherlands fertiliser aid other ways would have been found to fill the gap. The Netherlands has recently phased-out fertiliser aid to Mali.

4.2.3 *Zambia*

Zambia's position is in certain respects an exceptional one. The country has a commodity trade surplus, unlike Mali and Bangladesh; nevertheless, its current account shows a huge deficit (table 13). The part played in this connection by the economic and social policies of the Zambian government is discussed below. Netherlands aid has generally amounted to a little over seven per cent of the overall deficit on Zambia's balance of payments; the exception was in 1983, when the shortfall was reduced to US$ 22 million.

Table 13 Zambian balance of payments, 1985–91 (US$ million)

	1985	1986	1987	1988	1989	1990	1991
Commodity exports	797	692	852	1,189	1,340	1,254	1,172
Commodity imports	–571	–518	–585	–678	–774	–1,511	–752
Visible trade balance	226	175	267	502	566	–257	420
Invisible trade balance	–597	–505	–504	–867	–829	–716	–966
Current balance	–371	–330	–237	–365	–263	–973	–546

Source: IMF, International Financial Statistics.

Between 1980 and 1990 Zambia received fertiliser aid amounting to 775,000 tonnes, one-third of which came from the Netherlands; commercial imports totalled 1.11 million tonnes. In the second half of the 1980s Netherlands fertiliser aid was equivalent to between one and five per cent of Zambia's current-account deficit. Compound fertilisers (NPK) and urea accounted for roughly equal proportions – 42 per cent – of the aid supplied, the remainder comprising ammonium nitrate (AN), triple superphosphate (TSP) and nitrate/phosphate (NP) fertilisers (table 14). Over the period as a whole 72 per cent of Netherlands fertiliser aid was produced in the Netherlands; the rest came from ESC suppliers, notably Indonesia. Fertiliser aid to Zambia was terminated in 1989, its place briefly being taken by foreign-currency support channelled through the Open General Import Licensing (OGIL) system in 1991–92. Zambia received increasing amounts of official aid through the 1980s, alongside considerable commercial imports, and it is therefore likely that other sources could have been tapped had fertiliser aid not been provided by the Netherlands.

Table 14 Value and composition of Netherlands fertiliser aid to Zambia, 1985–91

	1985	1986	1987	1988	1989	1990	1991
Aid flows							
Total aid (millions of guilders)	52.1	115.2	59.9	51.0	48.7	93.6	83.9
Fertiliser aid (millions of guilders)	0	25.8	26.3	17.5	6.8	5.0	0
(as % of total aid)	0	22	44	34	14	5	0
Fertiliser aid by type (tonnes)							
NPK	–	24,000	24,000	19,296	–	–	–
Urea	–	25,613	32,650	8,990	–	–	–
NP 19-19+14s	–	–	–	4597	–	–	–
AN	–	–	–	–	14,300	–	–
TSP	–	–	–	–	–	10,000	–
Total	0	49,613	56,650	32,883	14,300	10,000	0

Sources: NIO and VIB.

The Netherlands accounted for around one-third by weight of all fertiliser aid received by Zambia, implying that considerable amounts were provided by other donors. The donor community in Zambia is a fairly close-knit group whose members are well aware of each other's programmes. The group can be divided broadly into fertiliser and non-fertiliser donors, the former including the Netherlands, Japan, Denmark, Finland, Norway and USAID and the latter Sweden, Germany, Denmark, the United Kingdom and the European Union.

Japan has been the most consistent fertiliser donor and is also a major source of funding for projects geared to rehabilitation, management and construction work at the Nitrogen Chemicals of Zambia (NCZ) plant. Following the liberalisation of fertiliser imports, Japan expressly earmarked its contribution to OGIL funds for this purpose. Japan is currently Zambia's largest bilateral donor, referring to the country as 'an experiment that must not fail'.

For many years Denmark and Finland gave Zambia fertiliser aid which was in practice tied to procurement in the donor country; nevertheless, the prices paid were normally those ruling on world markets. In 1992 Finland withdrew on account of economic recession at home while Denmark switched to making contributions to the OGIL fund for use in health care and education. These sectors were unable to absorb the aid, however, and the funding was again used to buy fertiliser. Norway and USAID supplied important quantities of fertiliser until 1988, ceasing out of dissatisfaction at Zambian policy on prices and subsidies.

Among non-fertiliser donors, Canada, the EU, Sweden and Germany have never considered offering this type of aid. They have opted for other priorities, and while not opposed to fertiliser aid in principle, believe that Zambia's needs are adequately met by other donors. Germany did once provide assistance to the NCZ plant but now considers this to have been a serious mistake.

The UK has been a highly critical member of the donor community. The British government has little confidence in the Zambian tender boards and administrative organisation and would not consider offering fertiliser aid; in 1992 it even suspended its OGIL contribution. The UK favours reimbursing the cost of very expensive import items such as oil. Other donors have also expressed reservations about Zambian bookkeeping, but most have been satisfied with the arrival checks carried out by international firms on OGIL-funded imports. The announcement of the abolition of the OGL system at the end of 1992 caused something of an upheaval amongst donors, since it meant that other control mechanisms and aid forms would need to be found.

Zambia's huge balance-of-payments deficit is clearly justification enough for the provision of import support. Moreover, there have been major commercial fertiliser imports each year, and other donors have also shown interest in providing fertiliser aid (in kind or through the OGIL system), despite major objections to Zambian economic and social policies. Fertiliser supplied by the Netherlands can therefore in principle be regarded as fungible at the macro-level.* When regarded at the

* In *Import Support* (IOV 1989), fertiliser aid to Zambia was considered additional on account of

farmers' level, fertiliser aid appeared not fungible for small farmers since, after market liberalisation, they could no longer benefit from government supplies which were facilitated by donated fertilisers (see also section 5.3).

4.2.4 *Need for balance-of-payment support and fungibility*

In the three cases considered above, the deficit on current account in combination with insufficient means to fill the gap, such as remittances, constituted an a priori reason to provide import support to help covering the remaining financing gap. This support, normally extended as currency aid, has been provided in the form of fertiliser aid, on account of its assumed fungibility. The fungibility of Netherlands fertiliser aid to the three recipient countries has therefore been regarded from two viewpoints, namely, as currency support and as commodity support. In every case the value of the aid relative to the recipient's net import needs was so small that it can reasonably be assumed that the country in question would have found the necessary resources elsewhere had the Netherlands not stepped in. It was also considered whether it was likely that other donors would have filled the gap, with fertiliser shipments or with funds earmarked for the purchase of fertiliser, had the Netherlands ceased providing this form of aid. This would very probably have happened in the case of Bangladesh and Zambia; in that of Mali it is less evident, since here the Netherlands was virtually the only fertiliser donor. In any event Mali had access to sufficient hard currency to be able to continue importing fertiliser.

All this being the case, one may wonder why the Netherlands opted to offer commodity support. Given the highly fungible nature of the aid concerned at macro-level, it might have been more logical to provide currency aid. On the other hand, it might be argued that with such a high level of fungibility, in both money and commodity terms, it did not matter what form of programme aid was offered, provided there was agreement of policy between the Netherlands and the recipient country.

4.3 Policy agreement

A country's eligibility for programme aid normally depends on how far its economic and social policies coincide with those favoured by the Netherlands and on how effectively and efficiently it can use the aid. In the case of pure currency support,

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Zambia's tight foreign exchange position and the Netherland's major role as fertiliser donor. The obvious willingness of other donors to provide fertiliser aid to Zambia has led to this opposite conclusion.

account would thus be taken not only of the recipient government's macro-economic policies but also of the functioning of its Central Bank and the manner in which the currency was allocated. In the case of commodity aid, account also needs to be taken of the relevant organisations and procedures in the recipient country, specifically the parastatal or other agencies involved in importing and distributing the commodity concerned.

In the period 1985–91, on which this study is mainly focused, attention in policy consultations shifted increasingly to recipients' performance in terms of structural adjustment. In the course of the 1980s the problems facing recipient countries proved not to be of the temporary type that the balance-of-payments support programme was intended to relieve. They were in fact highly structural in nature, and it was the growing burden of sustaining chronic deficits that eventually forced the adoption of structural adjustment programmes. These are overseen by the IMF and World Bank and, like many other donors, the Netherlands makes intensive use of the macro-economic analyses compiled by these institutions in building-up a picture of recipients' macro-economic performance. The consortia (known as Consultative Groups) through which programme aid is often coordinated are also chaired by the World Bank. This has gradually created a situation in which individual donors focus less attention on the (probably unmeasurable) effects of 'their' aid, looking instead at recipients' willingness to comply with the requirements of structural adjustment programmes.

The World Bank thus has a dominant role in the whole appraisal process. It has not proved infallible, however, and DGIS's new Programme Aid Guidelines therefore recommend greater participation by DGIS staff in the Bank's appraisal and evaluation missions. The IOV evaluation report on bilateral aid to India, Tanzania and Mali (1994) also urged the attachment to embassies of staff with macro-economic expertise with a view to assessing the desirability of programme aid, or of particular forms of programme aid, independently of the World Bank. The currently held view that programme aid, including currency support and fertiliser aid, is fully fungible, has engendered a certain indifference in respect of this aid form: decisions on programme aid allocations have been based on largely uncritical readings of World Bank analyses, while aid has been wound down or even withdrawn on World Bank recommendations.

In 1990 the Netherlands began offering fertiliser aid under the country programmes only (Budget Category II), since this would ensure proper integration with other activities funded under that heading. Somewhat ironically, fertiliser aid has since declined sharply – in the case of the three countries covered in this study to nothing, despite their acceptance of rigorous restructuring programmes. Total programme aid to these countries has also declined, hence the reduction in fertiliser aid has not been fully substituted by other forms of programme aid (see figure 7).

4.3.1 *Bangladesh*

Bangladesh's macro-economic policy, which historically has differed little from those of its South Asian neighbours, has featured extensive state intervention, both through the nationalisation of existing firms and the reservation of whole sectors of the economy to state undertakings, and through bureaucratic interference in the operation of such private businesses as remained by means of detailed licensing systems, credit controls, labour-protection legislation, import controls and other forms of regulation.

Social and economic development is guided by a system of five-year plans and detailed annual plans, which were long geared more to industrialisation and import substitution than to rural development and export diversification.

When structural improvements in Bangladesh's economic situation failed to materialise in the second half of the 1980s, growing pressure from the principal donors caused drastic measures to be taken. A major shift of policy is now under way: aimed at sharply reducing the direct role of the state in the economy and increasing that of the market, it involves privatising some state undertakings, opening-up most sectors of the economy to private enterprise in competition with state undertakings, and scrapping or relaxing licensing systems and import controls.

The country's chronic trade deficit is partly offset by remittances from Bangladeshis working abroad (mainly in the Middle East), the remainder being covered by grants and loans from donors and to a very limited extent by commercial loans. There has been little if any increase in recent years in traditional exports, mainly jute, but the clothing industry has rapidly developed into Bangladesh's main source of foreign-currency earnings.

The broad aims of agricultural development policy in Bangladesh have been to promote productive sectors with a view to creating jobs and raising incomes and thus relieving rural poverty. Efforts have also been made to improve access of the rural poor (women expressly included) to the means of production and to improve the physical infrastructure of rural areas.

The main overall policy goal has been to increase food production with a view to self-sufficiency in rice, to be achieved through the expansion of irrigation schemes and the introduction of high-yielding varieties together with the associated agricultural inputs. The supply of irrigation equipment and other agricultural inputs has recently been privatised. The Bangladesh government also attaches great importance to extending water-control schemes with a view both to reducing flood damage to crops and to making rice production in the monsoon season more efficient through improved regulation of water levels.

Until 1978 the distribution of fertiliser and other important agricultural inputs was the exclusive domain of the Bangladesh Agricultural Development Corporation (BADC), though some wholesale and most retail tasks were delegated to outside traders (who had to be registered with BADC). The main problems at that time were weaknesses in the areas of import policy and stock management, marked fluctuations in sales and availability and irregular local production.

Since 1978 there has been a gradual shift to a more market-led system. This began in Chittagong Division, at retailer and small-wholesaler levels, the system being extended to the whole country in the mid-1980s. The wholesale sector too was increasingly liberalised. Urea factories were subsequently allowed to sell direct, and in the past few years direct importing by private firms has also been permitted.

Farmers' access to fertiliser supplies has generally been made easier by privatisation: there may now be eight or ten dealers in a village, with farmers regularly buying from two or three. While the competition that has ensued should keep prices down, government is nevertheless alert to possible monopolistic tendencies (a recent unreasonable rise in domestic urea prices, for example, was countered by imposing a temporary export ban).

General policy agreement is evident from the Agreed Minutes of policy consultations between Bangladesh and the Netherlands. Bangladesh has put great effort into achieving self-sufficiency in food, rural development and improving living conditions, all major themes of Netherlands development policy.

The goals of fertiliser aid to Bangladesh – increased farm output, especially of food, and balance-of-payments relief – have changed little over the years. The 1992 Country Policy Plan for Bangladesh stressed rural development, particularly food production; TSP deliveries were to continue being funded but, following liberalisation, would have to be channelled through the private sector. Bangladesh, however, has not received any fertiliser aid since 1993.

Given the balance-of-payments problems facing Bangladesh, the manner in which hard currency is allocated, the liberalisation of fertiliser imports and distribution, and the adoption of rigorous restructuring policies, it can be concluded that fertiliser aid was an appropriate response. It can also be argued, however, that currency support would have been equally appropriate.

4.3.2 *Mali*

The macro-economic policy of the Malian government is one of rigorous fiscal and monetary restructuring involving freeing prices, slimming-down the public sector, strengthening the private sector, and hiving-off functions to village and regional organisations. With the exception of cotton, all prices are now free. The guaranteed price set for paddy in the *Office du Niger* (ON) area is not sustainable and in practice the prices received by farmers are therefore free. Mali has been successful in controlling inflation, which averaged 3.6 per cent per year over the period 1980–89. Fifteen state enterprises have been wound up, six restructured and eleven privatised.

Sharp fluctuations in the prices of Mali's main exports, cotton and meat, make for balance-of-payments instability. The balance of payments benefits from remittances from emigrants, which accounted in 1980 for one-third, and in 1990 for one-fifth of foreign-currency income; this explains how the country's imports and investments can exceed its exports and savings. Between 1985 and 1990 the current account deficit fell from 169,000 million FCFA to 116,2000 million FCFA due to growing exports and decreasing commodity imports (table 11).

Mali is a member of the *Communauté Financière Africaine*. Until 12 January 1994 the exchange rate of the FCFA against the French franc was set at 50:1; since then it has been 100:1. A convertible currency means that Mali does not have the foreign-exchange difficulties affecting countries whose currencies are not convertible; rather the problem is one of inadequate resources.

The Malian government faces a difficult budgetary situation, falling behind in domestic and foreign debt payments. Foreign debt rose from FCFA 188,000 million in 1980 to FCFA 650,000 million in 1990. In 1980 debt service payments (interest and amortisation) used up eight per cent of export earnings; from 1985 to 1988 the figure fluctuated around the 30 per cent mark, falling in 1990 to 19 per cent.

Malian agriculture policy emphasises growth and diversification in production and exports, improved food security and a better management of natural resources.

Priorities have shifted over time: in 1960–68 emphasis was on the establishment of cooperatives, in 1968–79 on the execution of policy by parastatal organisations (the *Organisations de Développement Rural*, ODR) and since 1979 on the decentralisation of responsibilities to village associations. Decentralisation has proved a slow process, however, and throughout the 1980s responsibility for implementing agriculture policy remained almost entirely in ODR hands. The ODRs were for many years involved in information and training work, research, the supply of production inputs, crop purchasing and price-setting, industrial processing and exports. In these circumstances they were able to establish an independent position vis-à-vis both farmers and the restructuring policies of government and donors. It was not until the end of the 1980s that pressure began to be put on ODRs to concentrate on core production and marketing tasks, a move which was to be accompanied by decentralisation, privatisation and the transfer of functions to the rural population. The rapid rise of new farmers' associations in the last two years has speeded the process.

Fertiliser distribution was for many years entirely in the hands of ODRs, which set their own prices; the price of the same type of fertiliser could thus vary from one area to another, depending on the ODR supplying it. Until 1990 CMDT prices were well above those ruling in neighbouring countries. The extra revenue so generated enabled CMDT to sell other agricultural inputs for use in cotton growing (mainly insecticides) at prices below world-market levels. CMDT fertiliser prices were not lowered until 1991, partly due to pressure from the Netherlands; the ON had gone over to realistic market prices two years earlier.

The prices paid by farmers have fluctuated. Following a period of stability in 1980–84 prices rose between 1985 and 1988, dropping back in 1990–91; the fall in prices expected to result from privatisation has yet to materialise, mainly because the private sector is having difficulty carving out a market share alongside the ODRs.

CMDT fertiliser deliveries are efficient, prompt, sufficient in quantity and of the standard type;* the lorries that take fertiliser to the villages also transport cotton on the return journey. CMDT, which enjoys a monopoly position, is very reluctant to plunge into privatisation, fearing problems in the areas of costs, deliveries and quality. The modest price reduction expected to result from free competition had not yet materialised at the start of 1993; in CMDT areas in particular, price competition will be hampered by CMDT's monopoly position.

* The appropriateness of the standard type 'cotton fertiliser' has regularly been subject of discussion. See also 5.2.4.1.

In the ON region the *Fonds de Développement Villageois* (FDV) has embarked on an active policy of promoting privatisation which is now beginning to bear fruit. FDV is using its remaining stocks as a buffer to deal with initial hitches in the privatisation process, but it is unclear how likely these hitches are to persist. FDV prices have always been roughly at market levels and no great price shifts are therefore expected from privatisation.

There is general policy agreement between the Netherlands and Mali, the development priorities of the Malian government being broadly in line with the overall objectives of Netherlands aid policy: food security, ecological balance and rural water supply.

The international donor community, including the Netherlands, has taken a fairly positive view of the restructuring policy pursued by the Malian government since 1989. The IMF's assessment of the period 1989–91 is favourable; the adverse social side-effects appeared less severe than might have been feared and only the slimming-down of the public sector was behind schedule. A major political event was the overthrow of the regime of Moussa Traore in March 1991. This was followed by a year of provisional government, elections for a president and a multi-party parliament being held in 1992.

Mali's trade deficit, macro-economic policies and efficient system of fertiliser distribution form an adequate justification for Netherlands fertiliser aid. The same factors, together with the confidence felt in the main recipient organisation, CMDT, would equally well have justified currency support. However, the aid was not channelled through central government but went straight to the regional development organisations, in which case it was considered appropriate by the Netherlands to provide fertiliser aid rather than currency aid.

4.3.3 *Zambia*

Zambian macro-economic policy was for many years founded on the revenues from copper exports. Until 1974 the country had one of Sub-Saharan Africa's more prosperous economies but since then population growth has outpaced economic growth. The stagnation of the economy can be ascribed to a combination of unbalanced domestic policies and external factors: the first international oil crisis (1973), a dramatic 40 per cent fall in world copper prices, and severe droughts necessitating large-scale food imports (1981–82 and 1991–92).

The first structural adjustment programme, instituted in 1983 following pressure from the World Bank, chiefly involved a pay freeze, a cut in subsidies (notably on maize and fertiliser), and a ceiling on government borrowing. In 1985 a public auction system was introduced for foreign currency and led to devaluation of the Zambian Kwacha.

A new four-year reform plan launched in 1989 provided for liberalisation of the currency markets. The Zambian government and the Bank of Zambia then gradually gained some control over the money supply: the public-sector deficit fell from 6.6 per cent of GDP in 1989 to 4.2 per cent in 1990, while annual inflation fell from 158 to 105 per cent over the same period. Thereafter the fiscal and monetary position again worsened, however, and by July 1991 the budget deficit was back at its 1989 level.

By late 1991 the Zambian economy was in a worse predicament than ever: foreign debt repayments stood at some 65 per cent of export earnings, excluding arrears, while foreign debt per head was more than twice as much as annual GDP per head.

Following the election of a new government and parliament in 1991 it was hoped that Zambia would embark upon a new path in which free-market economics would play a major part. At the start of 1992 the government took various measures aimed at stabilising the economy: fertiliser subsidies were abolished, maize prices were gradually freed and new tax rates were introduced. Currency exchanges were allowed to begin operating towards the end of the year and the value of the Kwacha fell rapidly. Denationalisation of public-sector undertakings is proceeding very slowly, however.

Zambian agricultural-development policy long gave priority to the achievement of food security. Agricultural production was stimulated by bringing small and emergent farmers into the production process on a large scale through government programmes such as the issue of land, advisory and training services, credit provision and the manipulation of prices and subsidies. Aiming at national food security and a high level of self-sufficiency, government strongly encouraged the cultivation of hybrid maize as the staple food crop. These measures increased market production throughout the country, particularly among small farmers.

From 1974 onwards agricultural-sector prices were regulated by government, which introduced nationally-uniform maize and fertiliser prices and set up an appropriate transport system. In practice this meant heavy subsidies, leading to a sharp increase in maize production and fertiliser use, and hence to the rising subsidy costs that were partly responsible for the large public-sector deficits of recent years.

Fertiliser distribution was long the job of the Provincial Marketing and Cooperative Unions and the national Marketing Board (Namboard), which dealt with all matters concerning the import, storage and distribution of fertiliser to the provincial cooperatives. In 1986 the government decided to abolish Namboard: all fertiliser-related functions were transferred to Nitrogen Chemicals of Zambia (NCZ) until privatisation of the sector (including imports) got under way in 1990. Since then NCZ has been one of many importers on the Zambian market.

Fertiliser deliveries to farmers were frequently delayed due to planning failures by Namboard and NCZ, infrastructural deficiencies, lack of road vehicles and railway rolling stock, and inadequate rural storage facilities. In the 1980s late deliveries sometimes resulted in maize yields being 20–30 per cent down on what could have been expected. Delays were not the only problem: there was also physical wastage during fertiliser transport from the ports to the Lusaka warehouse, as well as smuggling to neighbouring countries. Estimated losses, ascribed to the manifold handling of the material, range from 10 to 20 per cent.

Prices rose rapidly after the abolition of fertiliser subsidies in 1989. In four years the price to farmers of 50 kg of fertiliser rose from K 85 to K 7200 (in nominal terms; the real price almost doubled). Maize prices have risen less rapidly; government uses the 'import parity' price as a guide but does not guarantee it.

Policy agreement between the Netherlands and Zambia has not always been possible. The strong emphasis on food security in Zambia's economic and social policies was long a determining factor in Netherlands aid policy. On major points, however, the Netherlands has taken its cue from IMF and the World Bank, which in the 1980s were extremely dissatisfied with the Zambian government's efforts to tackle imbalances in the economy.

After the collapse of the structural adjustment programme in 1986, the Netherlands (and other donors) took a very cautious attitude. Zambia was urged to phase-out maize and fertiliser subsidies and thereby to cut the public sector deficit. Reforms again failed to materialise in 1988. In 1989 the Netherlands decided to end fertiliser aid and the last shipment took place in 1990. After Zambia agreed a new economic recovery programme with IMF and the World Bank, the Netherlands, and other donors, began to provide balance-of-payments support through the OGIL system (Japan was the only major donor to comply with Zambia's request for continued fertiliser aid). The overall amount of Netherlands programme aid going to Zambia, however, has again been on a downward trend since 1990.

The macro-economic justification for fertiliser aid to Zambia has always been somewhat weak. The country's balance-of-payments deficits were largely caused by its unsustainable agricultural policy under which open-ended subsidies led to ballooning budget deficits and hugely inefficient resource distribution. The subsidy policy was designed to promote food security for all, an objective which attracted the sympathy of the donor community. The Netherlands has sometimes given fertiliser aid on humanitarian grounds, despite the lack of policy agreement, but has been consistent in switching from commodity to currency aid through the OGIL system after Zambia reversed its earlier policy and deregulated the maize and fertiliser markets.

4.4 Counterpart funds

Counterpart funds comprise local currency generated by fertiliser sales by the recipient authorities. These funds were in principle an unconditional contribution to public revenues, since attaching conditions to the use of counterpart funds would amount to double tying: programme aid tied to the purchase of fertiliser, and revenue from its sale tied to particular uses. In the past, conditions were sometimes nevertheless attached to the use of counterpart funds accruing from fertiliser aid, albeit with variable success.

If the Netherlands wished to influence the use of counterpart funds, budgetary support could be offered in the form of untied currency aid (e.g. through OGIL), the counterpart value of which would be earmarked for particular programmes within a certain ministry. This would imply a desire on the donor's part to strengthen a particular sector, together with a lack of confidence in the recipient country's ability to undertake the task due to its policy priorities and administrative capacities.

4.4.1 *Bangladesh*

Counterpart funds generated by the sale of fertiliser supplied as aid by the Netherlands have always been treated as government revenue; at well below one per cent of the annual budget, the amounts were small in relative terms. Total counterpart funds accruing from commodity aid, however, has been considerable: between 1980 and 1990 the aggregate donor contribution to the country's Annual Development Plans rose from around 50 to over 90 per cent, albeit more recently there has been some increase in the Bangladeshi government's share.

The limited availability of funds with which to meet local project costs is sometimes cited as a principal obstacle to project implementation. While this might be taken to indicate a need for more programme aid to allow the generation of counterpart funds, it is also suggested that programme aid allows the Bangladeshi government to channel more spending into consumption since it can rely on donors to fund the annual development plans.*

This situation has led to a worrying degree of under-investment in Bangladesh, reflected by currency reserves equivalent to six or seven months' imports in 1993–94. The result is a vicious circle, in that any plan to increase project aid comes up against the obstacle of inadequate funding for local costs. The Netherlands had earlier decided to scale down its import support programme for Bangladesh in favour of budget support to programmes in social sectors. Due to the relatively large currency reserve in 1993, however, programme aid was terminated altogether.

4.4.2 *Mali*

The position in Mali is unusual in that, until 1989, the counterpart funds accrued directly to the regional development organisations which received the commodity aid, i.e. CMDT and ON, bypassing the Finance Ministry altogether. It was decided that the Finance Ministry should receive one-third of the revenue, but since the ministry has used that money to make up arrears of payment to the ODRs, disbursement of the funds has in fact remained in their hands.

The Netherlands laid down that counterpart funds should benefit projects geared to rural development, but it was not until 1988 that CMDT was required to give a detailed account of how funds had been used. Analysis shows that three-quarters had gone into the institutional and financial reinforcement of the ODRs themselves (repayment of bank loans, internal subsidies on pesticides, staff training programmes) and around one-quarter more or less directly into rural development (credit funds, irrigation schemes, village storage depots). CMDT used the additional resources to keep its head above water in a period of low cotton prices and in better times to implement its own policies somewhat more generously.

Counterpart funds accruing to the ON were tied in much more closely with its extensive project aid, in that they were managed by the *Fonds d'Intrants Agricoles* (FIA), later the *Fonds de Développement Villageois* (FDV).

* See: Report on the Task Forces on Bangladesh Development Strategies for the 1990s, Vol. I: Policies for Development.

With hindsight it is clear that what was supposed to be ad hoc balance-of-payments aid in fact showed great continuity: over eight consecutive years, from 1984 to 1992, Mali received fertiliser aid averaging ten million guilders a year. Balance-of-payments aid would thus appear to have lost its ad hoc character and to have taken on that of complementing budgets of ODRs receiving project aid from the Netherlands.

4.4.3 *Zambia*

From the 1970s onwards the Zambian government faced growing budget shortfalls of a structural nature; in 1980 the deficit already stood at 160 million Kwacha, and by the end of the decade had risen to 3,500 million. The deficits were due in large part to maize subsidies.

In 1986 it was agreed with Zambia that counterpart funds would be used to meet the local costs of Netherlands projects and small-scale food production projects. In 1987, for example, there was an agreement to channel 15 per cent into the counterpart share in development programmes in Western Province. The Netherlands has had a major involvement in development activities in Western Province in the areas of education, health care and sustainable agriculture since 1982, and Netherlands counterpart funds were to have been used to resource the Zambian input into the projects concerned. Such was the state of government finances, however, that it was the exception rather than the rule for Zambia to meet its financial obligations in respect of development projects.

It was later agreed that the funds would be used to counter the adverse effects of structural adjustment programmes, notably the removal of maize subsidies. Whether this actually happened is not clear: the Zambian government could not give details of the nature of such expenditures, partly because the funds were not traceable and partly because the system of government accounting was not up to the task of meeting such a request.

4.5 Project aid related to fertiliser distribution and use

Aid is effective to the extent that its objectives are achieved, but there is a close link between aid effectiveness and efficiency. Aid that is inefficient is still effective if it achieves its goals, but were it also efficient (i.e. less wasteful) its effect would in all likelihood be greater. In contrast, aid that is ineffective (i.e. fails to achieve any of its objectives) can never be considered efficient, however well costs have been minimised. In the previous chapter we have seen that Netherlands' fertiliser aid has generally been efficient in terms of cost efficiency and timeliness. This pertains to the moment when the commodities are formally handed over to the recipient government. In the case of commodity aid, however, it is quite possible that the distribution and use of fertilisers in the recipient country are inefficient: the less efficient they are, the less likely it is that donated commodities can be distributed effectively in terms of reaching intended target groups in a timely fashion and supplying them with adequate knowledge to allow a judicious use of mineral and organic fertilisers.

In this connection we need to know what the Netherlands has done to strengthen distribution and extension arrangements in recipient countries through project aid. In *Bangladesh* since 1980 the Netherlands have contributed to the construction of fertiliser godowns (stores) with the aim of adding to BADC's storage capacity and thus making distribution more efficient. The godowns were intended to help BADC carry through the process of privatising its retailing and wholesaling functions which began in 1978. In *Mali* since 1979 the Netherlands has provided flexible programme aid on a large scale to the two largest regional development organisations receiving fertiliser aid, thus enhancing their effectiveness. In the case of *Zambia* it was some time before the Netherlands began seeking ways by which to remedy local weaknesses. In 1989, after considerable losses of maize and fertiliser, it was decided to support the Logistic Planning Unit in Southern Province; in 1989 and 1990 Netherlands experts helped to improve fertiliser distribution by NCZ (a full account of fertiliser-related projects in the three countries is provided in appendix 11.5).

A world-wide review of fertiliser-related projects funded by the Netherlands (appendix 11) found that relatively little had been done under this heading. There were only five projects in the area of logistics and distribution and four in that of policy support. Given the large sums devoted to fertiliser aid and the problems affecting inefficient parastatal organisations particularly in the area of distribution, it is regrettable that project and fertiliser aid were not always better integrated. Although programme aid is conditional on recipient countries' willingness to liberalise markets and privatise parastatals, they are often left to their own devices in carving out a new and additional role for the state in the fertiliser market. Paradoxically, parastatals are sometimes kept going for longer than is desirable in the privatisation process because donors continue to favour commodity aid. With regard to research and extension only 14 projects could be identified.

4.6 Macro-economic effectiveness of fertiliser aid

Fertiliser aid serves one of the principal purposes of Netherlands development policy, i.e. the promotion of economic self-reliance. Its effectiveness is hard to determine, given that fungible aid is not easily traced; moreover, its value has ranged from less than one to an exceptional seven per cent of current account and budget deficits facing recipient countries. No measurable macro-economic impact is therefore to be expected.

Although the macro-economic impact of Netherlands fertiliser aid is not really measurable, it certainly has helped recipients make progress towards economic self-reliance: fungible aid frees hard currency which the recipient country can use as it wishes, although donors often indicate their preference for these funds to be used in structural adjustment programmes. It has generally been taken for granted that fertiliser aid is fungible, and, using the definition of fungibility formulated in section 4.1, this was mostly the case over the period covered by this study. In recent years many donors have collectively revised their aid budgets downwards, which primarily affects programme aid, including fertiliser aid, and reduced its fungibility.

The effectiveness of import support in the form of commodity aid depends ultimately on efficient distribution and use in the recipient country. In Mali the Netherlands has worked consistently to foster improvements in this area. In Bangladesh and Zambia little has been done; indeed, in Zambia effective attention was not focused on distribution arrangements until fertiliser aid was being wound down. Around the world the Netherlands has invested little in projects intended to support fertiliser logistics, distribution and policy.

Although regarded as a fungible form of macro-economic support, fertiliser aid is not a neutral device. As noted in section 3.4.1 above, appraisal memoranda sometimes refer to its effects on soil fertility and to the target groups for Netherlands aid. Once regarded in international debate as the miracle input of the Green Revolution, mineral fertiliser in the 1980s came to be seen in a more controversial light (section 2.3). Critical questions have also been asked in Parliament and by various groups in society (see section 3.2.4 and appendix 5). It is therefore necessary to examine the implications of fertiliser aid for the other overall goals of Netherlands development policy, i.e. the alleviation of poverty and progress towards sustainable development.

Chapter 5 Micro-level impact

In chapter 4 fertiliser aid was evaluated as an instrument of macro-level policy, to which end its need was assessed vis-à-vis the balance-of-payments position of the recipient country and the fungibility of the aid. Unlike currency support, fertiliser aid also has micro-level effects that can be assessed, although those of Netherlands fertiliser aid in particular will not normally be distinguishable from those of fertiliser use in general. The analysis of micro-level effects is also justified in that appraisal memoranda and evaluation reports deal with the effects of fertiliser aid on target groups, food production and soil fertility (see sections 3.4.1 and 3.4.4). Moreover, throughout the 1980s and early 1990s, mineral fertiliser aid has been subject of discussion in relation to its effect on the poorest sections of the population and on sustainable land use (see e.g. section 2.3). In this chapter it is considered to which extent fertiliser aid to the three countries has helped to achieve the broader policy goals of financial and ecological sustainability and relief of poverty.

5.1 Bangladesh*

5.1.1 *Background*

The United Nations classifies Bangladesh among the world's least developed countries: in 1990 per capita GDP stood at around Dfl 400 a year at the official rate of exchange. Since the mid-1980s GDP has grown at an average annual rate of four per cent in real terms, while the population has increased by around two per cent a year; income per head has thus also grown by around two per cent a year.

* This section is based on the report by W.A. van den Andel et al., *Evaluation of Dutch mineral fertiliser aid to Bangladesh*, August 1993. The literature consulted in compiling the report is listed in the bibliography.

Agriculture's share in GDP has fallen from 50 to 40 per cent over the last ten years, but this relative decline in arable farming notwithstanding, Bangladesh has succeeded in sharply raising domestic cereal output; per capita cereal availability has thus increased. Even so, at the end of the 1980s almost half the population still lived under the poverty line.

Most Bangladeshis live in rural areas. At 959 people per square kilometre of agricultural land the density of population is very high (apart from a few city states the highest in the world) and is still increasing rapidly. Given the limited absorptive capacity of non-farm sectors there is thus growing pressure on rural areas and agriculture. The division of farmland as ownership passes down the generations has caused the average size of holdings to fall rapidly from 1.43 ha in 1960 to 0.90 ha in 1983–84; projections indicate an average of 0.73 ha in the year 2000.

The effects include a rapidly growing army of functionally landless and increasingly intensive forms of land-use, mainly aimed at increased dry-season production with the help of irrigation using surface waters and groundwater. IOV's 1993 study of the Flood Action Plan noted that irrigation development still had considerable potential in the short term, but that the scope for expansion would be exhausted before the end of the century.

Rural social structures in Bangladesh are marked by wealth inequalities and traditional dependency relations. The absolutely and functionally landless account for 53 per cent of households but own only five per cent of the land; 50 per cent of the land is in the hands of the wealthiest 10 per cent of landowners. Ownership of the essential means of production, i.e. land, water pumps, livestock, etc., is concentrated in relatively few hands.

The annual floods play an important role in agricultural production. Crop patterns are largely determined by the timing of the flooding, the depth of floodwaters, and the risk of crop damage from late or flash floods; sediment and algae deposited by the floods also help maintain soil fertility. Little or no mineral fertiliser is used in floodplain agriculture and average yields are lower e.g. than in the case of Boro rice (see table 15). Boro rice yields, however, are lower in Bangladesh than in comparable regions elsewhere (such as Java, Thailand or the Mekong Delta). This is mainly due to the smallness of the average holding, skewed patterns of land rights (sharecropping gives no incentive for long-term investment in soil fertility), flood damage, poor seed quality, unbalanced fertiliser use (over-application of nitrogen) and soils with insufficient organic content.

Table 15 Rice output[1] and yields in Bangladesh (1960–90)

	1960/61		1969/70		1979/80		1989/90	
	output mln. t.	yield t./ha	output mln. t.	yield t./ha	output mln. t.	yield t./ha	output mln. t.	yield t./ha
Total	9.6	1.1	11.3	1.2	12.5	1.2	18.5	1.8
Aus[2]	2.5	1.0	2.7	0.9	2.8	0.9	2.5	1.1
Aman[3]	6.7	1.1	7.0	1.2	7.3	1.2	9.5	1.7
Boro[4]	0.5	1.1	1.6	2.2	2.4	2.1	6.5	2.6

[1] Output figures for husked rice.
[2] Aus: planted in March/April, either transplanted or broadcasted; harvested in July/August.
[3] Aman: planted in monsoon season, June/July, either transplanted or broadcasted; harvested in November/December.
[4] Boro: transplanted in winter, December/January; harvested in March/April (local varieties) or April/May (HYV).

Source: World Bank, *Bangladesh Food Policy Review, Adjusting to the Green Revolution*, Washington 1992.

5.1.2 *Government fertiliser policy in Bangladesh*

The Bangladeshi government introduced a system of input subsidies to encourage the adoption of modern crop varieties. The low cost to farmers of the new technology led to its rapid acceptance. While the subsidies initially represented only a small burden on state finances, the success of the policy meant that this rapidly increased.

The distribution of farm inputs was established as a state monopoly, as was the local production of fertiliser. The monopoly has gradually been dismantled, however, and since 1992 imports and domestic distribution have been fully deregulated; to this end all input subsidies have been withdrawn. Fertiliser production is still entirely in the hands of public undertakings, though a new urea factory now under construction is partly financed by private foreign investors.

Liberalisation has greatly increased the number of selling points, improving the availability of fertiliser to farmers. Distribution costs have fallen and fertiliser is generally available when needed.

Fertiliser demand has always been determined by market forces; while there are still regular local shortages, production and imports have kept pace with rising demand. Demand continued to rise while the subsidies were being removed, despite the higher costs to farmers. In the 1960s fertiliser consumption rose at an annual rate of 21 per cent, in the 1970s by 12 per cent and in the 1980s by 8.5 per cent, eventually reaching a total of over two million tonnes a year.

Bangladesh: Rice harvesting in Rajshahi.

Fertiliser subsidies, expansion of the area under irrigated cultivation, and promotion of modern cereal varieties by the agricultural advisory services have caused a large increase in foodgrain production, while cash crops (of which jute has traditionally been the most important) have largely stagnated. Cereal-growing has thus come to occupy an increasingly dominant place in Bangladeshi agriculture.

Most fertiliser is thus used in rice cultivation. The introduction of modern varieties has brought a sharp increase in dry-season production, the Boro rice harvest, with the area under cultivation and the yield of all rice varieties both being increased (table 15). The increase in yields has mainly occurred during the last ten years. Production of Boro rice rose sharply, particularly after liberalisation of the trade in agricultural inputs.

National fertiliser production capacity

Bangladesh's considerable reserves of natural gas have formed the basis for urea production over the last thirty years. The country is now self-sufficient in urea and hence in nitrogenous fertilisers; indeed, several hundred thousand tonnes have been exported annually over the past few years. Production capacity has risen slightly more rapidly than demand, enabling a gradual increase in exports; moreover domestic production is efficient and internationally competitive, making production for export an attractive proposition.

Triple superphosphate is also produced on a small scale, using only imported raw materials; the TSP plant is old, however, and capacity too small for production to be economic. In recent years around a quarter of the country's consumption of phosphate fertilisers has been produced locally. Local TSP is of lower quality than the imported product at the same price. Gypsum, a by-product of the TSP plant which currently makes production viable, is now used as a sulphur-containing fertiliser and is the only source of this nutrient. Bangladesh is entirely dependent on imports for fertilisers containing potassium and micro-nutrients.

The Netherlands has been indirectly involved in fertiliser production in Bangladesh. In the 1970s development funds helped finance the establishment of a training institute for the chemical industry (mainly urea manufacture); a second phase of this project was approved in 1990. Between 1979 and 1985 Netherlands aid went into the installation of a granulator and storage tanks for phosphoric acid at the TSP plant. Phosphoric acid was also regularly supplied between 1985 and 1990.

5.1.3 *Fertiliser aid and the relief of poverty*

5.1.3.1 *Target groups for Netherlands fertiliser aid*

The aim of official rural development policy in Bangladesh is to raise living standards. No specific groups are targeted: the living conditions of much of the rural population are poor and it is assumed that the least well-off will be among those benefiting from any general improvement. Since the official view is that the poor can best be helped by the trickle-down effects of macro-economic growth, the government does not seek specifically to channel fertiliser to the target groups of Netherlands development policy (the landless, small farmers and women). The current five-year plan (1990–95) nevertheless refers to 'socio-economic group based planning', dividing the population into ten socio-economic groups for this purpose.

5.1.3.2 *Fertiliser users*

The average size of agricultural holdings in Bangladesh is gradually shrinking as a result of population growth. In 1960 around half of all farmers were classed as 'small' (less than 1.2 ha); by 1984 the proportion had risen to 70 per cent. Over the same period the area of the average holding fell by over a third to less than one hectare (table 16).

Table 16 Farm size, numbers and area, 1960 and 1984

	% of farms		% of agricultural land		Average size (ha)	
	1960	1984	1960	1984	1960	1984
Small	51.6	70.3	16.2	29.0	0.45	0.40
Medium	37.7	24.7	45.7	45.1	1.74	1.67
Large	10.7	4.9	38.1	25.9	5.10	4.78
All farms					1.43	0.90

Source: World Bank, *Bangladesh, Selected Issues in Foodgrain Development*, Washington 1990.

The use of mineral fertiliser in Bangladesh has spread widely since its introduction at the start of the 1960s. As table 17 shows, it is used by most farmers, with small farmers using more on average than large; this chiefly reflects its heavy use on Boro rice. It is noteworthy that on average farmers who rent their land apply as much fertiliser as those who own it.

Table 17 Fertiliser use, farm size and tenure, 1987

	% of farmers using fertiliser	Nutrients applied (kg/ha)	Amounts used on rice (kg/h)				
			Modern			Local	
			Boro	Aus	Aman	Aus	Aman
Farm size							
Small	86	60	168	116	93	22	20
Medium	92	50	158	116	96	17	20
Large	95	45	126	114	74	32	15
Tenure							
Owner	88	55	156	116	89	25	27
Tenant	91	53	161	114	93	17	10
All	89	54	158	116	91	22	20

Source: M. Hossain, *Nature and impact of the Green Revolution in Bangladesh*, IFPRI Research Report 67, Washington 1988.

Women's role in agriculture has generally been focused on activities in and around the home: tending livestock, growing vegetables and processing rice and other products after harvesting. In the case of the landless and small farmers the situation has altered in recent years, and women in these groups increasingly have to work outside the home if household needs are to be met.

Table 18 Working days per hectare for different types of rice (Bhabahanipur, Chittagong), 1980

Rice: / Activity	Aus (LV)	Aman (LV) (Transplanted)	Aman (LV) (Broadcasted)	Boro (MV)
Land preparation	33	43	31	49
Sowing, transplanting	36	33	1	48
Irrigation	3	–	–	9
Weeding	23	17	31	36
Harvesting	37	35	25	45
All fieldwork (mainly men)	132	128	88	187
Processing (mainly women)	22	32	37	46

LV: local varieties; MV: modern varieties.

Source: A.R. Khan, R. Islam, M. Hoque, *Employment, Income and Mobilisation of Local Resources: A Study of two Bangladesh Villages*, ARTEB, Bangkok 1981.

Modern rice varieties are more demanding in terms of cultivation and processing than traditional types. The number of working days involved has been measured in a Chittagong Division village: as table 18 shows, more work per hectare is required of both men and women. As the average size of holdings falls, so too does the net amount of labour required.

Research has shown that women in rural areas work on average twice as long as men. The increase in workload associated with larger harvests thus bears much more heavily upon women than upon men (box 5). The burden is relieved somewhat by the increasing use of the small commercial rice husking mills now springing up throughout the country and by the continuing trend towards smaller holdings. Women in the poorest groups – very small farmers and the landless – increasingly have to seek off-farm work, something that regularly gives rise to social problems.

5.1.3.3 *Effects of fertiliser use on rice yields and prices*

Fertiliser use has increased rapidly, rising from just two kilograms of nutrients per hectare in 1960 to ten in 1970, around 30 in 1980 and over 50 kilos in 1990. Fertiliser is used more intensively on modern rice varieties by small farmers, mainly to ensure the largest possible harvest from the small area of land available; moreover, they grow high-yielding varieties on a larger proportion of their land (half, compared with only 40 per cent in the case of large farmers). This of course increases the

Box 5 Effect of fertiliser use on women's workload in rural Bangladesh

While women's workload is greater than men's whatever the size of farm, the gap grows wider as we move from larger to smaller holdings (see table 19).

This is the conclusion from a case study focusing on the village of Trishal, situated in the Old Brahmaputra Floodplain, which shows that as holding size declines, the number of hours devoted to agricultural work increases for both men and women. Hours spent on non-agricultural activities, in contrast, decrease for men but increase for women. Off-farm activities, moreover, are carried out only by women.

Table 19 Men's and women's workload (hours per year), by activity and farm size, 1989–90 (Kazirshimla)

Farm size:	Large (<2.8 ha)			Medium (1.2–2.8 ha)			Small (1.2 ha)			Average		
Activity	M	W	A	M	W	A	M	W	A	M	W	A
Agricultural	50	56	106	108	80	188	140	431	571	367	84	451
Non-agricultural	180	945	1125	99	1132	1231	98	1142	1240	126	1073	1199
Off-farm	–	77	77	–	62	62	–	136	136	–	92	92
Total:												
hours/year	230	1078	1308	207	1274	1481	238	1709	1947	493	1249	1742
percentage	17	83	100	14	86	100	12	88	100	28	72	100

M = Men, W = Women, A = All.

The increasing workload associated with larger harvests (the result in part of fertiliser use) thus falls more heavily upon women than upon men.

Source: W.A. van den Andel et al., *Evaluation of Netherlands Mineral Fertiliser Aid to Bangladesh*, August 1993.

degree of risk: not only does crop failure mean no harvest but costs incurred are higher than in the case of traditional varieties.

The more intensive use by small farmers of modern varieties and the associated inputs make for higher yields than on larger farms. Modern varieties yield about 20 per cent more; since small farmers grow them on a larger proportion of their land, the average output per hectare is 30–40 per cent greater.

Before the introduction of modern technologies, including mineral fertilisers, rice prices in Bangladesh rose much more rapidly than the overall price level. Between 1971 and 1985, as modern technologies were introduced, the rate of increase was in line with general inflation, benefiting all consumers. Marginal farmers and the landless, who have to supplement their own rice production with purchases on the open market, have benefited from this price trend.

5.1.4 *Fertiliser and sustainable development*

5.1.4.1 *Ecological sustainability*

Fertility maintenance practices and the nutrient balance

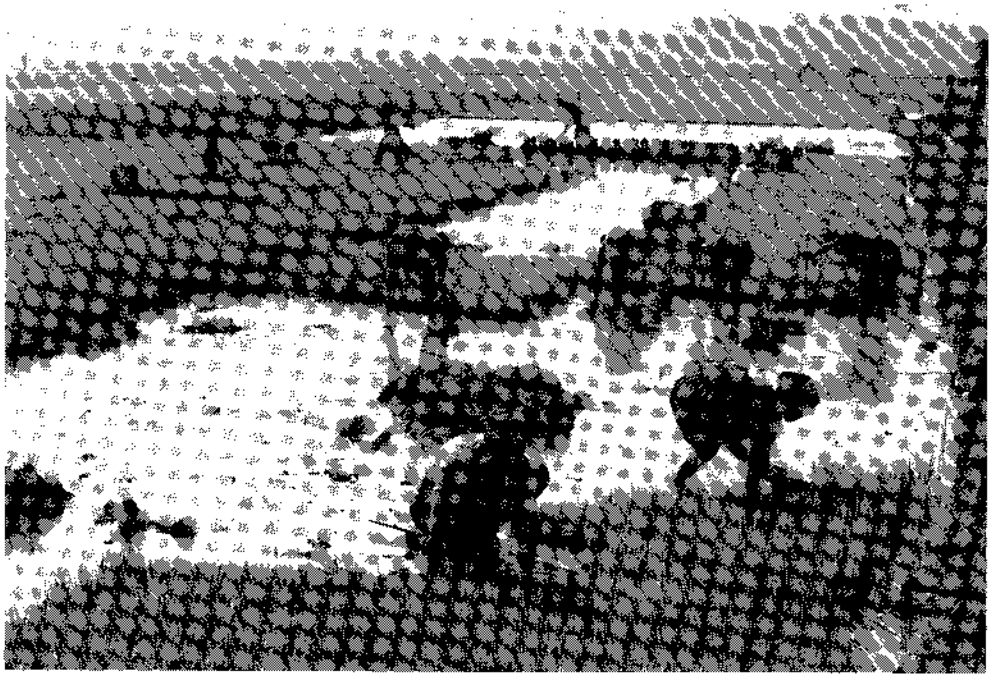
Mineral fertiliser is chiefly used in rice-growing, with smaller quantities going into the cultivation of wheat, sugar cane, potatoes and other food crops. Only a small proportion is used on export crops, mainly jute and tea. Some 30 agro-ecological zones can be distinguished in Bangladesh, but rice is the main crop virtually everywhere.

Bangladesh possesses extensive agricultural-research machinery which regularly issues new recommendations for fertility maintenance. Table 20 shows the recommended rates of fertiliser application for the main food crops, together with attainable yields and actual average yields for the whole country in 1987–88. As the table shows, there is still considerable potential for increasing yields.

Table 20 Attainable yields with recommended fertiliser application rates and actual yields, 1987–88

	Attainable yield	Actual average	Cow manure	Recommended fertiliser application kg/ha				
	t/ha	t/ha	t/ha	Urea	TSP	MP	Zn	S
Aus rice	3.0–4.5	1.07	5–10	140	90	40	10	60
Aman rice	4.0–7.0	1.38	5–10	140	90	40	10	60
Boro rice	4.5–7.0	2.43	5–10	180–210	90–130	40–70	10	60–70
Wheat	3.5–4.2	1.75	3–5	170–240	130–190	50–70	4	60
Jute	3.8–4.9	1.66	4–6	50–100	30	50–90	–	
Mustard	1.2–1.4	0.70	–	140–180	140	60	2	20
Cane sugar	92–184	41.58	9–20	280	180–280	180–280	–	–
Lentils	1.2–1.3	0.73	–	70	90–120	50	–	–
Sesame	1.0–1.1	0.60	4–5	80	120	46	–	–
Potatoes	20–30	10.74	10	277	186	322	–	–
Tomatoes	20–25	7.42	14	230	173	140	–	–
Onions	10–15	4.05	14	150	160	240	–	–
Bananas	25–30	17.04	30	740	690	690	–	–

Sources: N. Islam, Production of diversified field crops under irrigated conditions, and M.A. Rahim, Horticultural crops for diversified cropping in rice-based systems, both in: M.R. Biswas & M.A.S. Mandal (eds), *Irrigation Management for Crop Diversification in Bangladesh*, Dhaka University Press 1993.



Bangladesh: Transplantation of irrigated rice in Rajshahi.

Compound fertiliser containing N, P_2O_5, K_2O and S in the proportions 8:20:14:5 is recommended for rice, 12:15:20:6 is recommended for wheat, mustard and vegetables, and 10:15:10:4 for cane sugar. These recommendations assume that 5–10 tonnes of organic matter are also applied per hectare (see table 20). This is the 'basal dressing' often used before planting or transplanting; remaining N requirements are met by applying it in the form of urea while crops are emerging and/or maturing (top dressing).

Field research has shown that farmers do not always follow these recommendations. Fertiliser application is not balanced: while the amount of N applied is generally close to the recommended level (and sometimes above), amounts of phosphate and potash are mostly well below what are regarded as the optimum (box 6).

Similar conclusions emerge from the figures for total fertiliser consumption. For main crops the recommended application rates for TSP are around two-thirds of those for urea (table 20), while actual TSP consumption is only around one-third of that of urea. In the case of K fertilisers (muriate of potash) the position is even more unbalanced: while the recommended ratio of MOP to urea is 1:4, in practice they are applied in the ratio 1:11.

Box 6 Soil degradation due to unbalanced fertiliser use in Bangladesh

Fertility management practices frequently cannot maintain the soil's nutrient balance. While amounts of nitrogen applied are usually sufficient or more than sufficient, the application of phosphorus and particularly potassium generally falls well short of recommended levels.

The nutrient balances for N, P and K under two production systems (tables 21 and 22), cited in the Kahalu and Chandina case study (van de Andel et al. 1993), illustrate the unbalanced nature of fertiliser application and the consequent ongoing net loss of nutrients, leading in the long term to soil degradation. Moreover, this structural imbalance implies a serious loss of efficiency in fertiliser use.

Table 21 Average annual N, P and K nutrient balances over a three-year period (1985–88) under a regime of Boro rice, T. Aman (MV) rice and fallow (Kahalu case study)

Nutrient type:	N (kg/ha)			P (kg/ha)			K (kg/ha)		
	added	removed	balance	added	removed	balance	added	removed	balance
Treatment:									
1. N+¾P+¾K	180	147.6	+32.4	90	78.1	+11.9	60	234.4	-174.4
2. N+½P+½K	180	140.1	+39.9	60	74.2	−14.2	40	222.4	−182.4
3. N+¾P+½K	180	148.5	+31.5	90	78.4	+11.3	40	253.9	−213.9
4. N+½P+¾K	180	137.7	+42.3	60	72.9	−12.9	60	218.7	−158.7
5. (full dose)	180	168.5	+11.5	120	89.2	+30.8	80	267.6	−187.6
6. (only N)	180	122.6	+57.4	0	64.9	−64.9	0	194.7	−194.7

(The Boro rice in this rotation was fertilised with a full dose of NPKSZn (100:60:40:20:4 kg/ha) in treatments 1 through 5)

Source: BARI and FAO 1990.

Table 22 Average annual N, P and K nutrient balances over a three-year period (1985–88) under a regime of potatoes, T. Aus rice and T. Aman (MV) rice (Chandina case study)

Nutrient type:	N (kg/ha)			P (kg/ha)			K (kg/ha)		
	added	removed	balance	added	removed	balance	added	removed	balance
Treatment:									
1. N+¾P+0.86K	260	243.8	+16.2	150	99.9	+50.1	190	350.9	−160.9
2. N+½P+0.73K	260	230.7	+29.3	100	94.3	+ 5.7	160	331.9	−171.9
3. N+¾P+0.73K	260	243.3	+16.7	150	99.3	+50.7	160	349.8	−189.8
4. N+½P+0.86K	260	245.3	+14.7	100	99.1	+ 0.9	190	351.5	−161.5
5. (full dose)	260	255.6	+ 4.4	200	105.0	+95.0	220	368.2	−148.2
6. (only N)	260	164.7	+98.3	0	65.2	-65.2	0	231.4	-231.4

(Potatoes in this rotation were fertilised with a full dose of NPK (120:100:160 kg/ha) in treatments 1 through 5).

Source: W.A. van den Andel et al., *Evaluation of Netherlands Mineral Fertiliser Aid to Bangladesh*, August 1993.

Initially only N, P and K fertilisers were applied, but over time it became clear that in large parts of the country crop growth was being restricted by deficiencies of other nutrients. Sulphur (in the form of gypsum) and zinc are now also applied in many areas and there is greater recognition of the need for trace elements such as molybdenum and boron. These developments are actively encouraged by agricultural research units throughout the country.

An estimated 1.6 million tonnes of nutrients are taken from the soil every year by the main crops, the proportions of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and zinc in this total being 33, 6, 40, 9, 8, 4 and 0.08 per cent respectively. Roughly the same total weight of nutrients is returned to the soil (as organic or inorganic fertiliser or in irrigation water), but not in the same proportions. Mineral fertiliser provides around half of the returned nutrients and organic matter and irrigation water each provide around a quarter; fixation by leguminous plants provides some further nitrogen. The gap between nutrient removals and additions is greatest in the case of potassium, of which far more is taken from the soil than calculations indicate is added.

These calculations encompass both gross nutrient additions and, on the basis of certain assumptions regarding the effectiveness of fertiliser use, net additions. In the case of potassium the balance is negative under both headings; in that of nitrogen the balance is positive as regards gross additions but negative if only net additions are included. The net balance is negative for all nutrients (table 23).

Farmers know that they must continue to apply mineral fertiliser to sustain current production levels. The importance of maintaining the soil's organic content is also recognised, but when short- and long-term interests are weighed up the former often prevail, not least on account of prevailing tenure systems. Heavy rainfall and regular flooding mean that increasing soil acidity due to intensive fertiliser use is not a problem, since any excess is quickly removed.

Pesticide use has increased sharply with the introduction of modern crop varieties but remains at a low level. Four or five thousand tonnes have been used in recent years, equivalent to less than half a kilogram of formula per hectare. While no data are available on the environmental effects of pesticide use, IFDC analyses of run-off water in some areas have revealed the presence of pesticides.

The main obstacle to the maintenance or improvement of the soil's fertility is its declining content (or even complete lack) of organic matter. Population pressure has led to the virtual disappearance of cropping regimes which include green manure

Table 23 Soil nutrient balances in Bangladeshi agriculture

	Nutrients ('000 tonnes)						
	N	P	K	Ca	Mg	S	Zn
Additions							
Mineral fertiliser	542	85	48	68	–	10	1.1
Organic fertiliser	118	14	171	39	54	11	0.5
Irrigation water	6	15	59	221	49	36	0.7
Nitrogen fixation	19	–	–	–	–	–	–
Gross total	685	114	278	328	103	57	2.3
Net total*	223	22	71	62	15	10	0.2
Withdrawals							
Crops	525	93	629	148	124	70	1.4
Balance							
On gross figures	160	21	–351	180	–21	–13	0.9
On net figures	–302	–72	–558	–86	–108	–60	–1.2

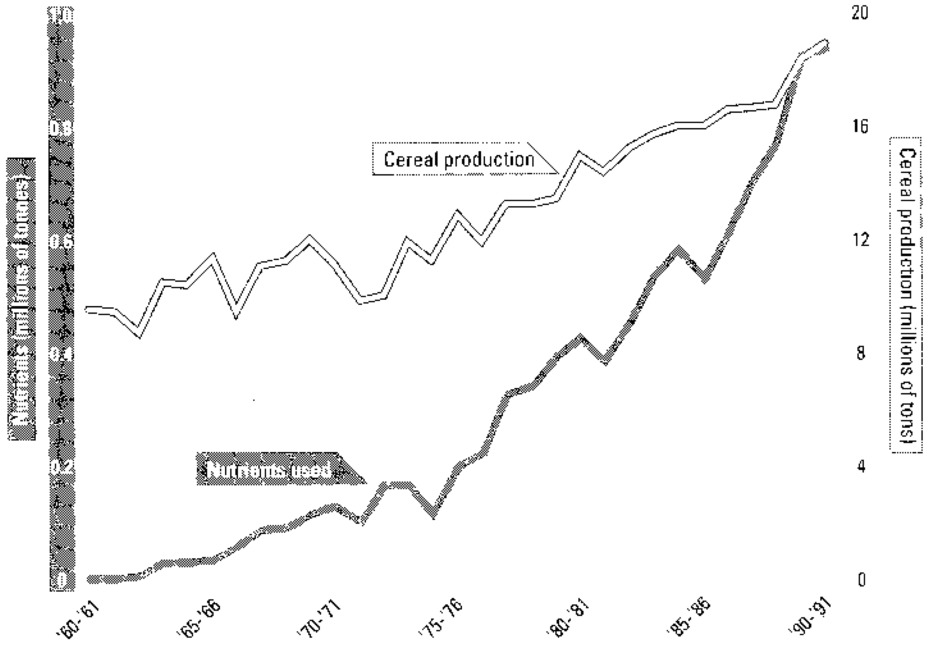
* Efficiency of use: N 35%, K 50%, Zn 10%, P, Ca, Mg and S 20% when contained in inorganic fertiliser or irrigation water; 10% for all nutrients in organic manure.

Source: N.I. Bhuniyan, *Intensive Cropping and Soil Nutrient Balance*, BARC, Dhaka 1992.

in one of the growing seasons. Moreover, when rice is harvested, little or no organic matter is left on the land: the stalks are cut close to the soil, the stubble is largely grazed by livestock and whatever is left is gathered by the poorest inhabitants for use as fuel.

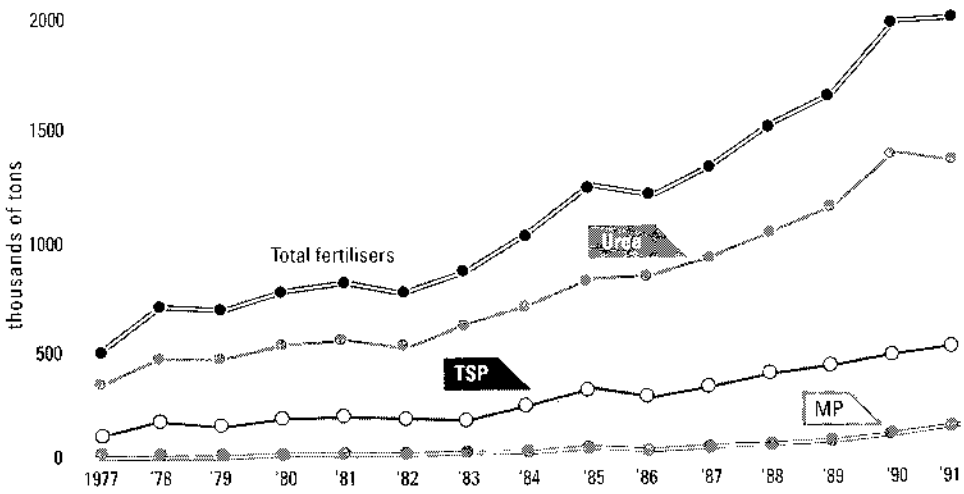
Pressure of population also means loss of grazing land and hence falling livestock numbers, reducing the availability of animal dung for use as manure while simultaneously increasing the demand for it as fuel. The net availability of organic matter for use in maintaining soil fertility is thus in very sharp decline. Prudent soil management, including action to maintain organic content, is vital if the soil is to remain fertile. Figure 10 shows dramatically that, despite increasing amounts of mineral fertilisers used, cereal production increases only modestly.

In addition to increasing and maintaining the organic matter content of the soil, there is a great need for more balanced use of mineral fertilisers. Figure 11 shows for 1990 and 1991 a slight levelling-off of urea (Nitrogen), while the use of TSP (Phosphorus) and MP (Potash) continues to increase slowly. It is hoped that the relative share of Phosphorus and Potash in the total consumption of mineral fertilisers will continue to increase.



Source: W.A. van den Andel et al., *Evaluation of Netherlands Mineral Fertiliser Aid to Bangladesh*, August 1993.

Figure 10 Cereal production in relation to nutrients used in Bangladesh



Source: W.A. van den Andel et al., *Evaluation of Netherlands Mineral Fertiliser Aid to Bangladesh*, August 1993.

Figure 11 Trends in fertiliser use in Bangladesh

Point pollution from fertiliser production

Bangladesh's main fertiliser-production facilities manufacture urea using natural gas as a feedstock. The plants are virtually all of modern design and the production process itself is clean. Gas (the only raw material needed) is brought in by pipeline, so there is no pollution at this stage; moreover, the system is an entirely closed one, being nowhere open to the environment, and little or no wastewater is discharged. The sites are clean, so that heavy rainfall does not contribute to water and ground pollution.

The picture is very different in the case of TSP. Transport of raw materials, sulphur and phosphate, involves losses at the quayside and dust being blown into the atmosphere, while the production process itself is polluting. Sulphuric acid is produced by obsolete processes which cause air pollution. The plant is old and the site extremely ill-maintained, with large waste heaps everywhere. There is little wastewater treatment and rainwater run-off carries with it large amounts of phosphate and sulphur, leading eventually to water and ground pollution.

5.1.4.2 *Financial sustainability*

The ratio of the value of additional output generated to the cost of fertiliser used, the value/cost ratio (VCR), is between five and eight in the case of modern rice varieties and around three in that of traditional varieties. Maximum output with modern varieties is around twice as high as can be achieved without fertiliser, namely, 4–5 t/ha as against only 2–2.5. In the case of local varieties the gap is considerably narrower: output is only around one-third to one-half greater when fertiliser is used than when it is not, the figures being 2–2.5 as against 1.5 t/ha.

Fertiliser use has become less agronomically efficient over the years. This is due partly to exhaustion of the soil's organic content in large parts of the country and partly to the gradual depletion of zinc and other secondary nutrients, which in turn limits the gains from fertiliser use. The overall efficiency picture is distorted by the fact that figures for crops on which fertiliser is not used are mingled with those for crops on which it is. Moreover, while fertiliser is applied to both modern and traditional varieties, the former show a much better response. It is therefore preferable to consider the responses of different crops under controlled conditions. Studies have shown that with modern varieties the extra yield from fertiliser use is between 6 and 15 (usually 8–12) kilograms for every kilogram of nutrients applied; in the case of local varieties, additional yield never exceeds seven kilograms.

Boro rice production has become extremely dependent on fertiliser use. Without the modern varieties, for which fertiliser is an essential requirement, cereal output would be considerably lower: many farmers now on the poverty line would go under and consumers would face higher prices.

Usage of organic manure depends mainly on availability and is thus not directly related to the price of inorganic fertiliser. This factor will only become relevant when the cost of inorganic fertiliser begins to exceed the value of animal dung as fuel.

5.2 Mali*

5.2.1 *Background*

Mali is one of the larger Sahel countries, covering (from north to south) a Saharan zone of almost 300,000 km^2, a Sahelian zone of 400,000 km^2 and a Sudano-Guinean zone of slightly more than 500,000 km^2 (map 1). Of the 196,000 km^2 suitable for farming only some 60,000¶ are effectively used for that purpose every year. The Sahelian zone mainly features nomadic livestock husbandry, millet cultivation and some irrigated areas, while cotton, various cereals and groundnuts are grown in the Sudano-Guinean zone.

Mali's population of just over 9.5 million (1993) is increasing at an estimated annual rate of 2.5 per cent (UN 1992); rural-to-urban migration is heavy, with the urban population estimated to be growing at 4.9 per cent per year. Even so, some 80 per cent of the population still live in rural areas. The number of Malians living abroad, temporarily or permanently, is put at 1.5 million. Per capita income is four times higher in urban than in rural areas.

More than three-quarters of the Malian population are directly or indirectly dependent on agricultural activities for much of their livelihood, arable and livestock farming together generating some 40 per cent of GNP. Low soil fertility and irregular rainfall make for low levels of productivity. Sorghum and millet are the main food

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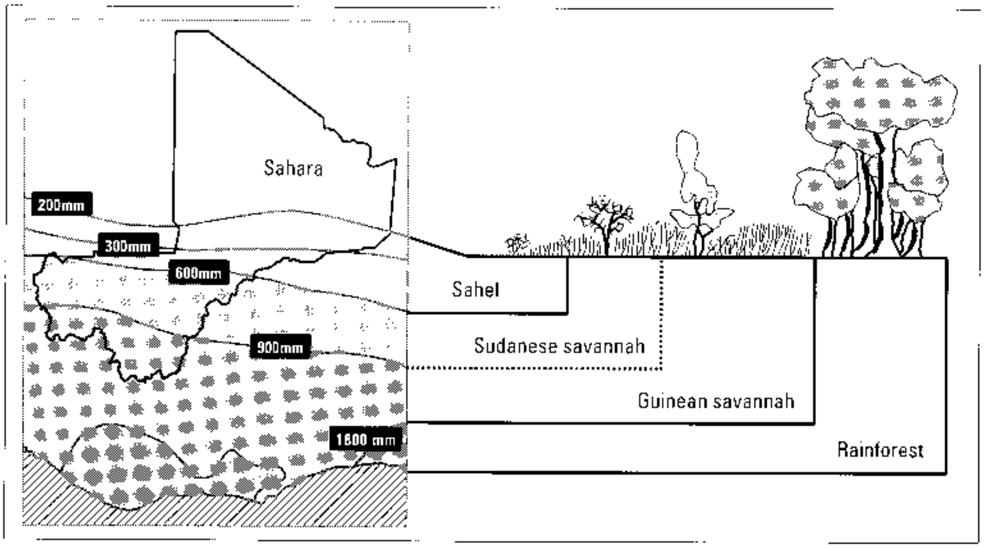
* This section is based on the report *Engrais Fertile? Étude analytique de l'aide néerlandaise au Mali en matière d'engrais minéral* (Henk Kieft, ETC Foundation Consultants for Development Programmes, Leusden, March 1993). The literature consulted in compiling the report is listed in the bibliography.

¶ The area used for agriculture was recently estimated by H. Breman; the official figure of 20,000 km^2 is very much out of date. According to a 1987 study by the Permanent Interstate Committee on Drought Control in the Sahel (CILSS), the figures of the *Direction Nationale de l'Agriculture* have scarcely altered since independence.



Map 1 Average annual rainfall and vegetation types in Mali

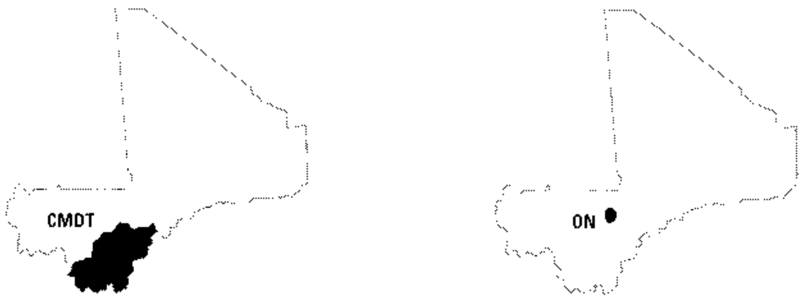
crops; maize, rice, fonio, niebé, groundnuts etc. are also grown. The cotton and livestock sectors each account for 30–40 per cent of the country's export income.

There are downward pressures on both cotton and livestock prices: in the former case they result from increased exports by Russia and China, in the latter from subsidised EU meat exports to Mali's traditional markets which have cost the country roughly eight per cent of its foreign-currency earnings. Production quotas were recently imposed on the *Compagnie Malienne pour le Développement des Textiles et des Fibres* (CMDT). For the moment there is no possibility of increasing the extent to which Malian output is industrially processed within the country.

The main agricultural development measures taken by the Malian government have been aimed at increasing cotton and irrigated rice output through CMDT and ON respectively (map 2).

The rise in cotton production in the second half of the 1980s was mainly realised by increases in the area under cultivation; over the last eight years cotton yields have stabilised at around 1300 kg/ha (table 24), an increase of some 330 kg/ha on the 1965–75 figure.

Groundnut prices have firmed-up in recent years. Structured efforts to promote groundnut production in the area of transition between the Saharan and Sahelian



Based on: *Atlas du Mali* 1981, in IOV 1994.

Map 2 Areas covered by the *Office du Niger* and the *Compagnie Malienne pour le Développement des Textiles et des Fibres*

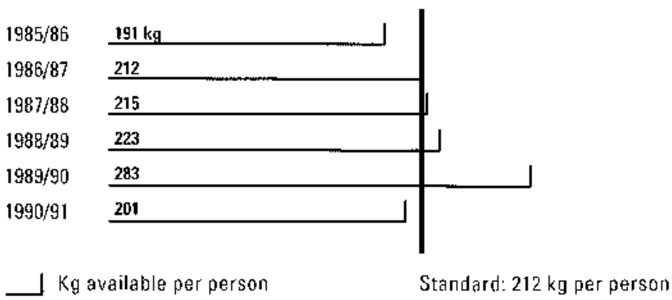
zones did not resume until 1992. Even though 55 per cent of the population live in more marginal areas, policy continues to focus on the areas of higher potential.

Table 24 Cotton production in southern Mali (1983/84–1989/90)

	1983/84	1989/90
Number of farms	59,928	93,094
Total area (ha)	103,924	178,335
Output ('000 kg)	135,175	219,526
Yield (kg/ha)	1,301	1,231

Source: CMDT statistics (in: IOV 1994).

In 1981–86 some 90 per cent of Mali's food needs were met from domestic production. From 1985/86 to 1990/91, thanks partly to good rainfall, the country was on balance self-sufficient in cereals (figure 12), even though rice (local production of which was initially inadequate) and wheat continued to be imported.



Source: PRMC, in: *La Riziculture Paysanne à l'Office du Niger, Mali, 1979–91*, IOV 1992.

Figure 12 Degree of self-sufficiency in cereals, 1985/86–1990/91 (Mali)

Mali: Degraded polder in Central Mali, where irrigation normally allows rice production. The Netherlands supported the rehabilitation of irrigation systems in the 1980s.

There is no national policy on agricultural credit. The various credit agencies are insufficient, and farmers outside the ODRs' target groups have to depend on private traders for credit.

5.2.2 *Official fertiliser policy*

The Malian government does not operate any active fertiliser policy. Fertiliser imports and distribution were formerly the responsibility of the ODRs, which set their own prices. The price of the same fertiliser type could thus vary from one area to another, depending on the ODR supplying it, and until 1990 CMDT prices were well above those prevailing in neighbouring countries. The extra revenue generated in this way enabled CMDT to sell other agricultural inputs for use in cotton-growing (mainly insecticides) at prices below world-market levels. CMDT fertiliser prices were not cut until 1991, partly as a result of pressure from the Netherlands; ON adopted realistic (market) prices in 1989.

The prices paid by farmers have fluctuated. Following a period of stability in 1980–84 fertiliser prices rose between 1985 and 1988, dropping again in 1990–91; at the start of 1993 the fall in prices expected to result from privatisation had yet to materialise.

Fertiliser use across regions, crops and farm categories is determined by considerations of economic viability. Some 75–80 per cent of fertiliser goes into cotton-growing and 10–15 per cent into irrigated rice cultivation (table 25). The application of fertiliser to the other main crops is not financially viable at the current ratio of fertiliser and product prices (maize grown in rotation with cotton constituting an occasional exception).

The ODRs' fertiliser infrastructure did not alter substantially between 1980 and 1989. Distribution by CMDT was reasonably efficient and privatisation was not promoted. In the area covered by the ON, in contrast, the *Fonds d'Intrants Agricoles* (FIA), the later *Fonds de Développement Villageois* (FDV), operated on market terms from 1988 onwards; privatisation was promoted by offering attractive terms to local farmers' organisations, the bank and local fertiliser traders; and private trading got hesitantly under way from 1991–92 onwards. Since ODRs have been required since 1988 to concentrate on their core functions, the importation and distribution of fertiliser will gradually be eliminated from their operations.

In the past policy documents have assumed a direct link between increased fertiliser use and increased output. The fact that sound practice also involves such measures as erosion control and the addition of organic matter to the soil, has only recently been recognised by policy-makers.

National fertiliser production

The Malian government's involvement in fertiliser production does not go beyond supporting the local extraction of rock phosphate (*phosphate naturel de Tilemsi*, PNT). Local output in crushed PNT meets one-third of Mali's phosphate needs and is mainly distributed by CMDT, which holds PNT shares. The plant has regularly been closed between 1991 and 1994 on account of political unrest in the area concerned, which is in the Sahara. All other mineral fertiliser used in Mali is imported.

5.2.3 *Fertiliser and the relief of poverty*

5.2.3.1 *Target groups for Netherlands fertiliser aid*

Ninety per cent of fertiliser used in Mali is applied to the most profitable crops (irrigated rice and cotton) in areas of relatively high agro-ecological potential in the centre and south. The farming population of these areas comprises 35 per cent of the country's total population (table 25) and has a per capita income above the national average. Income inequalities are considerable, however, and appear to be growing (there is disagreement about whether differentials are widening in cotton-growing areas).

Table 25 Population, area under cultivation, and fertiliser consumption by area (in percentages)

	Population	Area under cultivation	Fertiliser consumption
CMDT	33	8	75
Office du Niger	1.5	3	15
Opération Riz Mopti/Ségou	0.5	5	<10
Urban	10	< 1	< 1
Other	55	83	< 1

Sources: International Fertiliser Development Centre (IFDC), *Institut d'Économie Rurale* (IER), *Compagnie Malienne de Développement des Textiles et des Fibres* (CMDT) and Operations Review Unit (IOV).

Channelling fertiliser aid through ODRs implies a policy of support for producers in the cotton- and rice-growing areas of CMDT and ON respectively. An indicator of regional socio-political vulnerability derived from data regularly collected by the Famine Early Warning System (FEWS/USAID) for Mali's administrative regions confirms that Netherlands fertiliser aid goes to the less vulnerable (i.e. better-off) parts of the country; it was thus not geared directly to the needs of the poorest but rather to improving food supplies. However, farmers in the Office du Niger area formerly, i.e. before the start of the rehabilitation schemes, belonged to the poorest in the country.

A policy document recently issued by the Malian Agriculture Ministry voiced concern at women's limited involvement in the fundamental process of transition to a market economy: 'Women, who take care of the family and the maintenance of basic moral values, can play a crucial role in this development process, provided that they are fully involved. This implies the necessity of their access to physical and financial resources.'

Mali: Woman carrying water in Northern Mali. Women are for a large part responsible for the provision of food to their households.

Although no special studies could be made to assess the effects of fertiliser use on women's income and workload, the case study allows for several rather tentative observations in this respect:

- Fertiliser use demands more labour input per unit of land, part of which has to come from women and children;
- With few exceptions, women rarely have access to credit for fertiliser due to the lack of collateral;
- Women's access to land and credit depends on their husbands and on the village chief. In some projects the degree in which women are organised determines their access to land and credit;
- Women use the small quantities of fertiliser that are made available to them mostly on horticultural crops, although no particular extension on this is available;
- Women sometimes buy their own fertiliser in small quantities of 5–10 kilos, amounting to a unit price that is 50–100 per cent higher than for larger bags.

5.2.3.2 *Impact of fertiliser use on food supplies*

There is no direct linkage between food production in general and fertiliser use in the cotton-growing area. Fertiliser is necessary, however, to maintain the rotation system (one year of cotton, two or three years of food crops); the maize and sorghum grown under this system clearly benefit from the residues of fertiliser applied to cotton (mainly phosphates). A small amount of cotton fertiliser has been used directly for maize, particularly when cotton prices were low.

In the case of irrigated rice the direct link between output and fertiliser use is evident from the fact that yields in the ON region have risen from some 1500 kg/ha in 1985 to an average of 4000 kg/ha today.

5.2.3.3 *Impact of fertiliser aid on regional income levels*

Regional and intra-regional income levels are expressed differently in different studies. All comparisons are thus approximate.

Regional income levels

Regional income levels in southern Mali's cotton-growing area and in the rice-growing area of the *Office du Niger* are two or three times higher than in the north and west of the country. A comparison of incomes in western Mali (Kayes, where no fertiliser is used) with those in the south, however, shows that in 1984–91 the former grew at an average rate of 5.2 per cent per year and the latter at 3.9 per cent; for the later part of the period this lower growth rate in the cotton-growing area confirms farmers' observations that cotton yields were stagnating and incomes falling.

In 1992 the *Opération de Développement Intégré du Mali Ouest* (ODIMO) found the use of fertiliser by groundnut-growers in western Mali to be financially unviable on basis of current input and product prices. Despite rising groundnut prices of recent years, neither the Malian government nor donors have focused much attention on this part of the country. It is noteworthy that farmers have achieved worthwhile increases in productivity despite the lack of official support.

A tentative conclusion from the somewhat contradictory figures might be that, while income inequalities between fertiliser-using areas and more marginal parts of the country may be widening in absolute terms, the narrowing gap between growth rates indicates that they are shrinking in relative terms. Macro-level analyses (IOV 1992) indicate that regional incomes have not, in fact, become less unequal over the past decade.

Income inequalities within regions

In cotton-growing areas farm households are commonly grouped into four categories (A–D) on the basis of their access to production resources (labour, cattle, ploughs, land), the best-endowed farms being in category A. Table 26 shows how many belong to each group and the average income within that group.

Table 26 Average annual farm incomes

	Percentage of farms in category*	Average farm income (FCFA)
A	36%	2,000,000
B	42%	1,300,000
C	12%	800,000
D	10%	600,000

* 60 per cent of villages in the cotton-growing areas do not possess an *Association Villageoise* and therefore do not receive CMDT support.

Sources: Internal CMDT reports (1990–91); S. Marysse & R. Renard 1992.

There is a slight difference between income growth rates in categories A and D over the period 1988–91, indicating some widening of income inequalities among cotton-producers. It should be remembered, however, that virtually nothing is known about farmers who do not receive CMDT support and who may well form the real marginal group lacking access to fertiliser, credit and extension.

Other studies have found evidence of widening income inequalities in the cotton-growing areas. Various causes are cited:
- traditional income (re)distribution mechanisms are increasingly ceasing to function;
- ten per cent of farms earn 50 per cent of agricultural income;
- cotton earnings accrue to heads of households (generally men);
- the smallest farms and villages (which do not meet the criteria for establishment of farmers' associations) are not eligible for credit for the purchase of oxen and oxcarts.

No special programmes have been developed for small or marginal farms.

The IOV study of rice farming in the *Office du Niger* (1992) area analysed social and economic changes between 1979 and 1991. Increased output had generally raised living standards in rice-growing areas; the great majority of farm households were no longer short of food, as they had been in the early 1980s. One effect of increased production was monetisation of the village economy. New social classes emerged, notably a rural middle class which had not existed at the start of the decade, but there were also many poor farmers who had not benefited from the new developments and a growing army of agricultural labourers. Mention must also be made of the 'Sunday farmers' ('absentee land-holders'), i.e. civil servants, traders and others who cultivate (or pay others to cultivate) rice on land they have obtained through their contacts in government and the ON. Around one third of all land-holders in the irrigated area are estimated to belong to this group.

Despite improved living standards the Agriculture Ministry calculates that the incomes of 70–75 per cent of rice-growers are so low that any fall in rice prices would render them negative. Statistics from the *Institut d'Économie Rurale* (IER), however, indicate that a price fall of 20 per cent in 1990–91 would have resulted in only seven per cent of farms ceasing to be viable.

Relatively few donor-supported programmes have been carried out in the area of groundnut cultivation. In 1992 the *Opération de Développement Intégré du Mali Ouest* (ODIMO) found the use of fertiliser by groundnut-growers to be unviable at current input and product prices; it is thus hardly surprising that it is not used. What is noteworthy is that farmers have achieved worthwhile increases in productivity without formal government support. No detailed income studies have been made of this region.

We can conclude that fertiliser is a factor that can help to raise average incomes, particularly in the cotton- and rice-growing areas. At the same time, the effects of modernisation, including the use of fertiliser, tend to include widening income inequalities at village and household level. Insufficient data are available to permit conclusions as to the effect of fertiliser use on specific target groups.

5.2.4 *Fertiliser and sustainable development*

5.2.4.1 *Ecological sustainability*

Fertility maintenance practices

Traces remain of traditional management practices geared to maintaining soil fertility with fallow periods, mixed cultivation with legumes, retention of certain nitrogen-fixing tree species in the fields, crop rotation, and the use of household waste and animal dung. Alternating one year's cultivation with at least four fallow years allows reasonable yields to be maintained.

The shortening of fallow periods and the cultivation of nutrient-hungry crop varieties led to nutrient deficiencies in the soil which, from the 1960s onwards, were partly countered by the use of mineral fertilisers. Farmers originally began to use fertiliser at the instigation of agricultural advisors, but how it is used is increasingly determined by the pattern of fertiliser and crop prices. Malian farmers are clearly aware of the different levels of profitability involved in applying fertiliser to different crops.

While overall fertiliser consumption almost doubled between 1980 and 1990, the amount applied per hectare remains low. Up to 1980 annual consumption of the most widely-used special cotton formula, NPKSB, fluctuated around the 20,000-tonne mark; from 1990 onwards it stood at over 27,000 tonnes. Amounts of urea used have more than doubled, from some 7,000 to around 20,000 tonnes per year (table 27).

Recommended application rates vary from one crop to another; they are not regionally differentiated (table 27), despite clear regional differences in nutrient needs (box 7).

The scientific basis and value of the special cotton formula NPKSB (14-22-12+7+1), unvaryingly recommended by CMDT over the last 20 years, have been disputed. The main points at issue are:

Table 27 Fertiliser use: types, crops, composition, application rates, levels of consumption

Fertiliser type	Crop	Composition (per cent)			Recommended dose per ha	Application[1] (tonnes of prod.)	
		N	P_2O_5	K_2O	(kg/ha)	1980	1990
Cotton formula[2]	Cotton	14	22	12	150–200	20,296	27,739
Cereal formula	Maize/sorghum	15	15	15	100–200	7,000	15,186
Urea	Cotton/cereals	46	–	–	50–100	7,048	20,496
SSP[3]	Groundnuts	–	20	–	75	1,855	127
PNT[4]	Groundnuts	–	28	–	300[6]	840	9,535
DAP[5]	Rice	18	46	–	100	2,326	2,625
Animal dung mixed with straw	Cotton/maize	1.1	0.4	1.8	15,000[6]		
Animal dung (without straw) mixed with soil	Cotton/maize	1.2	0.5	1.9	15,000[6]		

[1] *Institut d'Économie Rurale* estimates. Different sources give widely differing figures.
[2] NPKSB (14-22-12+7+1).
[3] Single superphosphate.
[4] Phosphate naturel de Tilemsi.
[5] Diammonium phosphate.
[6] Basic treatment for three years.

Source: *Direction Nationale de l'Agriculture*, annual reports.

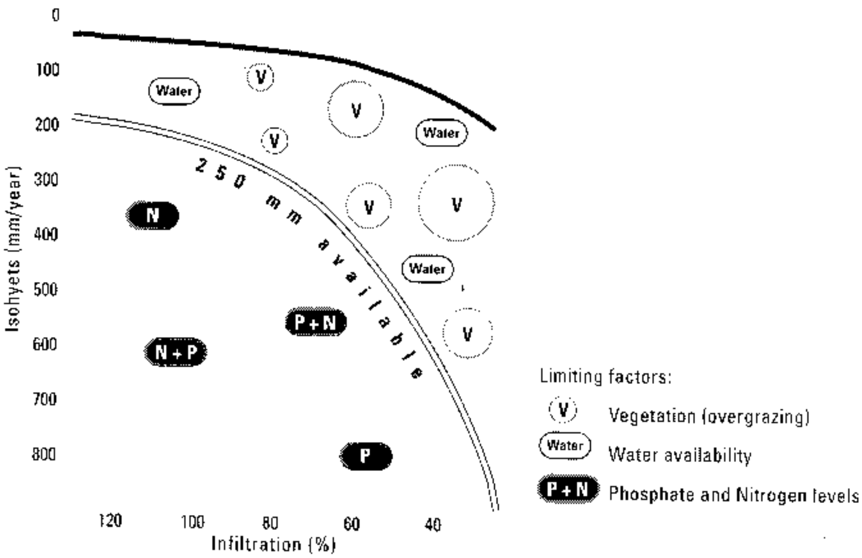
- the recommendation that sulphur (S) and boron (B) be applied every year where occasional application would be adequate (countered by the fact that cotton farmers apply the fertiliser only once in three to four years);
- the relatively high cost: comparable results are said to have been achieved in many countries with the much cheaper NPK 15-15-15 formula (disputed by those who claim that the phosphate content of fertiliser should be higher than 15);
- the uniform nature of the recommendation which takes no account of regional variations in nutrient needs; conversely, slight variations in the formula would not make a difference and would open-up possibilities for adopting more uniform cotton fertilisers in the sub-region and bring possibilities of bulk blending within reach.

Farmers in the cotton zone use less fertiliser than advisory services recommend (122 rather than 150 kg/ha of cotton formula); in the irrigated rice areas application rates are almost systematically 100 kg/ha in excess of the recommended figure of 150–250.

Mineral fertiliser is not used in the dry cultivation of sorghum and millet. The advisory services recognise that the cost/benefit ratio is less favourable and that the effectiveness of fertiliser use is lower than in the case of rice, for example.

Box 7 Factors limiting the carrying capacity of soils in Mali

Figure 13 gives a simplified picture of factors that limit the carrying capacity of soils in the Sahelian and Savannah zones. How much water is available for plants to take up depends on precipitation and infiltration. Some of the rain that falls on hillsides runs off, so that less water is available to plants growing there than rainfall figures would suggest; the beneficiaries are plants growing at the foot of slopes where the water accumulates. The amount of water available to plants equals the level of precipitation only in areas where there is no net run-off or inflow of water from elsewhere. The curve in the figure shows the different combinations of rainfall and infiltration that make 250 mm of rainwater available to plants. Where infiltration is 100 per cent (i.e. there is no net run-off or inflow), availability is equal to precipitation; where infiltration is 120 per cent (i.e. there is a net inflow), then 250 mm are available to plants even though only 200 mm of rain fall every year; and where infiltration is 80 per cent (i.e. one-fifth of the rain falling on the land surface runs off), an annual rainfall of 300 mm is needed to make 250 mm available to plants.



Based on: F.W.T. Penning de Vries and M.A. Djiteye 1991.

Figure 13 Factors limiting the carrying capacity of soils in Mali

Farmers apply inorganic fertiliser with a view to 'soil maintenance' rather than soil improvement. Organic matter is applied:

- to maintain the soil's organic content;
- to treat soils that have become too acid (interviews found that farmers regard animal dung combined with local rock phosphate, which contains lime, as the most effective treatment);

(Box 7 continued)

Where availability is 250 mm or more (along and below the curve), the factors limiting the carrying capacity of soils will vary. Where the figure is less than 250 mm (above and to the right of the curve) the availability of water is the constraint, though in this zone soil fertility may also be affected locally by the limited extent of vegetative cover, e.g. where there has been overgrazing (shown by the letter V). In zones where annual water availability exceeds 250 mm, limits are set by the levels of soil nutrients, chiefly N and P; these vary regionally, so that nutrient deficiencies are not the same everywhere. In some areas there is a deficiency of nitrogen (N), in others of phosphates (P), and in yet others of both. An evaluation mission visiting Burkina Faso in November 1993 concluded that phosphate levels were the limiting factor virtually everywhere and that where phosphate was not deficient the limiting factor was nitrogen.

– to reduce the cost of maintaining soil fertility;
– to make the soil easier to work.

In dry cereal-farming areas and areas of intensive horticulture around towns farmers apply household waste; they may even collect this from towns and villages.

Nutrient balance and acidification

Fertiliser consumption averages some 80 kg of nutrients per hectare per year, calculated on the basis of areas under rice and cotton. Losses through leaching and run-off should not be underestimated, however.

In CMDT cotton-growing areas, where cotton is grown in a one-, two- or three-year cycle with sorghum and maize, there is a net nutrient loss in the case of N and K (–23 and –20 kg/ha/yr) while P levels are broadly maintained. Van der Pol (1992) has calculated that if this pattern of cultivation persists, the soil could in theory become entirely barren within 30 years. Where fertiliser application is unbalanced (e.g. N only) the problem cannot be solved simply by increasing the amounts used. Sustainable production requires complementary measures such as erosion control, the application of organic matter, and a curb on the exporting of cotton waste to other regions for use as animal fodder. As much as 60 per cent of the fertiliser applied can be wasted through leaching and erosion, which can result in the loss of 6–30 tonnes of soil per hectare per year (depending on steepness of the slope, composition of the soil, and any countermeasures that have been taken).

In the areas of intensive rice cultivation the nutrient N, P, and K balances are rarely negative. Intensification is thus successful, at least in the short term.

On both ecological and agronomic grounds the use of inorganic fertilisers needs to be combined with that of organic matter, but insufficient are available to meet the growing need. Careful soil management with a particular focus on organic content could help to improve the situation.

The contribution of fertiliser use to the policy objective of intensifying land use has yet to be decided. On the one hand it is argued that more fertiliser per hectare means a smaller area under cultivation, and therefore more room for 'nature'. This is not true of the cotton-growing areas of Mali, however, where neither soil fertility nor fertiliser availability is the chief constraint on agricultural output as long as more land is available for cultivation. This agrees with the view held by Pieri and Van der Pol (1989) that low population densities, land availability and the current ratio of fertiliser to output prices, currently favour more extensive forms of land use.

The view taken by Breman and Van Keulen, on the other hand, is that population pressure must be seen in relation to the quality and quantity of natural resources: the number of people per hectare must be related to output per hectare (box 8). Land productivity in most of Mali is so low that there is over-population even at low densities; any shift towards more extensive patterns of land use would bring further degradation and exhaustion of the ecosystem. As this process continues any move towards more intensive land use becomes increasingly difficult.

While fertiliser use has not been shown to cause environmental harm, nutrient application rates of 80 kg/ha/yr indicate that care should be taken. Some small-scale soil acidification has been found in cotton-growing areas; this has been linked to the unbalanced application of urea as a top-dressing and/or to depletion of the soil's organic content, both of which reflect poor soil management.

We were unable to locate any serious studies of the effects of fertiliser use on Mali's flora and fauna. While farmers and agricultural advisors agree that pesticide use causes environmental harm, detailed studies have yet to be made.

5.2.4.2 *Financial sustainability*

The financial viability of fertiliser use depends on the cost to farmers of mineral and/or organic fertilisers relative to the price they receive for their output and, for

Box 8 Agro-ecological zones and their carrying capacity

As table 28 shows, in virtually all agro-ecological zones (see map 1) with the exception of the Guinean savannah, the average population density equals or even exceeds the average carrying capacity of the natural environment. While the averages conceal wide local variations, the general conclusion must be that in much of Mali there is no longer any spare capacity, and that in some places the sustainable level of exploitation has already been exceeded. Productivity can be maintained only by the introduction of nutrients from outside.

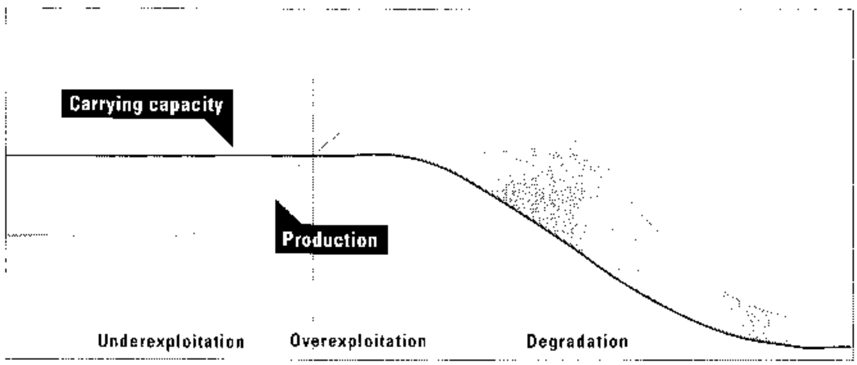
Table 28 Carrying capacity associated with forms of land use without external inputs and population (persons per km²), by agro-ecological zone

Zone	Carrying capacity			Average population density	
	Livestock	Arable	Integrated		(min–max)
Northern Sahel	1 (nomadic)	–	1	1	(0– 7)
Southern Sahel	7 (semi-nom.)	10	11	13	(7–27)
Sudanese savannah	7 (semi-nom.)	34	36	33	(7–66)
Guinean savannah	3 (sedentary)	48	51	25	

Source: Breman 1992.

Carrying capacities and production levels

Figure 14 relates the carrying capacity of the natural environment to the level of output. Where capacity exceeds output there is under-exploitation: some capacity remains unused. The optimum level of exploitation is one at which output remains just below capacity, so that future productivity is not put at risk. Where output exceeds capacity there is over-exploitation; this will lead to degradation of the ecosystem if countermeasures are not taken.



Source: Geerling and Diakité 1988.

Figure 14 The relation between production level and carrying capacity

example, on the response of particular crops to fertiliser application. The ratio of the value of additional output generated to the cost of fertiliser used, the value/cost ratio (VCR), indicates the viability of fertiliser use at farm level. In Mali the highest VCRs are for cotton and irrigated rice, though that for cotton fell between 1977 and 1994 from 5.4 to 2.6; the VCR for irrigated rice, in contrast, rose from 6.6 to 8.1 over the same period. The VCR for maize is stable but low, at just under two, indicating a high level of risk to the farmer. In practice that risk can be reduced by the use of NPK formulas that are more suitable for maize than those currently available. Farmers accept the current VCR for maize mainly because it is grown in rotation with cotton, allowing the risk to be spread. The very low VCR for sorghum (currently 1.4) explains why no fertiliser is used on this crop.*

The financial viability of using animal manure also depends on the cost to the farmer and on crop prices. At the price levels prevailing in 1992 the application of mineral fertiliser and animal manure was viable for irrigated rice, cotton and maize, but not or hardly viable for millet and sorghum; viability was improving somewhat for groundnuts.¶

In the long term soil fertility depends largely on farmers' willingness and ability to maintain its organic content by observing fallow periods, combining or rotating crops, adding organic matter, and controlling erosion by wind and water. This requires an investment of both labour and money: whether or not the necessary cash is available depends on crop profitability. Calculations show that the use of mineral and organic fertiliser is viable only for the main cash crops; in the case of sorghum and millet theAR margins are so small, and the risks so great, that farmers are not inclined to invest time and money in soil management and long-term fertility. The inclusion of a valuable cash crop in a three-year rotation system would appear necessary if the initial investment is to be recovered.

A combination of erosion control, mixed farming methods, and the use of animal manure, is a precondition for the efficient, sustainable and hence viable use of inorganic fertiliser. Improvements in the whole package will be needed if cotton output levels higher than the current average of 1300 kg/ha are to be sustained. The sustainability of most dry-farming systems depends on combining traditional techniques with the limited, careful and efficient use of external inputs. The soil's organic content is a limiting factor here and measures are needed to ensure that it is not depleted.

* The VCRs are specifically calculated for this study by B.G. Hanfoga, at the request of IFDC-Africa.
¶ Estimates regarding application of manure are based on data of IER: Boome & Sager (1992) and Maiga (1992).

5.3 Zambia*

5.3.1 *Background*

Zambia covers an area of some 753,000 km^2; at 10.4 people per km^2 its population density is among the lowest in sub-Saharan Africa. Zambia's population is growing by around 3.2 per cent annually; almost 60 per cent live in rural areas (table 29) and get their living from farming. In recent decades employment has increased more rapidly in urban than in rural areas, but not rapidly enough to absorb the enormous inflow of migrants into the towns, producing a wide gap between urban and rural per capita incomes. Government policy has stressed urban food security at the expense of rural development ('urban bias').

Table 29 Urban and rural population growth in Zambia

Year	Total population	Urban population	Rural population	Urban as % of Total
1963	3,489,504	715,020	2,774,484	21
1970	4,167,900	1,274,372	2,893,528	31
1974	4,677,000	1,663,000	3,014,000	36
1980	5,661,801	2,258,500	2,403,301	40
1991	7,818,447	3,285,766	4,532,681	42

Source: Central Statistical Office, Zambia.

The place of agriculture in the Zambian economy has not altered substantially in the last 30 years. Farming accounts for some 14 per cent of GNP (table 30). Agricultural exports have never exceeded three per cent of total exports; indeed, since 1978 they have not exceeded one per cent. By contrast, agricultural imports have risen sharply: in 1982 they stood at US$ 53.3 million, 16 times the value of agricultural exports (US$ 3.4 million).

Until 1974 Zambia had one of sub-Saharan Africa's more prosperous economies, but since then economic development has stagnated: where previously economic growth had averaged 5.6 per cent per year, after 1974 it failed to keep pace with population growth and income per head fell. In 1990 per capita income stood at 283 Kwacha (K); at constant 1977 prices this was worth some 40 per cent less than in 1966. The stagnation of the economy can be ascribed to a combination of unbalanced domestic policies and external factors (a 40 per cent drop in world

* This section is based on the report *Fertiliser for Food Security: Fact or Fallacy? An Evaluation of the Effectiveness of Mineral Fertiliser Aid*, D.C. Faber, European Centre for Development Policy Management (ECDPM), Maastricht, April 1993. The literature consulted in compiling the report is listed in the bibliography.

Table 30 GDP per sector at current prices 1965–88 (in percentages)

Sector	1965	1970	1975	1980	1985	1988*
Agriculture, forestry and fisheries	14	11	13	16	13	14
Mining and quarrying	41	36	14	14	16	15
Manufacturing	7	10	16	18	23	25
Construction and other industry	6	8	12	5	4	3
Services and other	32	35	45	47	44	43
Total GDP	100	100	100	100	100	100

* IMF Statistics (November 1994) suggest a slight decrease in total GDP between 1988 and 1991 (1990 prices). Consistent figures regarding sectoral breakdown of GDP after 1988 could not be found.

Source: *CSO Monthly Digest of Statistics.*

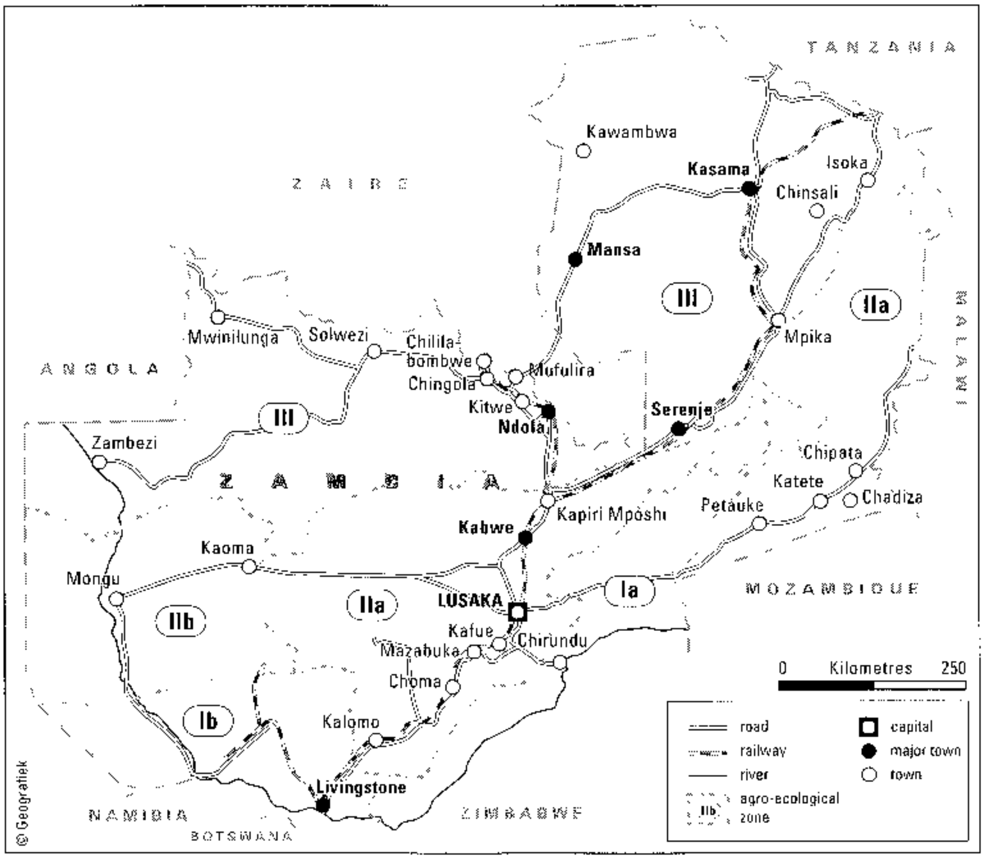
copper prices, the first international oil crisis and a severe drought necessitating large-scale food imports), leading to a rise in import costs, sharply reduced export earnings, and a balance-of-payments deficit equal to 30 per cent of GNP.

Of Zambia's nine million hectares of cultivable land only 1.3 million are in agricultural use, reflecting low population densities, fluctuating rainfall and the poor commercial prospects of crops grown far from any road or rail link. Maize is by far the most important crop, representing some 70 per cent of the total value of agricultural output. Since 1989, however, many commercial farmers have switched to other high-value and export crops.

The country falls into three agro-ecological zones (map 5.3): zone I is marked by low annual rainfall (less than 800 mm), poor soils and a short growing season (120–150 days); zone II has 800–1000 mm of rain per year and a growing season of 150–180 days; and zone III has a high annual rainfall (1000–1500 mm) and a long growing season (150–200 days).

In all there are some 714,000 farm households, of which 665,000 (93 per cent) fall into the category of subsistence or emergent farmers with less than ten hectares under cultivation; a further 47,000 (almost seven per cent) fall into an intermediate group with 10–40 hectares, while the remaining 1689 (less than one per cent) are large commercial farms covering more than 40 hectares. The commercial farms are mainly concentrated in parts of zones II and III, where the principal population centres and the railway from Livingstone to the Copperbelt via Lusaka are located.

Different agricultural systems are to be found in all three zones, ranging from the traditional (handpower, local seed varieties, little or no mineral fertiliser use,



Map 3 Agro-ecological zones of Zambia

production for household consumption, sale only of surplus) through mixed systems (handpower or oxen, local and hybrid seed varieties, little mineral fertiliser, sale of much of output) to the commercial (fully mechanised, hybrid seed varieties only, pesticides, full use of mineral fertiliser).

5.3.2 *Official fertiliser policy*

From 1975 to 1990 fertiliser prices were set by government in June of each year. They were the same throughout the country (pan-territorial) and were generally subsidised to the tune of about 50 per cent, whether the fertiliser was imported or produced locally. The overvalued Kwacha meant that imported fertiliser often under-sold the local product. Low uniform prices brought a rapid growth in fertiliser use in the more remote parts of Zambia: while national consumption rose by an annual average of just over three per cent, fertiliser use in the Northern and Eastern Provinces increased by 12 and 15 per cent per year respectively (table 31).

Table 31 Fertiliser consumption by province, 1980–88 (tonnes)

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988
Central	44,653	56,146	83,048	37,712	36,587	N.A.	48,653	55,459	56,431
Copperbelt	3,937	5,897	7,142	5,632	7.736	N.A.	31,000*	13.092	13,927
Eastern	28,159	28,169	34,939	41,059	21,886	N.A.	38,958	50,920	57,398
Luapula	4,591	617	1,384	2,458	2,429	N.A.	2,179	6,423	3,279
Lusaka	23,611	27,616	36,177	18,742	13,424	N.A.	15,697	29,305	27,388
Northern	15,680	14,627	20,739	19,188	20,928	N.A.	18,183	28, 350	33,744
N/Western	1,617	1,515	2,275	2,126	869	N.A.	2,507	4,117	1,847
Southern	72,364	82,190	61,298	36,959	37,965	N.A.	29,171	48, 750	34,179
Western	1,750	2,014	866	1,922	2,070	N.A.	4,327	6,575	1,738
Total	196,362	218,791	217,868	165,798	143,894	211,180	190,675	242,991	229,931

*Estimate.

Source: Ministry of Agriculture, Department of Planning, 1993.

From 1988 onwards fertiliser use figures quoted by the Ministry of Agriculture and by Nitrogen Chemicals of Zambia (NCZ) started to differ, possibly due to differences between supply and actual use levels. In 1988 fertiliser imports, hitherto a NCZ prerogative, were formally liberalised. The figures suggest more or less stable usage levels oscillating between 212 and 245 thousand tonnes from 1989 through 1991, with a sharp reduction to 150 thousand tonnes in 1992.

Despite the low prices, an extensive official credit programme was needed to ensure that small farmers had access to fertiliser. An evaluation of the credit system by an official Zambian study team found that only a small proportion of farmers were able to make use of it and that in reality credit availability had declined. Lack of interest on the part of commercial banks meant that government had to provide small and emergent farmers with loans, which it did in kind. Repayment was also often in kind, though the amounts recovered were very small. Small farmers used credit-funded fertiliser mainly for maize, while large farmers with access to commercial credit used the fertiliser they bought on other cash crops. There was thus a close link between maize output and the availability of credit to small farmers. After 1989 coverage of the three official credit institutions (CUSA, LIMA Bank and ZCF/FS) was sharply reduced, partly causing a fall in the area under maize in the following year.

Some 54 per cent of Zambia's fertiliser needs are met by imports. The remainder are covered by local production (25 per cent) and the sizable carry-over stocks which averaged some 75 thousand tonnes annually in the period 1980–92. Imports fluctuated markedly in that period, rising slightly overall. Factors that contributed to the high level of imports included the overvalued Kwacha, high maize prices, low fertiliser prices and the guaranteed market for maize.

Fertiliser imported between 1980 and 1992 was funded for 41 per cent by donors; the rest was procured commercially. Early on, most aid-funded imports came from the donor countries themselves (the Netherlands, Norway, Finland and others); Netherlands aid later shifted towards procurement in other Eligible Source Countries such as Tunisia, Indonesia and Nigeria.

Legislation providing for checks on the quality of imported fertiliser has been in place since 1966, but Zambia lacks the professional staff and laboratory facilities needed for the work.

Fertiliser production

In 1970 NCZ opened a plant in Kafue to produce 60,000 tonnes of ammonium nitrate a year, 25,000 tonnes for use as explosives in the mining industry and the remainder for agricultural purposes. The plant operated at 80 per cent of capacity until 1982, when new capacity was added. The new plant, built with help from Germany and Japan and supported financially for a time by USAID, was intended to produce 55,000 tonnes of ammonium nitrate and 141,000 tonnes of compound fertilisers every year. Some inputs (coal and pyrites) were locally procured wherever possible, while others (triple superphosphate, single superphosphate, potash) were imported. The Netherlands has not been technically or financially involved in the NCZ plant or the production of fertiliser.

Technical deficiencies, together with shortages of spare parts and raw materials due to lack of foreign currency, meant that production in the new plant fell well short of expectations: on average it operated at only 39 per cent of capacity. Demand outran supply: NCZ could meet only 25 per cent of fertiliser needs, leaving almost 75 per cent to be imported.

Whether any change can be expected in this situation in the short term is uncertain. NCZ plans to produce around 70,000 tonnes of compound fertiliser and ammonium nitrate and to import a little over 30,000 tonnes of urea over the next few years. Assuming that production costs can be controlled, the company hopes that this level of supply will enable it to cope with competition on the fertiliser market. In reality, NCZ has not yet proved able to compete on the Zambian market at import prices;

the business is virtually bankrupt and saddled with large, expensive and unsold stocks.

5.3.3 *Fertiliser aid and the relief of poverty*

5.3.3.1 *Target groups for Netherlands fertiliser aid*

The purpose of Netherlands fertiliser aid was to support Zambian agricultural policy in relation to the securing of food production (mainly maize). That policy did not distinguish target groups in terms of size or needs: subsistence, emergent, medium and large farmers all had access to the same fertiliser supplies at the same prices, wherever they were located. Fertiliser subsidies, a uniform pan-territorial price for each type, and high maize prices, meant that there was little or no need for interventions that specifically targeted small farmers. The only exception came in 1992–93 when government sold fertiliser to small farmers at reduced prices through the agricultural credit organisations (leading to a bumper crop). The then Minister of Agriculture announced that this exercise could be repeated if circumstances proved it necessary, i.e. if food output was at risk. Such measures are aimed at supporting small farmers, who have least resources at their disposal but account for 60–70 per cent of maize output.

In Zambia 20–30 per cent of rural households are headed by women. They have played a major role in the commercialisation of agriculture, contributing significantly to the production of cash crops. They also grow other crops for household use, maintain the vegetable garden and tend small livestock. There are cases where women share in the benefits from maize growing on a 50:50 basis.

Even so, women's role in agriculture has not in the past been explicitly recognised, as witness the fact that the promotion of cash crop cultivation was led by men and that even today credit facilities and extension (advisory and training) services are accessible to women only in a few cases.

An IFPRI study in Eastern Province (1993) showed that neither the decision to use fertiliser nor the amount used was affected by gender; there was, however, a general tendency for women to apply fertiliser mainly to local maize varieties. The reason for this appears to be that hybrid maize is less suited to processing and storage than traditional varieties and thus less suited to household use. Since female-headed households give higher priority to production for family consumption than for sale, this is a decisive argument for continuing to grow mainly local varieties.

5.3.3.2 *Effects of fertiliser aid on food supplies*

Commercialisation and regional origin of maize

Official incentives have had the effect of commercialising agriculture, i.e. there has been a sharp increase in the number of farmers marketing maize. In 1974 large farmers accounted for 70 per cent of all maize sold; in the 1980s their share fell to 30 per cent while that of the small farmers rose to 70 per cent. A study in Eastern Province has shown that the transition from subsistence to commercial agriculture starts with the use of fertiliser on local maize (box 9); the funds used to buy fertiliser for the first time may be generated in various ways: off-farm employment, credit, or the sale of small amounts of cash crops.

The high level of involvement of farmers in maize production was due to the high ratio of value to costs (table 36), which minimised risks to small and medium farmers. The recent abandonment of the link between maize and fertiliser prices has made the value/cost ratio less favourable, however, and while the effects of the new agriculture policy and market liberalisation have yet to become clear, it may be assumed that maize production will fall and will again be concentrated along the line of rail. Rapidly rising fertiliser prices, uncertain maize markets, storage and transport constraints and relatively low maize prices, have already persuaded many small farmers to abandon hybrid maize-growing. In many areas the 1992–93 season saw a return to cultivation of traditional drought-resistant food crops. The private sector is still not sufficiently organised to be able to guarantee markets for small farmers in the more remote areas.

Table 32 Source of official maize purchases, 1970–90 (in percentages)

Year	Low-cost provinces[1]	High-cost provinces[2]	National total
1970	87	13	100
1975	85	15	100
1980	82	18	100
1985	63	37	100
1990	51	49	100

[1]Southern, Central, Lusaka.
[2]Eastern, Copperbelt, Northern, Northwestern, Western, Luapula

Sources: CSO, Namboard, ZCF data.

One effect of the earlier policy on maize and fertiliser prices was to bring about a structural regional shift in the place of origin of maize (table 32), with more and more coming from high-cost areas remote from the main centres of consumption. The

Box 9 Transition process from subsistence to commercial farming, Eastern Province, Zambia

About 96 per cent of farms in Eastern Province are smaller than 10 hectares, despite the fact that this is considered to be a land surplus area. Maize is now the dominant crop: its market share from Eastern Province in the national supply rose from less than one per cent in 1970 to more than 27 per cent in 1983. Fertiliser use started in the late 1960s, mainly on hybrid maize, and its use continued to grow through the 1970s and 1980s. By 1985 fertiliser consumption in Eastern Province amounted to some 20 per cent of the national use. The main factors accounting for this increase were the favourable fertiliser prices and, particularly in the plateau region, the good physical responses of maize to mineral fertilisers.

The IFPRI study of 1993 carried out in Eastern Province suggested that fertiliser use on local maize varieties triggered the transition process from subsistence to commercial farming. The surplus realised through fertiliser use was sold in order to expand the cultivated area and to devote a larger portion of the land to hybrid maize. Land abundance and the feasibility of animal traction facilitated this process, as could be observed from sample farms comprising farmers who used fertiliser on traditional maize varieties only, farmers who applied it to both traditional and modern hybrid varieties, and farmers who grew hybrids only. It was also established that the growing of hybrid maize increased with farm size.

The progressive movement of a farming household from using no fertiliser at all to growing hybrid maize only with full use of mineral fertilisers is, in fact, the transition from subsistence to commercial farming. Indicators for this transition include cash income, cash sales, cultivated area and, of course, use of hybrid seeds and mineral fertilisers, all of which increase during the transition process. It was also observed that commercialised farms showed a high incidence of use of oxen, of primary schooling and of cooperative undertakings. As compared with the group of traditional and emergent farmers, commercial farmers included few female-headed households.

This transition pattern observed by IFPRI lends credibility to the so-called 'Lima ladder' propagated by Zambian researchers. They suggest that subsistence farmers grow cash crops, such as sunflowers and soybean, on a small portion of their land as an initial step and use the proceeds thereof to buy fertilisers. The next step (season) is to apply the fertiliser to their traditional maize crop, which will modestly increase its yield so that a smaller area need to be devoted to maize for home consumption. The land and labour thus saved can now be used to plant hybrid maize, the proceeds of which can be used to increase the area for hybrid maize and eventually to hire labour and use animal traction. In the sample observed by IFPRI it became apparent that the first step, growing cash crops, was often skipped since many farmers financed their fertilisers out of off farm income.

(Box 9 continued)

Use of oxen (larger area)

⇑

season 4

Farmer hires oxen; grows four Limas of hybrid maize

⇑

season 3

Farmer halves local maize area, adds two Limas of hybrid maize. Fertiliser or cash obtained from sale or barter of surplus maize and soybeans or sunflowers

⇑

season 2

Farmer sells (or barters) four bags of sunflower seeds for four bags of fertiliser for his local maize (or buys fertiliser with cash from sale of two bags of soy beans)

⇑

season 1

Farmer grows one Lima of soybeans or two Limas of sunflowers

⇑

season 0

Subsistence farmer with no cash crop and no fertiliser for his local maize

Source: IFPRI, *Fertiliser use on smallholder farms in Eastern Province*, 1993

Figure 15 Lima ladder (a Lima is a parcel of land of about 0.25 ha.)

ending of transport subsidies will clearly tend to reduce maize production in these areas, especially since sorghum, millet and cassava have traditionally been grown there.

Maize output and yields

World Bank figures indicate that the aggregate rise in maize output over the period 1974–89 was due entirely to increases in the area under cultivation. Despite increased fertiliser use, output per hectare actually fell, reflecting among other things poor yields on acid soils unsuited to maize-growing. Close analyses of fertiliser use and expansion of the area under cultivation at the provincial level indicate that there are two processes, operating in parallel, which between them have the effects indicated.

The first process characterises provinces where land is still plentiful (Northern, Western, Northwestern, Luapala). Here, small farmers were encouraged by the availability of cheap fertiliser and unfarmed land to increase the area under cultivation. While total maize output rose, the agricultural practices involved were far from optimal (this was 'high input, low output' agriculture) and yields fell.

The second process marks those provinces where soils are less susceptible to acidification and agriculture is more highly developed. Here, output rose largely as a result of intensification (increased use of fertiliser and labour per hectare), i.e. yields increased. As table 31 shows, these are the provinces that use most fertiliser.

Maize yields vary widely among various categories of farmer. In the case of subsistence farmers output per hectare is between six and 12 sacks, in that of emergent and small farmers between 12 and 40, and in that of large farmers between 60 and 120 sacks. The average maize yield in 1990–91 stood at just over 20 sacks per hectare, a clear improvement on the 1960s when the figure was just over twelve.

Maize yields and gains from fertiliser use depend among other things on management factors such as the timing of cultivation work, including planting, and the timing and amount of fertiliser application (see table 33).

Table 33 Critical importance of husbandry practices to yield improvements

Fertiliser	Local seeds	Hybrid seeds	Husbandry practices	Yield (tons/ha)
SO	–	–	SO	1.4
O	–	O	SO	4.6
	O	–	O	4.9
O	–	O	O	8.8

O = Optimal level; SO = Sub-optimal level; – = No application.

Source: World Bank, Agriculture Operations Division, Southern Africa Department, *Zambia Agriculture Sector Strategy: Issues and Options*, 1992.

Food supplies

From 1984 onwards Zambia was self-sufficient in staple foods (maize, millet, cassava); little or no food was imported, nor was general food aid given, though this did happen in the drought years of 1981–82 and 1991–92. In the first instance the beneficiaries of improved food supplies were the poorer sections of the population, since maize and corn meal were available throughout the country at relatively low, heavily subsidised prices.

In the drought years those hardest hit by inadequate food supplies were the poorest sections of the urban population: with less maize coming onto the official market they were dependent on the much more expensive black market for their supplies. While small commercial farmers lost income in the drought years because they had no maize to sell, at least they still had access to some local maize for their own use. As production credit in the form of fertiliser was available only for maize, however, output of local food crops fell (box 9). Since the new hybrid varieties are much more drought-sensitive than traditional crops, this shift in the pattern of production jeopardised emergent farmers' food security in drought years, particularly in areas less suited for maize production. The susceptibility of hybrid maize to drought conditions is compounded by the fact that it is planted later than local maize varieties.

Relief of poverty

While the poorer sections of the population generally had access to cheaper food, government policy proved unable to prevent the Zambian population becoming poorer over the period 1980–91. An Iowa State University study (1991) found 32 per cent of the population living below the poverty line, of whom more than half were rural dwellers. The 'poverty line' is set at half of the average income per head. The World Bank states that: 'The food security problem in Zambia is not so much a question of inadequate supplies or production of food at the national level as it is the general decline in per capita real income under rapid inflation. In addition, there is considerable evidence that many rural households are experiencing nutritional deficiencies, in part due to insufficient food supplies at the household level, at least seasonally' (1992, p. 64).

5.3.4 *Fertiliser and sustainable development*

5.3.4.1 *Ecological sustainability*

Fertiliser types

The types of fertiliser that farmers are advised to use on particular crops are determined on the basis of agricultural research which has been under way since the 1950s. The greatest contributions to this research have come from Mount Makulu Research Station and the University of Zambia, albeit in recent years financial support for the work has come mainly from donors.

Zambia: Agricultural labourers handle bags of compound fertilisers (NPKSB) on a farm near Lusaka.

Two main types of fertiliser are distinguished (table 34):
- basal dressing, a compound fertiliser whose composition is geared to particular crops (maize, tobacco, cotton, groundnuts, sunflowers etc.);
- top dressing, a simple fertiliser with a high concentration of one nutrient such as urea or ammonium nitrate (AN).

In Zambia all compound fertilisers must contain at least ten per cent sulphur.

Since the type of fertiliser required depends on soil type as well as the crop grown, different types have been developed for certain crops; in the case of maize, for example, fertilisers variously containing ten and 20 per cent N are used depending on the type of soil. In the 1980s compound fertilisers recommended for maize accounted for 53 per cent of fertiliser use, while simple nitrogenous fertilisers (27 per cent urea and 12 per cent AN) accounted for 39 per cent; the remaining eight per cent comprised other simple and compound types.

The composition of fertilisers and recommended annual application rates have been adjusted over the years in the light of continuing research and practical experience. The fact that prices have not reflected nutrient content has encouraged their over-application. Moreover, the types used have not always been the most appropriate, putting ecological sustainability at risk.

Table 34 Fertiliser types and composition

Type	Fertilisers	Nutrient composition (%)				
		N	P_2O_5	K_2O	S	B
Basal dressing	Compound A	2	18	15	10	0.1
	Compound V	4	18	15	10	0.1
	Compound C	6	18	12	10	
	Compound D	10	20	10	10	–
	Compound X	20	10	5	10	–
	Compound R	20	20	0	10	–
Top dressing	Urea	46	–	–	–	–
	AS	21	–	–	24	–
	AN	34	–	–	–	–
	SSP	–	19	–	12	–
	TSP	–	44	–	–	–
	Potash	–	–	60	–	–
	Potash-Sulphate	–	–	50	16	–

Source: C.N. Mulenga, W.A. Stoop, *Soil Fertility in Fields of Small Farmers in Western Province – Zambia, Report of a Support Mission to ARPT Western Province*, KIT, 1991.

Problems relating to fertiliser use

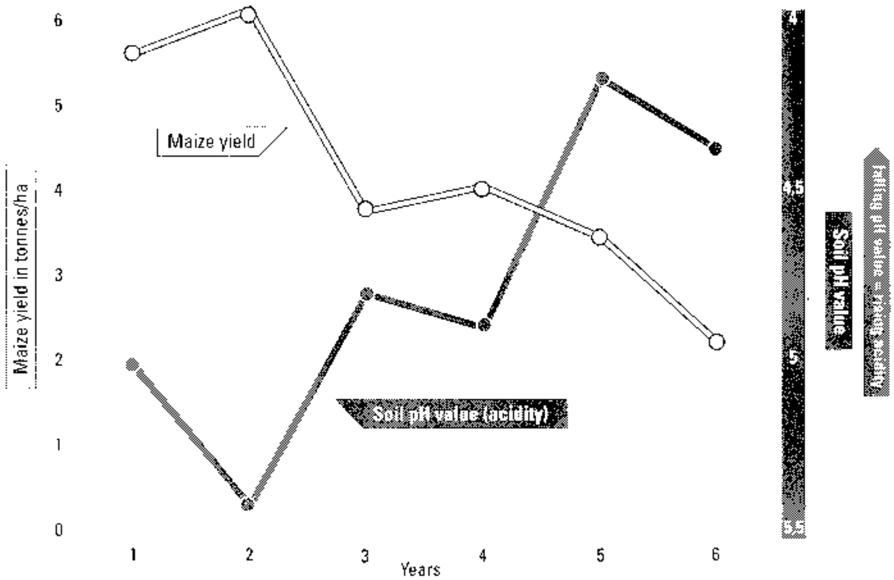
Sustainability of the benefits of fertiliser use has long been a focus of debate in Zambia. In the late 1970s trials in various parts of the country found that after three or four years of applying nitrogen to acid soils (Northern Province, Western Province) yields began to fall unless countermeasures were taken.

Zambian soils are old and much of their lime and nutrient content has been leached out. At least half of the country's cultivable land shows relatively low Ph values (i.e. the soil is acid), which have been further lowered by long-term nitrogen application and failure to maintain the soil's organic content. Increasing acidity reduces plants' ability to take up nutrients, leading to sharply falling yields (box 10). The acidifying effects of nitrogen can be countered by the application of lime, and trials have shown that this enhances the sustainability of fertiliser use. The rule of thumb is that around three tonnes of lime need to be applied to every hectare of fertilised land once every four years (table 35).

The effectiveness of lime and its impact on the sustainability of agricultural production and fertiliser use is demonstrated in areas along the line of rail, which have been farmed commercially for over a hundred years and where maize yields are currently

Box 10 Mineral fertiliser, soil acidity and output in Zambia

The harmful effects of long-term nitrogen application without the addition of lime have been clearly demonstrated in Zambia; indeed, experience shows that even balanced NPK application may not be enough to stop yields falling in monocultures. Soil analyses show declining yields to be associated with rising acidity (i.e. falling Ph values) and falling organic content. Figure 16 shows the link between downward trends in maize production and pH values.



Source: PRMC, in: *La Riziculture Paysanne à l'Office du Niger, Mali, 1979–91*, IOV 1992.

Figure 16 Average annual maize yields and soil pH values in Misamfu, Zambia

The Zambian Association of Official Agricultural Chemists puts the amount of lime needed to counter acidification due to the application of nitrogen to maize at 1.8 kg for every kilogram of added N. Since Zambian farmers use 100–160 kg/ha of N on land where maize yields are high, this means that 200–300 kg of pure lime must be applied for every harvest.

Rising acidity is not limited to the topsoil but extends to lower levels. This makes action to counter acidification even more difficult, given that in Zambia 60–70 per cent of maize is produced by smaller farmers who have no access to lime or to the equipment needed to apply it effectively.

Source: Zambia case study, carried out as part of the IOV evaluation of fertiliser aid.

Table 35 Response of maize to lime (based on trials carried out in Samfya, 1970–75)

Single lime application (kg/ha)	Average yields (t/ha)				
	1970/71	1971/72	1972/73	1973/74	1974/75
None	1.8	1.5	0.9	0.8	0.5
450	4.2	1.7	4.0	0.9	0.7
450 (annually)	2.8	2.7	4.0	3.2	1.4
900	3.5	2.7	4.5	2.7	1.1
1800	3.1	3.1	4.4	2.3	1.4
3600	3.9	3.4	4.2	2.2	1.8

Source: MAWD Annual Research Report.

among the highest in the world (10–12 t/ha). Amounts of lime used in the rest of the country are negligible, since high transport costs make its application uneconomical.

The agricultural advisory and training services have yet to deal seriously with the problem of acidification at small-farmer level, with the result that small farmers are not properly familiar with the causes and consequences of rising acidity or with possible remedies. In particular they are unaware of the vital need to apply lime, and moreover lack the resources that this would demand. Large commercial farmers apply lime, but all these farms are located close to chalkpits or to the line of rail. It is estimated that rising acidity due to fertiliser use will lead within 20 years to the loss of 15 per cent of cultivable land in Northern Province.

Failure to apply lime along with mineral fertiliser is just one of several obstacles to sustainable agricultural production. Others include erosion due to deforestation and overgrazing, and the pollution of surface waters by agricultural and industrial activities.

The intensification of agricultural production under growing pressure of population has shortened the traditional fallow period of 20–25 years to just 6–10 years, resulting in soil degradation. While over 80 per cent of the country's cultivable land is fallow or unused, pressures on the land have increased sharply in 'inhabited' areas as farmers, most of whom still use slash-and-burn techniques, are restricted to the land controlled by their chief and by the often considerable distances between field and village.

To sum up, the main problems associated with fertiliser use are:

- inefficient use encouraged by subsidised prices;
- rising soil acidity due to the imprudent use of nitrogenous fertilisers and the failure to apply lime (notably in the north).

Since privatisation of the fertiliser trade, a further problem has been the limited availability of mineral fertiliser in large areas of the country.

Use of organic matter

The Zambian government does not have a policy of encouraging the use of animal manure and other organic matter. The scale on which animal or green manure is used is negligible: livestock numbers are so low (except in a small area of Western Province) that very little animal manure is available in proportion to the area under cultivation. Farmers use such organic material as they have in growing vegetables for their own use. Small and subsistence farmers are not in a position to grow and use green manure, since this would take up land that would otherwise be available for growing crops; digging the material into the soil, moreover, is heavy and labour-intensive work.

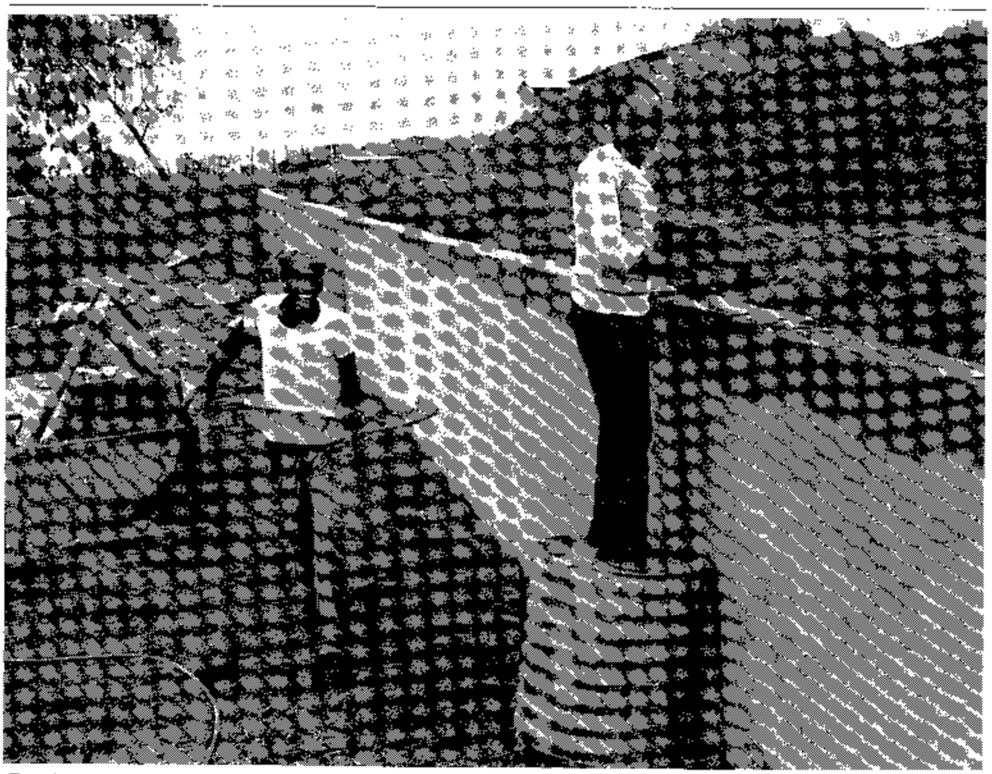
The soil's organic content, already low, has been further lowered by non-optimal farming practices. Research has found that in parts of Zambia the organic content of the topsoil has fallen by 50–70 per cent after five years or more of cultivation, which indicates the need for rotation.

Promoting sustainable agricultural production

Since the start of the 1980s the Adaptive Research Planning Team (ARPT, now Farming Systems Research Team-Western Province, FSRT-WP) has been engaged in on-farm and field trials in every province. The aim is to develop LEISA crop patterns and agricultural techniques that are ecologically sustainable. The main focuses of attention are:

- the use of green manure and, particularly, the cultivation of leguminous plants with a view to maintaining soil fertility;
- the efficient use of organic manure;
- the development of water-conservation and minimum-tillage techniques which small farmers can use to maintain the soil's organic content and water-retaining capacity.

Farmers have taken a wide variety of measures geared to ecologically sustainable production. Those adopted by small and emergent farmers include reducing or abandoning the use of fertiliser (and switching back from maize to traditional crops), water conservation, cultivation of legumes and green manure, and the use of shifting cultivation practices. Erosion-control measures formerly required by the colonial



Zambia: In order to prevent further erosion, a wall is erected in Western Province.

authorities were no longer enforced after independence. As a result the more densely populated areas have suffered erosion and desertification.

In contrast, larger farmers have over the years adopted zero- and minimum-tillage methods and more efficient techniques of fertiliser use (in terms of timing and application rates), reduced the use of pesticides, and taken steps to maintain the soil's organic content and to counter acidity. Irrigation has not as yet led to increasing soil salinity. These techniques have enabled large farmers to achieve financially viable and reasonably sustainable levels of output.

The cultivation of foodgrain crops better suited to Zambia's ecology – such as sorghum – is another way of achieving more sustainable agricultural production.

Air and water pollution

Since 1972 NCZ has been producing fertiliser at a plant in Chilanga, 40 km south of Lusaka on the river Kafue. While the plant has its own water-treatment facility it is inefficient, with the result that the effluent contains high concentrations of nitrates and of P, K and a number of other elements. This 'treated' effluent is discharged into the sewers for further processing at the municipal sewage-treatment plant (if it is working) and eventual discharge into the Kafue. Unfortunately the outflow is upstream of the point at which Lusaka's drinking water is abstracted; the chief problem is that nitrate levels are so high (18.1 mg/l) as to present a danger to public health.

5.3.4.2 *Financial sustainability*

The main factors affecting the choice of crop and its financial sustainability are the market price and the cost of transporting it to market, input costs, the efficiency of fertiliser use (which depends in turn on climate, soil type, crop and management), labour availability, credit, etc.

Calculations of production costs provided the main basis on which the Zambian government set the prices of fertiliser and maize. The costs considered were those of the large commercial maize-growers, whose methods of soil treatment were assumed to bring the highest production costs; this meant that the prices set were automatically favourable to the small farmer. In practice, however, the margins were on the narrow side for the larger farmers, producing the shift in hybrid maize cultivation from large to small farmers that was mentioned earlier.

The relation between costs of fertiliser use and the extra yield resulting from that use is indicated by the Value Cost Ratio. As a rule of thumb it is said that farmers will start to use mineral fertilisers if the VCR is two or higher, depending on the extent to which farmers are prepared to take risks. As appears from table 36, fertiliser use has been quite profitable in maize production since the VCRs have been well above two.

Since 1989 the profitability of maize hasfluctuated, reflecting the fact that maize and fertiliser prices have risen at uneven rates. Government's concern is that fertiliser prices will rise faster than maize prices, discouraging maize production. There has already been some shift of production back to large farmers, a trend which government has been watching closely as it fears a possible fall in maize supplies. The government therefore wishes to continue to play a guiding role in ensuring food security in Zambia. After the drought of 1991–92 it intervened on a large scale in the maize and fertiliser markets. In the 1992–93 season the price of fertiliser indeed rose faster than that of maize, making the purchase of fertilisers for top-dressing more difficult.

Table 36 Value/cost ratios for fertiliser application to hybrid maize

Year	VCR
1983/84	4.1
1984/85	4.4
1985/86	8.4
1986/87	4.4
1987/88	4.5
1988/89	5.2
1989/90	2.9
1990/91	7.2
1991/92	15.2
1992/93	5.1 (Estimate)

Based on: Zambian Ministry of Finance (1989).

Chapter 6 Conclusions

The results of the desk studies described in chapters 2 and 3 and of the country studies described in chapters 4 and 5 allow a number of conclusions to be drawn regarding the questions formulated in chapter 1:

- How has Netherlands policy on fertiliser aid developed, and in how far did it correspond with the changing situation and needs of developing countries?
- What considerations have been taken into account in the appraisal of applications for fertiliser aid and how effective were the management instruments at the disposal of the Directorate General for International Cooperation (DGIS)?
- How efficiently has fertiliser aid been provided?
- How effective has fertiliser aid been at the macro-level?
- Was fertiliser aid an effective instrument in the relief of poverty?
- Did fertiliser aid contribute to sustainable development?

A major dilemma in the evaluation of fertiliser aid is that it has been regarded as both a fungible form of macro-aid and as a means with which to realise objectives at the meso- and micro-levels. It might be asserted that once the fungibility of aid is established, there is no longer scope for analysis at the sectoral or micro-level. The report does not enter into the complicated issue of fungibility in its various forms (aggregate or categorical) but uses the definition formulated in *Import Support* (IOV 1989). It is assumed that even fungible aid is not without economic and/or policy effects, which allows for analysis of its effects at the meso- and micro-levels.

6.1 Development of Netherlands policy and the needs of recipient countries

Netherlands policy

Until 1985 fertiliser aid was considered only in general terms in various White Papers. In 1985, the only sectoral policy document to deal explicitly with fertiliser aid was published. It contained a plea for multi-year agreements for fertiliser aid, including complementary measures to target the aid to relevant groups so as to increase its effectiveness. These recommendations were more or less echoed in ministerial answers to questions, reports and letters from Members of Parliament, pressure groups and the fertiliser industry. Parliament and pressure groups were mostly concerned with the effect of fertiliser aid on target groups, such as small farmers, and on the environment in general. The industry tried to maintain the supply of fertiliser from the Netherlands. Most of the recommendations formulated in the memorandum, however, were not implemented.

> *The memorandum on Fertiliser Aid (1985) included a number of specific policy recommendations relating to fertiliser aid, but they had little or no effect on the conduct of policy.*

Fertiliser aid was intended to contribute to the main objectives of the Netherlands' aid policy: economic self-reliance and poverty alleviation. The White Paper *A world of difference* (1989), however, emphasised the development of Low External Input Sustainable Agriculture (LEISA), thereby implicitly distancing itself from fertiliser aid. A more differentiated approach towards the role of mineral fertilisers in maintaining soil fertility was adopted in the sectoral memorandum *Sustainable Land Use* (1992).

Fertiliser aid was perceived as a fungible* form of macro-economic aid. In principle, a general policy agreement between the Netherlands and the recipient country was a sufficient condition for its disbursement. The tying of the aid to the purchase of a particular product suggests a policy intention on the part of the Netherlands to use this macro-level instrument to pursue sectoral and micro-level objectives. Differing

* Programme aid is considered fungible when it substitutes for imports that would have been effected anyway, rather than being additional to planned imports (both commercial and aid financed). Fungible aid, therefore, does not lead to more means for the recipient of the currency or commodities, but frees financial means at the macro-level (for the recipient government) for other (usually unknown) purposes. This definition is a simplification of the complex realities that underlie the concept of fungibility. White (1994) distinguishes categorical and aggregate fungibility, which each have different economic and policy effects. He further gives three reasons for conducting micro-analysis when evaluating macro-aid forms: aid may not be fully fungible; donor involvement may change the nature of that activity; and donors must be able to pin their funds to some goods or activity (White 1995).

views between the Netherlands and the recipient country on macro-economic and sectoral policies, however, did not always lead to the immediate discontinuation of fertiliser aid, e.g. in Zambia, Sudan and Sri Lanka. Stated reasons to continue fertiliser aid despite substantial disagreements on major policy issues were the desired continuity of aid relations and a possible threat to food security.

Fertiliser aid between 1970 and 1991 aimed to contribute to the main objectives of the Netherlands' development aid policy: poverty alleviation and economic self-reliance. Over the years, fertiliser aid has been considered a flexible form of aid, enjoying high priority among recipient countries.

Prior to 1986 in particular, appraisals for fertiliser aid were rather superficial and conditionalities were rare. Later in the decade conditionalities were adopted from World Bank programmes for structural adjustment, without investigating whether the speed and scope of the imposed adjustment measures were in the best interests of ecological sustainability and the intended target groups. In the turmoil of market liberalisation and the privatisation of state enterprises, recipient governments were usually left to sort out their new position vis-à-vis the private sector, without adequate help from donors to equip them for their new role. The Netherlands sometimes continued to deliver fertiliser aid to inefficient parastatals (e.g. in Bangladesh and Zambia) while simultaneously demanding their privatisation or abolition through structural adjustments. Attempts to circumvent government institutions met with limited success in several cases (e.g. in Mali and Bangladesh). It seems as if not only the recipients, but also the donors including the Netherlands, were far from ready to shift their attention to the private sector.

Counterpart funds, i.e. revenues generated from the sale of fertiliser aid, are in principle at the free disposal of the recipient government. Nevertheless, attempts were made to tie these funds to particular projects. Their share in the total budget of the Government of Bangladesh was well below one per cent and no conditions were attached to their use. Most counterpart funds to Mali constituted in practice general budget support to a recipient Regional Development Organisation, although it was supposed to spend the funds on specific rural development programmes. In Zambia, the funds were in part tied to local cost financing of Western Province projects, the enforcement of which was hardly feasible.

The scope for guiding developments in recipient countries offered by fertiliser aid as against pure currency support has not been exploited to any significant extent.

During the 1980s, several pressure groups and Members of Parliament raised the issue of environmental effects of fertiliser use. The sectoral memorandum *Fertiliser Aid* (1985), devoted little attention to the use of fertiliser in the various farming systems, nor to its ecological consequences. In 1989 *A World of Difference* devoted ample attention to ecological sustainability, but virtually ignored mineral fertiliser application in favour of LEISA. LEISA, however, requires location specific insight in socio-economic and agro-ecological conditions for its safe introduction. Unsuccessful attempts to adopt this method may lead to environmental degradation, due to depletion of soil organic matter through the over-exploitation of natural resources. This was reflected in the subsequent sectoral memorandum *Sustainable Land Use* (1992) where a more balanced view is given of the respective roles of organic and inorganic fertilisers in sustainable land use systems. By this time, however, Netherlands fertiliser aid had been almost phased-out, due to reductions in country programmes in general and programme aid in particular.

> *The decline of fertiliser aid was caused predominantly by policy decisions regarding programme aid in general and external circumstances. The generally critical attitude towards fertiliser use in the period 1989–91, however, facilitated the rapid decline of fertiliser aid after 1989.*

External causes comprise *inter alia* an increasing production capacity in Asian countries particularly for nitrogenous fertilisers, the liberalisation of fertiliser markets, and the declining purchasing power, especially of small farmers in Africa, resulting from structural adjustment processes.

Recipient country priorities

The Green Revolution of the 1970s greatly increased the need notably for nitrogenous fertilisers (urea), especially in Asia. For a variety of reasons the Green Revolution did not take off on the same scale in Africa, where ecological, economic, cultural and institutional conditions were less favourable to the introduction of fertiliser. Most countries had considerable import requirements: the fertiliser needs of African countries had to be met almost entirely from imports, and fertiliser also constituted a substantial part of the import bills of Asian countries.

> *Fertiliser aid given by the Netherlands has helped to meet recipients' requirements. The types of fertiliser supplied have been almost entirely in line with their wishes.*

In some cases, the reductions in fertiliser aid have partly been replaced by other programme aid forms such as reimbursement of priority imports, contributions to currency auctions and Open Government Import Licensing systems, and the co-financing of the World Bank's structural adjustment programmes. The reduction of fertiliser aid levels is not in line with the priorities of recipient countries.

6.2 Aid procedures

Fertiliser aid procedures consist of the appraisal of aid applications, advisory services, and ex-post evaluations of aid deliveries.

Appraisal

Appraisal memoranda for fertiliser aid prior to 1986 were brief and sketchy. The institution of the Projects Committee (1987) and the introduction of the detailed checklist for appraisal memoranda (1989), resulted in longer and more informative appraisal memoranda, but did not contribute to more uniformity of appraisals. Fertiliser distribution and use were considered to be the responsibility of the recipient country. Macro-level judgements were generally borrowed from IMF and World Bank analyses and accepted uncritically. In some cases fertiliser aid was given despite negative macro-economic judgements on grounds of urgent necessity, food security and the need for continuity of the aid relationship. Recipient countries' agricultural policies tend to be examined in terms of price policies and subsidies. Institutional factors (such as credit provision and advisory and research services) and more general socio-economic issues (such as the position of small farmers and inequalities of land ownership) are given only limited consideration. Environmental implications were not taken into account until 1990. It was generally presumed that small farmers were among the beneficiaries of fertiliser aid.

> *Macro-economic aspects prevailed in the appraisals. Expected effects of fertiliser aid at the institutional level and the effects on farmers groups have been given only limited attention.*

The DGIS advisory structure for fertiliser aid comprised the Technical Advice Section of the Sectoral Policy, Spearhead Programmes and Technical Advice Department (DST/TA), as well as the Food Supplies Purchasing and Sales Section (VIB) and the Department for Development Cooperation (OSL) of the Ministry of Agriculture, Nature Management and Fisheries. The advice given concerned the type and quantity of fertiliser and related logistics.

Advisory services with regard to the type and quantity of fertiliser to be provided and the related logistics have been adequate.

DGIS staff lack sufficient familiarity with the technical aspects and use of fertiliser types and, more importantly, with the developmental implications of this aid form. Comprehensive fertiliser knowledge was mostly vested in one or a very few persons who were not always consulted by the country desks. After 1990 agro-ecological advisory arrangements were strengthened by the expansion of DST (Spearhead Programmes Coordination and Technical Advice Department) and by the appointment at the embassies of sector specialists with environmental expertise.

DGIS staff had little specific knowhow with regard to macro-economic appraisals as well as environmental and developmental effects of fertiliser aid at micro-level. Despite the large sums of money involved, adequate advice in this field was often neither sought nor given.

Procurement procedures

Depending on the aid procedure, procurement through International Competitive Bidding was either carried out by VIB or by an organisation in the recipient country. Tendering procedures were in most cases adequately monitored, either by VIB or by the Netherlands' embassy, and prompt payment was assured by the Netherlands Investment Bank for Developing Countries (NIO). Depending on the chosen aid form, NIO either paid the fertiliser supplier immediately after shipment, or reimbursed the recipient country for fertiliser imports effected earlier in the year. The latter form was mostly applied in Asia, where recipients were well equipped to negotiate their own fertiliser imports. The difference between reimbursement and unconditional balance-of-payments support is purely theoretical and recently the practice of reimbursement has been abandoned.

Procedures with regard to fertiliser procurement were clear and efficient. African countries mostly used the services of VIB to procure their fertilisers. Countries with experienced purchasing agencies, notably in Asia, have proved able to obtain supplies on reasonably favourable terms. It should be noted that international tendering, required by the Netherlands for reasons of accountability, tends to drive prices upwards as producers and traders seek to protect themselves against certain price and foreign-exchange risks during the tendering period. Experienced buyers prefer direct negotiation.

The procedures for procurement, shipment and payment of fertilisers under the Netherlands' aid programme were clear and have been implemented efficiently by organisations in the Netherlands and in recipient countries.

Evaluations of fertiliser aid

Where evaluations were not concerned exclusively with the procurement and international transport of aid fertilisers, terms of reference tended to differ significantly. Evaluation reports often added more information (than required in the terms of reference) on institutional and micro-issues which were deemed of importance to the effectiveness of fertiliser aid. The main emphases in the reports depended to a considerable extent on the disciplinary composition of the missions.

Missions took a predominantly positive view of the macro-level impact of fertiliser aid. Their assessment of the role of intermediary organisations was much less favourable: inefficient distribution was frequently cited, particularly in the period prior to privatisation. Missions gave considerable attention to various micro-level effects, mainly of an agronomic nature but also under such headings as employment, farm incomes, production systems and the impact on small farmers. Micro-level effects tended to attract less favourable (or indeed entirely unfavourable) judgement. Many recommendations were in line with the proposals formulated in the sectoral memorandum on fertiliser aid (1985).

Appraisal memoranda made regular but selective reference to the conclusions and recommendations of evaluation missions, but mission findings have not had any structural and systematic impact on the points covered. Evidently a positive evaluation at the macro-level was thought sufficient to justify approval of new proposals.

More effective use could have been made of the results of evaluations of fertiliser aid. They could have prompted a re-examination of some types of fertiliser supplied and improvements in aid efficiency (distribution, logistics) or additional technical assistance (information, training, research).

6.3 Aid efficiency

To determine the efficiency of the Netherlands fertiliser aid the following questions are relevant:

– Was a competitive price paid, given the conditions governing procurement?

- Were disbursement pressures at work and, if so, did they affect the prices paid?
- Would a cheaper type of fertiliser have brought the same agronomic result?
- Have complementary activities been developed to help maximise the efficiency of fertiliser aid?

Fertiliser prices

Initially tied to procurement in the Netherlands, fertiliser aid loans were partially untied in 1975 on the basis of international agreement. The Netherlands also partially untied financial aid grants for LDCs. Grants to non-LDCs were in principle tied, but in individual cases this condition could be waived. In 1989 all financial aid was partially untied and in 1993 all aid to SPA-countries in Africa was in principle fully untied. Procurement in the Netherlands and Eligible Source Countries was financially efficient. Two products (urea and triple superphosphate) could be obtained cheaper from non-ESCs (Eastern Europe and the United States respectively), but recipient countries tended to regard products from these sources as less adequate, on grounds of quality (product properties, packaging) and reliability (timely delivery). In the period under consideration (1985–91) only Sri Lanka, a non-LDC, still received in part *de facto* tied fertiliser aid until 1989. This led to higher import prices.

Prices paid for fertiliser were generally competitive.

Disbursement pressure

Fertiliser aid is widely thought to be subject to disbursement pressure, which is considered to affect its efficiency. Analysis of fertiliser-transaction payment dates over the period 1985–91 shows that a relatively large number of payments (38 per cent) were made in the month of December. When the dates of signature of appraisal memoranda are also taken into account, however, it is clear that only 14 per cent of all fertiliser-aid spending was subject to disbursement pressure. The December payment peak is inherent in the DGIS administrative cycle. Where disbursement pressure was involved, checks indicated that this had little or no adverse effect on prices.

The amount and rhythm of fertiliser aid was not substantially influenced by disbursement pressure. Where this was observed, it did not lead to price inefficiencies.

Fertiliser types

Whether cheaper fertiliser types could have been substituted for those actually supplied is a complex technical question: a cheaper product does not necessarily represent better value, since particular crops and soils may have specific requirements as regards the form, combination and water solubility of nutrients. Some highly complex types of fertiliser that have been developed for certain (mainly export) crops are difficult to produce and therefore more expensive; compound fertilisers that are low in nitrogen are an example. The effectiveness of some of these complex fertiliser formulas (e.g. cotton fertilisers in West Africa) is under discussion.

Poverty alleviation was to be achieved partly through improved food security. Complex and expensive fertilisers intended for cotton and tobacco, for example, tend not to be used by the poorest farmers, while single nutrient (straight) fertilisers and basic formulas such as NPK 15-15-15 are more likely to be used by food-producers. Complex formulas are not entirely to be disregarded in this respect, however, since food crops grown in rotation with cash crops substantially benefit from the residual effects of these fertilisers.

> *Most of the fertiliser supplied under the Netherlands fertiliser aid programme found its way to food crops. Generally the types supplied were adequate and efficient. Only in some cases could well-informed involvement by DGIS have resulted in cheaper alternatives.*

Technical support activities

Stated policy as well as evaluation reports have frequently called for supplementary aid to be directed towards the development of fertiliser policy and use in the recipient country (planning, logistics and distribution, research and training services, local fertiliser production and staff training). Despite these recommendations and policy intentions, the number of such projects has remained relatively small and project and programme aid have rarely been effectively coordinated. The Netherlands, along with other fertiliser donors, has shown little interest in providing governments engaged in deregulation with technical support geared to their new role. Exceptions were the aid given to Mali and such projects as FADINAP, IFDC-Africa and NFDC (Pakistan). Others, such as projects under the FAO fertiliser programme, some of which were supported by the Netherlands, have not been very successful.

The felt need for an explicit policy with regard to fertiliser utilisation and its implementation through fertiliser-related projects must have been low, due to the macro-economic character of this aid instrument. This does not mean, however, that fertilisers have not found their way to nutrient-hungry soils in recipient countries. It merely implies that chances have been missed to complement this substantial aid item on a larger scale with measures that could have increased its efficient use and the introduction of more sustainable fertiliser use practices.

Over the years relatively little effort has gone into projects aimed at improved fertiliser policy, logistics, research and use in conjunction with the often substantial fertiliser donations. Opportunities to complement this substantial aid item on a larger scale with measures that could have increased the efficiency of its use and the introduction of more sustainable fertiliser use practices have not been exploited on a significant scale.

6.4 Macro-level effects

The impact of macro-level aid depends on its scale. The macro-economic impact of the Netherlands' fertiliser aid value depends partly on the size of the recipient country's economy: it has been relatively greater in the case of the small African economies than in Asian countries, even though the absolute amounts going to the latter are often far larger. The value of fertiliser aid ranged from less than one per cent of the deficit on current account for Bangladesh, through between one and two per cent for Mali to four to five per cent for Zambia.

The macro-economic impact of Netherlands fertiliser aid has been positive in that it relieved pressure on the balance of payments and the government budget. The relative size of the fertiliser aid value suggests that the direct macro-economic effect has been of some importance for African countries but modest in Asian countries.

Fertiliser is considered to be such an essential product that developing countries will always find some way of meeting their needs, whether from their own resources or with help from donors (who, in the 1980s at least, generally showed considerable interest to provide fertiliser aid). In terms of economic self-reliance one can conclude that fertiliser aid freed funds, in hard currency, which in principle can be used freely for other imports. The Netherlands has generally not been in favour of providing fully untied currency support, including cases where there was full policy agreement and fertiliser aid was considered fully fungible.

> *Despite the presumed fungible character of fertiliser aid and a policy agreement with recipient countries, preference was given to commodity import support rather than currency support for reasons of accountability and of retaining some measure of control over aid effects on sectoral and micro-levels.*

Counterpart funds generated by the sale of foreign currency and commodities to the private sector are normally put into the national exchequer and thus serve to bolster government revenues. DGIS does not usually impose conditions on the use of counterpart funds although there have been exceptions, particularly in Africa. In Mali, counterpart funds constituted in practice budget support to the two recipient Regional Development Organisations (ON and CMDT), although they were supposed to be spent on specific rural development programmes. In Zambia part of the funds were tied to local cost financing of projects in Western Province, but enforcement of this arrangement was not feasible. No conditions were attached to the use of counterpart funds in Bangladesh.

6.5 Implications for poverty alleviation

The findings with regard to the effects of fertiliser aid on poverty alleviation are based on country studies in Bangladesh, Mali and Zambia. Two such effects are distinguished: direct effects resulting in increased production and hence increased incomes of the poor, and indirect effects gained by increased availability of food at reasonable prices.

Bangladesh

The very small landholdings and enormous population pressure have helped to ensure that fertiliser use is widespread among both large and small farmers and among both owners and tenants, with small farmers using proportionately more than large. The advent of fertiliser use led to increased food output and hence to a fall in the average level of real prices. This is clear from the fact that, before 1971, rice prices rose more rapidly than the overall consumer price index, whereas between 1971 and 1985, when fertiliser came into widespread use, the rise was in line with general inflation. This benefited all who depended on the market for food supplies, including marginal farmers and the (virtually) landless. The cultivation and processing of modern rice varieties is generally more labour-intensive, providing employment for landless men and women and for the wives of marginal farmers.

Through increases in food production and employment, the benefits of which extend to the poorest sections of society, fertiliser aid has helped to promote the Bangladeshi government's overall aim of raising rural living standards.

While there is no evidence of widening inequalities of income or of particular groups being marginalised as a result of the introduction of fertiliser, it is likely that the associated increased need for credit has added to the risks facing small farmers and made them more dependent, e.g. on local landlords and loan sharks. Special programmes have been developed to encourage fertiliser use by female-headed households through the provision of credit.

Mali

Fertiliser aid to Mali has never been geared explicitly to the relief of poverty but rather to the development of zones of high potential, namely, the regions covered by the *Office du Niger* (rice) and the *Compagnie Malienne pour le Développement des Textiles et des Fibres* (cotton). Farmers in both regions have benefited from the aid, which was incorporated into wide-ranging, long-term and process-based district development programmes. Evaluation of these programmes has shown a marked increase in farmers' economic self-reliance, especially in the *Office du Niger* region. Rice output has more than doubled, and in the cotton-growing region the residues of fertiliser applied to cotton have benefited commercial maize production.

Food production has risen in both target regions of the Netherlands aid to Mali, due to fertiliser use, increasing the supply of food on local markets. Many poor farmers have been able to improve their income through the provision of fertilisers in combination with institutional and other support.

Zambia

The Zambian government for long pursued a policy of cheap food for all, achieved through heavy subsidies on agricultural inputs (hybrid seeds and fertilisers) and on the national staple: maize (including its processing into meal). In the towns there were special state shops, generally poorly stocked, where the poorest could obtain maize meal in exchange for coupons.

The effect of the subsidies was to make hybrid maize-production attractive, particularly to smaller farmers; women too were enabled to grow maize commercially, often also applying fertiliser to traditional maize varieties grown for home consumption. The result was the commercialisation of agricultural production, especially in remote areas. In 1974, large commercial farms accounted for 70 per cent of maize output, by the end of the 1980s their share had fallen to 30 per cent. Spiralling subsidy costs eventually forced the government to adopt a rigorous adjustment policy leading, from 1991 onwards, to a more rational distribution of factors of production: this has once again concentrated maize production among farmers located close to roads and railways and not too distant from centres of population, while farmers in more remote areas have reverted to traditional crops.

In the 1970s and 1980s Netherlands aid served to underpin Zambia's unsustainable agricultural policy by facilitating heavy fertiliser subsidies. A large proportion of the fertiliser supplied went to smaller and poorer farmers, but it was used rather wastefully.

> *Fertiliser aid to Zambia has merely promoted a shift within the overall pattern of food production to the cultivation of hybrid maize, particularly by small and emerging farmers. It has not contributed to a structural increase of total domestic food production. By contributing to state revenues, fertiliser aid helped only temporarily to maintain general food subsidies, which benefited everyone, including the poor.*

On the basis of the three country studies it can be concluded that fertiliser aid has some positive direct and indirect effects on the poorer segments of the population, but it is not a form of aid that directly benefits the poorest members of the society.

6.6 Implications for sustainable development

For the purposes of this study the concept of sustainable development was operationalised by focusing on two aspects of fertiliser use, namely, ecological sustainability, conceived as maintaining soil fertility, and financial sustainability at farm level.*

* These limitations imply that the ecological and financial consequences of mineral fertiliser production in countries other than those where it is used (in this study Bangladesh, Mali and Zambia) will not be considered. While attempts are increasingly being made to determine such environmental costs at a global level and to include them in cost/benefit calculations, this is not yet general practice and it would be beyond the scope of this evaluation to attempt to arrive at such estimates.

Ecological sustainability

Factors leading to soil degradation include persistent negative nutrient balances, which occur when nutrients are lost more quickly than they are replaced (by whatever means). All three countries covered in this study suffer deficiencies of one or more soil nutrients in the main food-growing areas. A deficiency of only one nutrient can severely restrict crop growth.

Despite their high natural fertility, soils in Bangladesh are deteriorating, mainly on account of poverty combined with extreme population pressure. Most organic crop residues are not being returned to the soil but are used as construction materials, fuel and fodder. The effects of unbalanced fertilisation and declining organic matter content in the soil are already being felt: the efficiency of Nitrogen application is levelling-off. The scarcity of organic materials and prevailing tenure systems do not encourage farmers to invest much in longer-term soil fertility. The fertiliser aid programme contributed to more balanced fertilisation by switching to Phosphorus (TSP) donations in 1985/86 when Bangladesh indicated that it had become self-sufficient in Nitrogen. At present, deficiencies of secondary and trace elements such as sulphur and zinc are making themselves felt. The Netherlands contributions to the TSP plant in Chittagong had a positive side effect in that its by-product, gypsum, contains the increasingly needed sulphur.

In the cotton growing areas of Mali a gradual soil degradation is taking place. The present agricultural practices are basically traditional farming systems, involving crop rotation and fallow periods, which in the long run do not provide an adequate answer to the growing population pressure. Malian farmers make a rather extensive use of fertilisers (once every four years), which renders only the longer-term Phosphorus balance positive. Wind and water erosion is already severe and much topsoil containing precious nutrients is being lost. In the rice growing areas, nutrient balances are generally good for the major nutrients, but here also the organic matter content will decline over time if it does not receive more particular attention.

The subsidy system in Zambia has been responsible for considerable misallocation of fertilisers. Many areas with a high natural soil acidity have been supplied with nitrogenous fertilisers (Northern and Western Provinces). As a result some soils have been degraded until they are no longer fit for agricultural purposes. Subsistence and emerging farmers thrown back onto subsistence agriculture after liberalisation of the fertiliser market, revert to traditional slash-and-burn systems. Due to relative population pressure in the inhabited areas, the required 20–25 year fallow period is no longer observed and the sustainability of these low input systems has therefore deteriorated. A positive aspect of the abolition of subsidies is the shift of fertiliser use to areas that are better suited for more intensive agricultural practices. A Netherlands-funded project in Western Province has devoted much attention to more sustainable low input agricultural practices.

In the three countries covered, farmers, researchers and decision makers are clearly aware that as land is used more intensively it becomes increasingly hard to maintain soil fertility with the sole help of organic manures and natural processes. Climatic conditions in the tropics make it difficult for organic matter to accumulate in the soil, with the result that less humus is formed than in temperate zones. Organic matter is so low in nutrients that vast amounts would be needed to maintain soil fertility, and the production of such matter in large quantities can itself pose an ecological threat (tree-felling, the presence of large numbers of livestock). High priority has therefore been given to the production (where possible) and importation of mineral fertilisers, with governments often undertaking their distribution and sale at subsidised prices.

> *Netherlands fertiliser aid has helped to meet the priority need for supplementing soil nutrients and, in Mali and Bangladesh, has clearly contributed to short-term improvements in soil fertility, particularly in rice-growing areas. It has also helped to limit nutrient losses in Zambia and in the cotton-growing region of Mali. It has not always led to more intensive land-use, however, either because labour was in too short supply or because spare land was still available for cultivation.*

The question of the contribution of fertiliser aid to the ecological sustainability of agricultural production is a complex one. In the three countries covered by this study it is clear that fertiliser use has slowed the rate of nutrient depletion, at least in the short term, but that there are nevertheless potential threats to soil fertility in the longer term. Threats from imprudent (unbalanced) fertiliser use include rising acidity levels and depletion of the soil's organic content, but ecological sustainability may also be endangered by the agricultural modernisation package as a whole (irrigation, modern crop varieties, chemical pesticides, etc.).

Unbalanced fertiliser use can lead to deficiencies of other nutrients, as was reported for Bangladesh, for example. The unbalanced application of Nitrogen can cause certain acid soils to become excessively acid: this has been reported in Kenya and Zambia and, to a lesser extent, in the cotton-growing region of Mali. Rising acidity poses a major threat to plant growth but can be countered by a package of measures, comprising the application of lime (in large quantities), the cultivation of more resistant crops and the rotation of crops, and careful management of the soil's organic content. Farmers who do not realise that they are using fertiliser in an unbalanced way often try to promote plant growth by applying still more Nitrogen, or else stop using fertiliser altogether. Such practices can be due to inadequacies in the area of information and training, and to the limited availability of affordable and suitable fertilisers and of lime.

Unbalanced use particularly of nitrogenous fertilisers eventually leads to deficiencies of other nutrients and sometimes to excessive acidity. In this respect the rising share of compound fertilisers in the Netherlands fertiliser aid programmes can be regarded as a positive development.

Unbalanced practices such as the long-term application of inorganic fertiliser coupled with the limited recycling of by-products can ultimately deplete the soil's organic content. Shortages of organic matter in the form of crop residues or animal dung form a major problem in Mali and particularly in Bangladesh where increased application of inorganic fertiliser no longer raises yields. Slash-and-burn techniques are widespread in Zambia, reflecting the low density of the rural population. These cannot be sustained in the long term, however, since the necessary fallow period of at least 20 years is no longer observed in populated areas. Too low organic matter content in the soil reduces the efficiency of inorganic fertilisers.

While fertiliser aid has helped to limit nutrient losses in the three countries covered in this study, the longer-term ecological sustainability of mineral fertiliser use is not always guaranteed; efforts to improve the sustainability of mineral fertiliser use by the recipient country have never been subject of conditionalities or policy dialogues.

Fertiliser is manufactured on an industrial scale in two of the three countries covered in this study: urea and triple superphosphate in Bangladesh and ammonium nitrate in Zambia. In addition, compound fertilisers are produced in Zambia and rock phosphate is extracted in Mali. Urea production in Bangladesh uses natural gas and old plants are gradually being replaced with more modern facilities. The energy source used by the Zambian fertiliser plant, coal, is not environment-friendly, and in both Zambia and Bangladesh there are reports of polluted surface waters in the vicinity of production sites. A particular concern in Zambia is that nitrates are discharged into the river Kafue upstream of Lusaka's water supply inlet. The TSP factory in Bangladesh, responsible for some ground pollution, is scheduled for closure.

Point pollution through fertiliser production in the three countries covered by this evaluation is largely limited to the TSP factory in Bangladesh which is scheduled for closure and to the highly inefficient nitrate factory in Zambia.

Financial sustainability

Fertiliser use is financially attractive when the input/output price ratio is such that farmers can afford to purchase fertilisers. Governments often seek to influence that ratio through price and trade policies. In Bangladesh, fertilisers were initially subsidised by government, whereas outputs yielded real market prices. State intervention was eventually abolished, but the price ratio remained attractive for most farmers due to increased availability and competition among traders. In Mali price ratios were attractive in the cotton area through controlled cotton growing, which prevented excessive subsidies in times when world market prices for cotton were low. Price ratios in rice production have remained attractive at real prices after subsidised rice imports were restricted. In Zambia the price ratio has been kept attractive for small farmers through substantial government intervention. When this ended and real price ratios started to prevail, many small and remote farmers had to abandon fertiliser use.

The price ratio can be improved through efficiency gains in the procurement, distribution and use of fertilisers. Governments have an important responsibility in this: for example, they are supposed to facilitate private trade; to ensure fair competition and to improve the physical and institutional infrastructure (credit, extension, etc.). In areas where the price ratio is unattractive to farmers, e.g. due to remoteness or poor market outlets for produce, low levels of organic and mineral fertiliser use may lead to soil degradation. In these areas government intervention to stem the rapid degradation of fragile soils may be necessary, e.g. in large parts of Mali and Zambia.

The liberalisation of fertiliser markets and the privatisation of parastatals has brought efficiency gains in Bangladesh and Zambia; Mali's privatisation process evolves more slowly due to the dominant role of the Regional Development Organisations. Governments have problems in defining their complementary role after market liberalisation and have received little support in this respect from the donor community, including the Netherlands.

6.7 Epilogue

Fertiliser aid has firstly been evaluated as a macro-instrument, because it was perceived primarily as a fungible form of import support. For the years in which fertiliser aid was provided to the three countries studied, it can be said that it was fungible according to the definition used: the fertiliser would have been imported even without the Netherlands contribution. Due to the relative smallness of the aid and the fungibility of counterpart funds and foreign currency, it is difficult to attribute it with any significant *macro-economic effects*.

To determine whether aid is fungible or additional is an extremely complicated question, which is difficult to answer *ex ante* or *ex post*. It was not deemed appropriate in the evaluation to discuss the many scientific uncertainties that still surround the fungibility issue; it should merely be noted that fungibility is not as clearcut as the definition used by DGIS, nor is it constant over time. For example, the fact that several major fertiliser aid donors reduced their aid more or less simultaneously casts doubt on the assumption that the withdrawal of Netherlands fertiliser aid will be substituted by other donors. Furthermore, reductions in fertiliser aid have not fully been replaced by other forms of programme aid, at least in the three countries concerned. Particularly in countries where the fertiliser market is small, it is unlikely that the private sector will automatically substitute for donor-financed fertiliser imports. In many cases private traders have been discouraged from entering the rather risky fertiliser market. For example, when parastatals are supplied with fertilisers by external donors during the liberalisation process, they often constitute unfair competition for private traders (monopolistic practices, subsidised prices, unwarranted market interventions).

Commodity aid may be fungible in the eyes of the donor, but this does not mean that supplies are without economic and/or policy effects. Recipient governments may have been able to use other revenue for less productive purposes or even for recurrent costs and the aid may have prevented recipient governments from actively pursuing a widening of their tax base. Fertiliser aid may have contributed to a slow-down in the emergence of a viable private fertiliser sector which, contradictorily, was a prerequisite for the provision of fertiliser aid (through insistence on structural adjustments). At the *micro-level*, fertiliser aid distributed through subsidised government channels may have led to misallocation of inputs. Conversely, it may have had a positive effect on soil fertility, labour opportunities for the landless, and income for small farmers.

To a certain extent these effects at the sectoral and micro-level were acknowledged in that explicit policy objectives were formulated for the purpose: fertiliser aid was meant to assist small farmers; its effectiveness at the sectoral and micro-level was to be enhanced through additional project aid, etc. Later, the ecological effects of fertiliser use also became a cause of concern. The fact that both macro- and micro-objectives were pursued with fertiliser aid gave this aid instrument its hybrid character. In practice, fertiliser aid retained its macro-character; objectives at the sectoral and micro-level were added, but not consistently pursued or evaluated. Systematic knowledge regarding the developmental effects of fertiliser aid was therefore not built up, nor were consistent and systematic attempts made to increase its effectiveness through additional projects and/or technical advice at the micro- and sectoral level. This mixed macro–micro perception of import support in general, and fertiliser aid in particular, led to a substantial degree of ambiguity in appraisal memoranda, evaluation reports and policy implementation, and to rather superficial policy agreements that form the basis of programme aid allocations.

This evaluation shows that proper use of mineral fertilisers can be very beneficial for agricultural production and soil fertility, particularly when mounting population pressure necessitates more intensive use of agricultural land. If a donor chooses to provide fertiliser aid rather than currency aid, this offers possibilities to optimise its effectiveness, irrespective whether or not it is fungible. These possibilities have not been used to any significant extent, despite the fact that policy statements allowed for such involvement.

In many cases, fertiliser market liberalisation has made fertiliser aid in its traditional form superfluous. The formal recipient organisations ceased to exist, or were no longer allowed to import. Nevertheless there is still sufficient scope for donors, including the Netherlands, to support beneficiary governments in their role vis-à-vis the private sector: facilitating fertiliser trade through market information, legislation, removal of administrative obstacles, quality control, etc. In cases where fertiliser imports remain unattractive for the private sector, resulting in unwarranted soil mining, it may even be advisable to earmark funds for fertiliser imports and/or for the careful targeting of fertiliser aid.

Appendix 1. Conduct of the study

1 Background

At the end of 1991 the Operations Review Unit (IOV) decided to evaluate Netherlands fertiliser aid to developing countries. The main reason for that decision was the general lack of information on the effects of the aid, despite the fact that over the years it had been a major element in the Netherlands' programme of development cooperation.

It was decided to focus on Netherlands policy and practice in the area of fertiliser aid and on its impact at various levels in the recipient countries. This involved examination of the extent to which recipient governments' agricultural policies have enabled the poorer sections of the rural population to benefit. The implications of fertiliser use for soil fertility and the relief of poverty at the micro-level were to be charted through case studies, which would also consider how fertiliser aid had contributed to sustainable development and the sound management of environmental resources. The efficiency of purchasing, transport and distribution were also to be studied.

2 Approach

2.1 *Desk studies*

When the main questions had been decided upon, separate studies of relevant literature and other documents were launched. These desk studies, carried out by Mrs M.A. Leeuwerik (literature and documentation) and Mrs H.H. Wittenhorst (documentation), form the basis of chapter 2.

2.1.1 *Review of the literature*

1. Importance of fertiliser to soil fertility and agricultural output

The aim here was to give an account, in language accessible to non-specialists, of the agricultural significance of different types of fertiliser and their advantages and drawbacks, the risks involved in their prolonged use, trends in the use of simple and complex types, and feasible alternatives. The basis for this exercise was the report on fertility-maintenance practices compiled by J. van der Heide and Dr van Noordwijk of the Soil Fertility Institute (IB-DLO).

2. Main points of the international debate on agricultural production and sustainable development

Our review of the international debate on the economic, social and environmental drawbacks and benefits of fertiliser use is based on a report on fertiliser use and sustainable development drawn up for us by IAC, Wageningen.

3. Fertiliser supply and demand trends

Our analysis of past and forecasted supply and demand trends for various types of fertiliser in different macro-regions is based on the World Bank report *Market Outlook for Major Primary Commodities* (1992, 1994).

2.1.2 *Examination of documents*

1. Netherlands policy on fertiliser aid

In considering Netherlands fertiliser aid we have focused particularly on its policy setting, looking at regional policy plans, official policy documents, sectoral memoranda, explanatory memoranda, parliamentary replies, correspondence between DGIS and the Netherlands fertiliser industry, and critical publications on fertiliser aid.

2. Aid statistics

For an overview of expenditure from 1974 (the first year covered in the time series given in the 1985 *Fertiliser Memorandum*) to 1992, nine tables were compiled showing the amounts, types, origins and destinations of Netherlands-funded shipments of fertiliser aid. These tables are based on information from VIB and NIO, supplemented with data from the 1985 memorandum.

3. Appraisal of fertiliser aid

Sixty-nine appraisal memoranda from 1985 to 1991 have been analysed to determine which policy aspects were considered and on what grounds deliveries were approved.

Our main points of concern were how much attention was devoted to macro-economic policy, rural development policy, social and economic policy, relevance to target groups' needs, the position of women, agricultural uses, environmental implications, logistics, effectiveness and possible bottlenecks. Internal discussion relating to appraisal and external advice was also explored.

4. *Evaluation*
All evaluation reports relating to the funding of fertiliser shipments (or to import support of which fertiliser aid formed part), compiled between 1985 and 1991, were checked. The purpose was not to assess their quality or the correctness of their conclusions, but rather to determine whether and how the following points were covered: macro-economic conditions, economic policy, agricultural policy, the role of intermediary organisations, the effects of fertiliser aid at macro- and micro-level, environmental impact, implications for the position of women, the uses made of counterpart funds, and efficiency. Missions' conclusions and recommendations were also studied.

5. *Operation of procurement and payment procedures*
We examined the records for ten countries (Bangladesh, the Philippines, India, Kenya, Mali, Pakistan, Sudan, Sri Lanka, Tanzania and Zambia). Where information was available, the following points were checked: payment procedures, tying conditions, evaluation of tenders, awarding of contracts, operation of the procedure, pressure from suppliers, and disbursement pressure.

6. *Disbursement pressure*
For every fertiliser shipment between 1985 and 1993 we checked the signature dates of the appraisal memoranda (DGIS records), contract and shipment (Fertecon, see 7. below) and the date of payment (NIO records). This made it possible to determine in how far the pattern of aid shipments was influenced by pressure to complete budget disbursement before the fiscal year ended.

7. *Price checks*
We examined whether Netherlands policy on tying, partial untying and preferential margins had had any adverse effect on the financial efficiency of fertiliser aid. The effects of the procurement modality on prices paid were also considered. To this end the prices paid for Netherlands-funded shipments were compared with those ruling on world markets in the month in which the relevant contracts were signed. The British organisation Fertecon drew up two reports: *Evaluation of fertiliser deliveries financed by the Netherlands Development Corporation* and *Additional information relating to comparable cif prices*.

8. Fertiliser-related project activities
Having compiled a list of project activities around the world which could be said to provide backup for fertiliser use, we then examined relevant evaluation reports in order to obtain a picture of the kinds of project that are funded by the Netherlands under this heading. Project activities were listed on the basis of their identifiability as backup activities designed to improve fertiliser use, looking particularly at the extent to which projects were geared to solving problems in the fertiliser sector.

Our analysis of project evaluation data, which follows the same lines as our earlier study of rural development, includes: project description, points covered, mission findings, location in macro-policy context, specific external problems, sustainability and wider impact, mission conclusions.

2.2 *Field studies*

2.2.1 *Approach*

Our choice of countries was based on the following criteria:
- they should have received substantial and/or regular fertiliser aid from the Netherlands;
- they should be sufficiently diverse in terms of agricultural systems, social, cultural and economic circumstances, agro-ecological conditions, government policy, fertiliser use and the purchasing and processing of fertiliser aid;
- for operational and budgetary reasons the number of countries to be visited could not exceed three.

Application of these criteria led to our choice of Bangladesh, Zambia and Mali, whose principal features are:
- Bangladesh: very high density of population and high natural soil fertility;
- Zambia: low population density and fair natural soil fertility;
- Mali: low population density and low natural soil fertility.

Each mission had a Netherlands team leader who gathered together a team of local consultants. Each team included expertise in the areas of macro-policy, agriculture and fertiliser policy, operational matters, and effects at the local level.

In preparation for the field studies a two-day seminar was organised for each mission involving the Operations Review Unit, the team leader and local consultants. Discussion focused on the document *Memorandum for field missions: Evaluation of mineral fertiliser aid*, which included:

- a list of questions to be addressed together with a number of working hypotheses;
- a lengthy questionnaire for use by the missions, one part focusing on the formulation and execution of fertiliser-aid policy, and the other on the role of fertiliser in recipient countries;
- a report outline designed to ensure that missions' reports followed a fairly standard pattern;
- a position paper designed for use as a discussion document, together with a glossary of terms relating to agronomy, economics and DGIS policy.

The process of choosing case studies to illustrate micro-level effects was also begun at these meetings.

The memorandum was supplemented with a document dealing with the question of fertiliser efficiency vis-à-vis financial efficiency and the operational implications of sustainability. The Brundtland report's definition of sustainable development – 'a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations' – is a broad one and unsuited to operational purposes. Three specific aspects were therefore focused upon:

(i) Ecological sustainability at the micro-level and the role of fertiliser. The key here is to maintain the right balance of plant nutrients in the soil. Assessments of the sustainability of agricultural systems must be based on their long-term impact on soil fertility.

(ii) Investment in soil fertility is inevitably long-term but farmers are often driven by short-term financial considerations. We therefore looked at financial sustainability in terms of the extent to which farmers can afford to invest in maintaining soil fertility.

(iii) Finally, since governments can influence farmer behaviour through macro-level policies, such policies were examined in order to determine how far they promoted ecological and economic sustainability.

Three studies were carried out between October 1992 and January 1993.

1. Bangladesh

The Bangladesh field study took place in December 1992 and January 1993 and was carried out by W.A. van den Andel (mission leader, freelance consultant), M. Shamsul Hoque, S.M. Altaf Hossain and M. Habibur Rahman. Report: W.A. van den Andel, S.M. Altaf Hossain, M. Habibur Rahman, *Evaluation of Dutch Mineral Fertiliser Aid to Bangladesh*, The Hague 1993.

2. Mali

The Mali field study took place between October 1992 and January 1993 and was carried out by H. Kieft (mission leader, Educational Training Consultants Leusden), Aart van der Heide, Nancoury Keita, Fousseyni Mariko, Bakary Coulibaly, Nazon Kone, Check Soumaré, Mrs Ami Touré née Keita, and Mrs Margaret Karsten. Report: H. Kieft, *Engrais fertile? Étude analytique de l'aide néerlandaise au Mali en matière d'engrais minéral*, ETC, Leusden 1993.

3. Zambia

The Zambian field study took place between November 1992 and February 1993 and was carried out by D.C. Faber (mission leader, European Centre for Development Policy Management), E.N. Chidumayo, V. Chinene, J.K. McPhillips, F. Mwape, M. Mwinge, L. Ndalamei and G. Nkata. Report: D.C. Faber, *Fertiliser for food security: Fact or fallacy? An evaluation of the effectiveness of mineral fertiliser aid*, ECDPM, Maastricht 1993.

2.2.2 *Conduct of the studies*

Case studies were used to illustrate effects at the micro-level. These studies, which served to underpin the field missions' overall findings, had to cover the various aspects relevant to the country concerned. Consequently, they were selected in different ways in the three countries and dealt with different topics. Missions began by examining existing documentary material, supplementing it when necessary with field visits and interviews. The case studies were chosen as follows in the three countries.

1. Bangladesh

Five agro-ecological zones were identified for case studies. In each region a study was made of micro-level effects under the headings: relief of poverty, environment, women in development, sustainable land use.

2. Mali

Case studies were conducted in the regions covered by the *Office du Niger* and by the *Compagnie Malienne pour le Développement des Textiles et des Fibres*. These regions differ markedly in agro-ecological terms: the ON region is predominantly irrigated, while farming in the CMDT region is entirely rain-fed. The mission considered the impact of fertiliser aid on institutional structures, farmers' organisations, women and vulnerable groups, and agricultural research and advisory services.

3. Zambia
Three provinces in Zambia were selected for case studies: Western Province (Mongu and Kaoma), Central Province (Kabwe) and Northern Province (Kasama), covering different agro-ecological zones. The purpose was to study the effects of mineral fertiliser use on crop production. Due to the dearth of reliable secondary data, primary data were gathered through interviewing a selection of farm households regarding fertiliser use at the farm level.

2.2.3 *Interviews and field research by the IOV team*

Specific policy-related aspects of fertiliser aid to the three countries, e.g. formulation and execution, and donor coordination in the recipient country, were the responsibility of the Operations Review Unit (IOV) team. Field visits, supplementing the work of the country teams, were made by F.A. Makken and A.H. Pieper.

3 Coordination

The study was coordinated mainly by A.H. Pieper (IOV/DGIS) and F.A. Makken (Institute of Agricultural Economics, LEI-DLO; as from 1 January 1994, IOV/DGIS). The studies of the relevant literature and documents were carried out by Mrs M.A. Leeuwerik and Mrs H.H. Wittenhorst, who also contributed to the text of the report. The editors were F.A. Makken, B. van der Putte and Mrs M.A. Leeuwerik.

As is customary, IOV appointed an advisory group to oversee the work. Its membership was as follows:

Mrs H. von Metzsch	DGIS/IOV (Chair)
Dr H. Breman	Centre for Agro-Biological Research
J.J. Neeteson	Ministry of Agriculture, Fisheries and Nature Management
Dr M. van Noordwijk	Soil Fertility Institute
Mrs L. Res	International Agrarian Centre
Dr H.A.J. Moll	Wageningen Agricultural University, Department of Development Economics
C. van Beuningen	Humanist Institute for Cooperation with Developing Countries (HIVOS), The Hague
H.E.J. Jorritsma	DGIS/DST/ML
C. Konstapel	DGIS/DST/TA
A.H. Pieper	DGIS/IOV (coordinator until 1 June 1993)

H.G.M. Hendrix	DGIS/IOV
Dr A.P.R. Visser	DGIS/IOV (advisor until 1 June 1992)
J. van der Heide	Soil Fertility Institute (advisor until 1 July 1992)
F.A. Makken	Institute of Agricultural Economics until 31 December 1993; DGIS/IOV from 1 January 1994 (advisor/coordinator from 1 July 1992)

Appendix 2. The manufacturing of fertiliser*

The manufacturing of some widely-used single and compound fertilisers can be broken down into three stages:

1. Raw materials: water, air, energy, phosphate rock, sulphur and potash;
2. Intermediary products: nitric acid, sulphuric acid, and phosphoric acid required for manufacturing the various nitrate, phosphate and compound fertilisers;
3. Final products, containing one or more of the three most important plant nutrients.

Figure 17 gives an overview of production methods for a range of fertilisers.

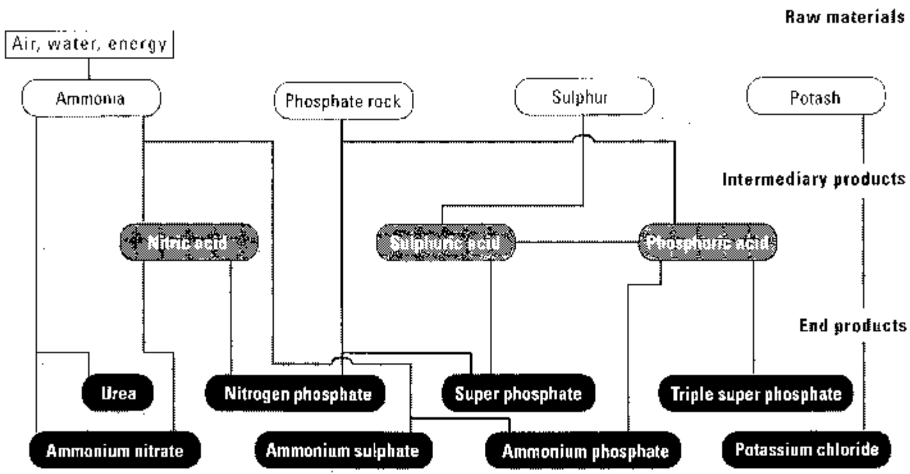


Figure 17 Stages of fertiliser production

* Source: *The world fertilizer market*, Rabobank Netherlands, 1993.

Nitrogenous fertilisers

Nitrogenous fertilisers (N-fertilisers) are manufactured using hydrogen (H_2) extracted from natural gas or oil, and atmospheric nitrogen (N_2); in combination, these gases form ammonia (NH_3). Atmospheric nitrogen, natural gas or oil and water are therefore the raw materials required for the manufacturing of N-fertilisers. The production process demands substantial amounts of energy, however: to produce one ton of calcium ammonium nitrate (CAN), an ammonium nitrate fertiliser, around 400 cubic metres of natural gas is required. Ammonia can either be used directly as a fertiliser, or be combined with sulphuric acid which yields ammonium sulphate. In the production of nitrate fertilisers, the manufactured ammonia is first oxidised into nitric acid (see figure). Urea is synthesised by allowing the ammonia to react with carbon dioxide.

The most important nitrogen fertilisers are:
- urea (46% N)
- ammonium nitrate (AN) (33.5% N)
- calcium ammonium nitrate (CAN) (27% N)
- ammonium sulphate (AS) (21% N).

Phosphatic fertilisers

Phosphatic fertilisers can be produced in the following ways:
1. As a by-product of steel production (commonly known as basic slag). In modern steel production there are no longer by-products which can serve as fertiliser.
2. Through extraction of phosphate rock. Phosphate rock is of volcanic or organic origin. That of volcanic origin is normally crystalline and is extracted mainly in the former Soviet Union. By far the most common phosphate rock is that of animal origin, derived from the bone, teeth, scales and other remains of sea creatures. These remains, driven by sea currents in ancient times, accumulated in specific layers that are mostly found just beneath the earth's surface and can be obtained through open-cast mining (North Africa and the USA).

Phosphate rock is not very soluble, and is treated chemically to enhance its solubility ('unlocking phosphate rock'). Treating it with sulphuric acid provides superphosphate (SSP: 20% P), while treatment with phosphoric acid yields triple-superphosphate (TSP: 46% P). Ammonium phosphate (DAP: 18% N, 46% P) is created by allowing ammonia to react with phosphoric acid. SSP, TSP and DAP are the three most important phosphate fertilisers.

Soft phosphate rock consists of a very finely powdered phosphate rock; very little chemical treatment is required to render it useful to the farmer.

Potash fertilisers

Potash (K) normally occurs naturally in the form of potassium chloride (KCl) often at great depths (400 to 1200 metres) so that mining is necessary. In some places potassium is extracted from the sea. Potash mines are predominantly found in the former Soviet Union and Canada, but also in central Germany and eastern France (Alsace). The raw product of these mines is made available for use as fertiliser by coarse grinding it into so-called raw potassium salts. These contain a very high percentage of pollutants (60–80%), the most important of which is common salt (NaCl). Purification of raw potassium salts yields potassium chloride (KCl) containing 40–60% K.

Calcium fertilisers

Calcium carbonate ($CaCO_3$) is used as raw material in the preparation of most calcium fertilisers. In nature it is found in ample quantities and various forms: limestone, marl, chalk, shells. Dolomite and dolomite marl are the primary raw materials for the preparation of magnesium-retaining calcium fertilisers.

Calcium fertilisers are produced in the following ways:
1. By extraction from rock, which is processed mechanically (breaking, grinding, drying, sifting) or chemically.
2. As a by-product of certain industrial processes, such as the sugar industry.

Compound fertilisers

The following raw materials can be used in the production of compound fertilisers:
1. Straight fertilisers;
2. Manufactured products, such as ammonium phosphate;
3. Raw materials which react chemically when combined. Products obtained in this way are referred to as complex fertilisers.

Compound fertilisers mainly comprise N, P and K.

Appendix 3 The changing pattern of fertiliser supply and demand

The following account is based on the World Bank publication *Market Outlook for Primary Commodities*, October 1992; any other sources cited are indicated. The production and consumption figures for nitrogen, phosphorus and potassium cover both simple and compound fertilisers.

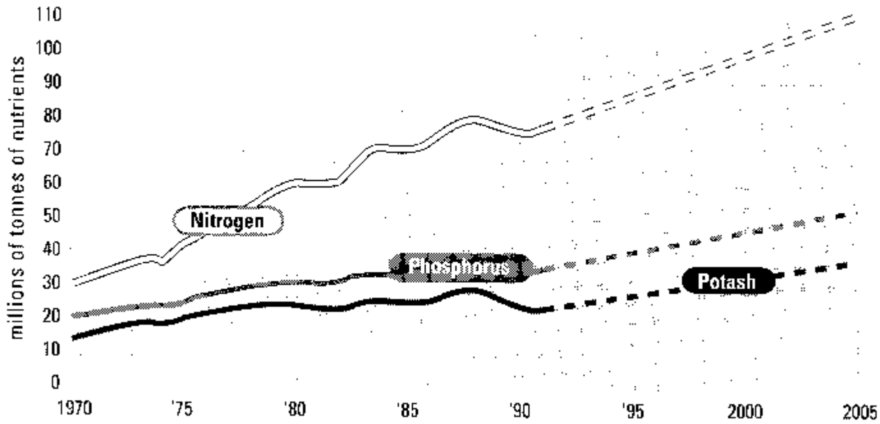
1 Consumption trends

World level

Between 1930 and 1960 world N, P and K consumption grew at similar rates; absolute levels of consumption of the three major nutrients also differed little. From 1960 onwards, however, the use of nitrogenous fertilisers began to increase more rapidly due to the Green Revolution, albeit consumption of other nutrients also rose (figure 18). There is also a linkage with the reduced use of legumes due to the presence of another nitrogen source (nitrogenous fertiliser).

Fertiliser consumption fell in 1973–74 as a result of the oil crisis and again at the end of the decade due to the second crisis. Growth then resumed until 1989, when world consumption began to fall on account of problems in Central Europe and the Soviet Union and falling demand in Western Europe (Louis 1992). According to the World Bank, world consumption in 1991 totalled 141 million tonnes (the IFA's estimate is somewhat lower; see figure 18).

Long-term projections indicate an annual growth in fertiliser use world-wide of 2.2 per cent, reflecting the growing demand for cereals (a result of population growth and rising incomes); world-wide consumption in 2005 is expected to total 192 million tonnes. These projections are based on simulations using the World Bank's integrated grains/fertiliser model, in which future fertiliser demand depends



Sources: 1970–1991, International Fertiliser Industry Association 1992
1991–2005, World Bank 1992 (estimates).

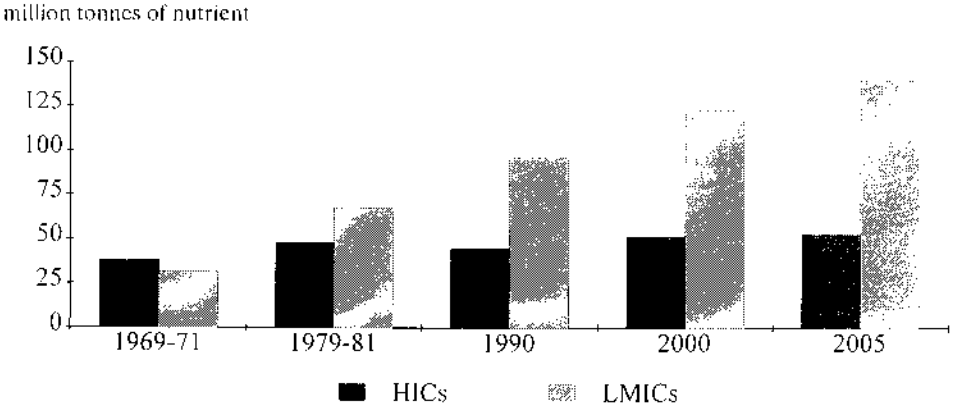
Figure 18 World N, P and K consumption, 1970–2005

on the area under cereals and on fertiliser and product prices. Demand is affected by a number of factors, however, which make these projections uncertain:

- Eastern Europe and the former Soviet Union are major consumers, and political and economic changes in these former communist states will inevitably have a significant global impact;
- increasing concern regarding the environmental implications of fertiliser use may tend to curb demand;
- demand may also be reduced by changes in agricultural policies, e.g. withdrawal of fertiliser subsidies in developing countries and action to control production surpluses in Western Europe.

Consumption patterns in country groups

Since 1970 fertiliser consumption in low- and middle-income countries (LMICs) has been growing as a proportion of total world consumption, and this trend is expected to continue (figure 19). This reflects the fact that the rate of population growth is greatest in countries in the LMIC group, necessitating ever more intensive methods of food production.



Based on: World Bank 1992.

The figures shown for 1969–71 and 1979–81 are two-year averages (split years beginning in July); those shown for 2000 and 2005 are estimates.

Figure 19 Fertiliser consumption in HICs and LMICs, 1970–2005
(million tonnes of nutrient)

Trends in nutrient consumption vary between LMICs and HICs.

– Trends in N consumption

The Green Revolution caused the consumption of nitrogen to rise faster in LMICs, including all developing countries, than in HICs. In the former the annual growth rate between 1960 and 1990 averaged 9.5 per cent, but in the latter at only 3.6 per cent. The World Bank expects the rate of increase in N consumption to fall compared with previous decades due to a lower rate of growth in cereal production. A more balanced use of fertiliser could also slow the increase. Annual growth rates over the period to 2005 are put at 2.7 per cent for LMICs and 1.3 per cent for HICs. N consumption in LMICs is then expected to be thrice that in HICs. Figures in 1970 were roughly equal.

– Trends in P and K consumption

P and K consumption in HICs changed little between 1970 and 1991; a slight increase is expected between now and 2005, reflecting environmental concerns and the high level of consumption. P and K consumption in LMICs, on the other hand, rose sharply over the same period and is expected to continue increasing at a rapid rate.

In 1970 P and K consumption was lower in LMICs than in HICs. This position had reversed by 1990, however, and LMIC consumption is expected to continue to be greater than that of HICs up to 2005.

– P and K consumption vis-à-vis N consumption
Since 1970, N consumption in LMICs has exceeded P and K consumption, despite the rapid rise in the latter. Projections indicate that total P and K consumption in LMICs will equal 70 per cent of N consumption in 2005. In HICs, on the other hand, total P and K consumption exceeded that of N in 1970 and is expected to equal 90 per cent of N consumption in 2005. A possible explanation for these differing patterns of consumption is the over-application of phosphate in HICs due to its low price.

Consumption patterns in LMICs

With the exception of North Africa, African countries are at an extreme in consumption terms in that they accounted for only about one per cent of total LMIC consumption in 1970 and less than that in 1990 (in 2005 their share is expected to be even smaller). This is partly due to the failure of the Green Revolution to take off in Africa. Sub-Saharan consumption is also extremely low in absolute terms: overall N, P and K use in 1989–90 averaged only 8.9 kg/ha (Reuler & Prins 1993), as against 46.8 kg/ha in Latin America and the Caribbean, 68.9 kg/ha in South Asia, 190.3 kg/ha in East Asia and the Pacific, and 236 kg/ha in Western Europe (IAC 1993). Moreover, two-thirds of Sub-Saharan consumption is concentrated in just five countries, Nigeria, Zambia, Zimbabwe, Kenya and Ethiopia (Bumb 1989).

The increase in fertiliser use from 1970 onwards was greatest in Asia, where the Green Revolution had its greatest impact. This reflected favourable ecological conditions and the need to feed a rapidly growing population. Fertiliser use is expected to continue to increase in Asia. In Latin America fertiliser use increased rapidly up to 1987, thereafter falling as subsidies were cut in a number of countries (Louis 1992).

N consumption has risen much more rapidly in Asia than in Latin America and Africa. The gap between the rates of increase in N consumption on the one hand and P and K consumption on the other, has also widened more rapidly in Asia than in Latin America or Sub-Saharan Africa. This trend indicates the growing imbalance in fertiliser use in Asia (FADINAP 1992), where 66 per cent of the increase in world N consumption between now and 2005 is expected to be concentrated.

The growth in P and K consumption between 1970 and 1990 was also greatest in Asia. Over half the increase in world P consumption in coming years is expected in Asia, where K consumption will also rise most rapidly. The large amounts of N fertiliser that have been used in rice-growing in that continent over the years are slowly but surely exhausting the soil's stock of K.

2 Changing production patterns

World level

The general trend is for the rate of increase in world fertiliser production to fall. Annual percentage growth was faster between 1960 and 1970 than between 1970 and 1991, and projections show output continuing to level off in the period up to 2005.

World fertiliser output in 1991 totalled some 152 million tonnes, just over twice the 1970 figure; the forecast for 2005 is 202 million tonnes. Long-term projections indicate an average annual increase in output up to that year of two per cent, as against 3.7 per cent between 1970 and 1990.

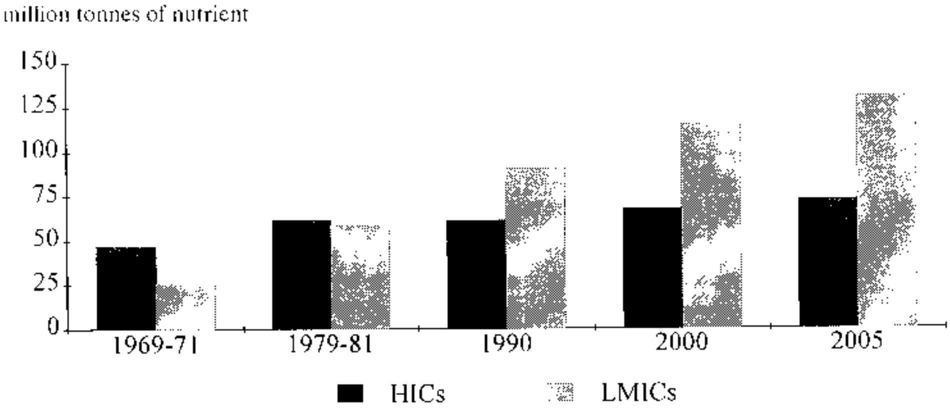
World output of nitrogenous fertilisers in 1991 was about 2.5 times greater than the 1970 figure; output in 2005 is expected to be 114 million tonnes, around 1.4 times the 1990 figure. The increase in P and K output was smaller, at around 170 per cent; output in 2005 is projected at 38 million tonnes, 1.3 times the 1990 figure.

HICs and LMICs

In 1970 36 per cent of world fertiliser output was produced in LMICs; by 1990 the figure had risen to 60 per cent (figure 20). Long-term projections indicate that future production increases will tend to be concentrated in LMICs, reflecting their abundant supplies of cheap energy (for the production of nitrogenous fertilisers) and raw materials (for the production of phosphate fertilisers). Of the increase in output expected over the period 1990–2005 83 per cent will occur in LMICs; the nutrients concerned are mainly N and P. Potash production will continue to be dominated by Canada and the countries of the former Soviet Union.

LMIC production

Asian countries' share in LMIC output, particularly of N and P, has tended to rise: where, in 1970, Asia accounted for 18 per cent of LMIC fertiliser production, by 1990 the figure was 39 per cent (the estimate for 2005 is 40 per cent). The greatest increases in N production are expected in India, Bangladesh, Indonesia and China;



Based on: World Bank 1992.

The figures shown for 1969–71 and 1979–81 are two-year averages (split years beginning in July); those shown for 2000 and 2005 are estimates.

Figure 20 Fertiliser production in HICs and LMICs, 1970–2005 (million tonnes of nutrient)

in the case of India the rate of increase is curbed by limited natural-gas availability (Louis 1992).

In 1970 and 1990 Latin America accounted for around five per cent of LMIC fertiliser production, a figure that is expected to be unchanged in 2005.

African countries are also at an extreme in terms of production (again, North Africa excepted). The World Bank (1992) gives no figure at all for fertiliser production in Africa, while another source (Bumb) indicates an extremely small share in output. Fertiliser production in Sub-Saharan Africa amounted to 276,000 tonnes in 1987–88, just 0.3 per cent of total LMIC output; 70 per cent of Sub-Saharan output comprised nitrogenous fertiliser, mainly produced in Zimbabwe, Nigeria and Senegal.

Although output in Sub-Saharan Africa rose by 9.3 per cent per year in the 1970s, the total remained small; moreover, the annual increase slowed to 1.8 per cent in the 1980s. Output in 1995 is projected at 1,051,000 tonnes (Bumb 1989), on the assumption that both Nigeria and Tanzania acquire an additional N production facility in the 1990s.

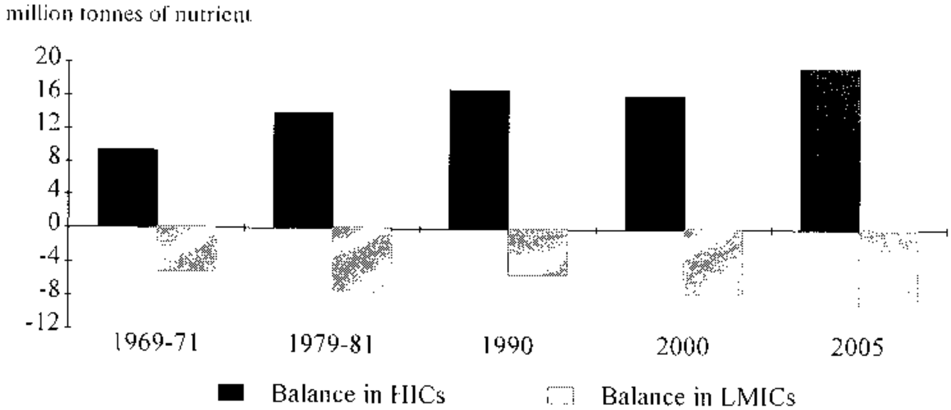
3 Patterns of supply and demand

The general trend hitherto has been for world production to exceed consumption. While the World Bank expects the surplus to be somewhat smaller in the period up to 2000, it is likely to increase again thereafter as production capacity grows.

Fertiliser consumption in LMICs is structurally in excess of production, while the richer countries show a considerable excess of production over consumption (figure 21). The surplus fluctuates between 10 and 13 per cent of world output.

Despite sharp increases in fertiliser production in some LMICs, projected supply and demand figures indicate that in general they will remain large net importers (reflecting a rapidly growing demand for food), while overall the HICs will remain exporters. The Netherlands supplies around 13 per cent of all HIC exports of nitrogenous fertilisers.

Countries in Asia, Sub-Saharan Africa and Latin America are expected to remain the principal net importers of nitrogenous fertilisers, while the Middle East is likely to see the largest growth in exports (thanks to production for the Asian market). In Latin America, countries with natural-gas reserves such as Mexico and Venezuela are expected to produce a surplus for export. Mention must be also made here of the large-scale and increasingly structural nature of the HIC production.



Based on: World Bank 1992.

The figures shown for 1969–71 and 1979–81 are two-year averages (split years beginning in July); those shown for 2000 and 2005 are estimates.

Figure 21 Balance of production and consumption in HICs and LMICs, 1970–2005 (million tonnes of nutrient)

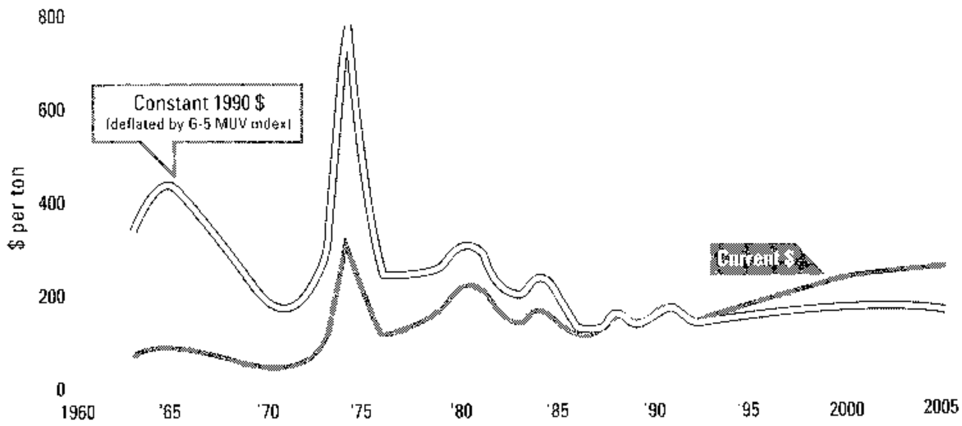
With regard to phosphate fertilisers, LMICs in Asia (especially India) and Latin America are likely to remain the biggest importers, while HICs (notably the United States) and North Africa (especially Morocco and Tunisia) will continue to produce surpluses for export.

Virtually all K fertiliser used in Asia, Latin America and Sub-Saharan Africa is imported; the Asian region is expected to be the largest net importer in the future.

The biggest importers world-wide will remain the USA, China and Brazil, while the bulk of exports will continue to come from Canada, Germany and the former Soviet Union.

4 Price movements

Notwithstanding short-term fluctuations due e.g. to movements in the dollar exchange rate, the general trend since 1965 has been one of falling real prices. There were sharp price increases in 1974 and again in the late 1970s resulting from the two oil crises, and N and P prices rose again in late 1990 following the disruption of supplies by the Gulf War. Since then prices have fallen, reflecting declining demand due to flooding in China and bad weather in the United States.



Source: World Bank 1992.

Figure 22 Urea prices 1960–2005 in current and constant (1990) US dollars (bagged, fob NW Europe)

The World Bank expects fertiliser prices to show only moderate increases through the 1990s, reflecting the narrower gap between supply and demand, falling thereafter in response to increased production capacity. In the case of nitrogenous fertilisers that fall set in in the early 1990s as a result of the liberalisation of the fertiliser market in Eastern Europe.

Rising trends in fertiliser production and consumption are thus expected to continue into the future, albeit at a slower rate. The share of LMICs in both production and consumption has risen over the years; this is also expected to persist. African LMICs (outside North Africa) are remarkable for their very low consumption of fertiliser and extremely low level of production, which is concentrated in just three countries.

At world level there has always been a production surplus, concentrated in the HICs, which fluctuates between 10 and 13 per cent of world output; this is expected to persist.

While the surplus is expected to be somewhat smaller in the period to 2000 due to a temporary shrinkage in production capacity, it is likely to increase again thereafter.

Appendix 4 DAC list of aid recipients and list of Eligible Source Countries

NOTE TO ACCOMPANY PUBLIC PRESENTATIONS OF THE 'NEW' DAC LIST

The DAC List of Aid Recipients

1. At its High Level Meeting held in December 1993, the OECD Development Assistance Committee (DAC) agreed to revise its list of countries and territories receiving aid. The objective of this revision is to ensure that the list continues to provide a relevant guide to aid patterns in a changing world, thus fulfilling its essential role as a basis for the collection of comprehensive and comparable statistical information on aid and other resource flows. In particular the new approach to the list reflects:

- the success of the development process in a growing number of developing countries and territories;

- the importance of new aid recipients in Central and Eastern European Countries and the New Independent States of the former Sovjet Union (CEECs/NIS).

Structure of the DAC list

2. Against this background, the list is now entitled the DAC List of Aid Recipients (previously the DAC List of Developing Countries and Territories), and presented in two parts. The distinction between the two parts does not reflect any difference in the quality of aid, but only the category of recipient country or territory in relation to the United Nations target for ODA. Part I lists the developing countries and territories categorised into LLDCs and income groups based on regularly

updated World bank thresholds, and includes those CEECs/NIS which the DAC has agreed to assimilate into this part of the List. The aid receipts of Part I countries and territories will be accounted as Official Development Assistance (ODA) and set against the UN target of 0.7 per cent of donor GNP. Part II lists countries and territories in transition with two sub-categories, the remaining CEECs/NIS and those 'traditional' developing countries and territories progressing from Part I of the List (see below). The aid receipts of Part II countries and territories are not counted towards the 0.7 per cent UN target.

Aid definitions and policy principles

3. The terms 'aid' and 'assistance' encompass both Official Development Assistance and aid from official sources to countries and territories in transition. Official Development Assistance and other official aid flows share the same concessionality and qualitative standards, i.e. they are

- administered with the promotion of the economic development and welfare of the recipient countries or territories as the main objective;

- concessional in character and convey a grant element of at least 25 per cent (calculated at the rate of discount of 10 per cent).

4. Similarly, the DAC aid policy principles apply to both Official Development Assistance and aid from official sources to countries and territories in transition.

Progression from Part I status

5. The DAC is introducing the principle of moving countries and territories which achieve a significant measure of development progress from Part I to Part II of the new List. By the end of 1995, the DAC will introduce a threshold based on a composite set of objective indicators, including the appropriate level of GNP per capita, to be agreed by the Committee, together with the other indicators. The DAC will consult with relevant international bodies on the use of development indicators in this context. Countries and territories exceeding this composite indicator will normally progress from Part I to Part II of the List, with provision for exceptions on a case-by-case basis under an agreed DAC review procedure.

6. The six countries whose 'graduation' in 1996 was announced in 1992 will appear on Part II of the List. All other countries and territories exceeding an interim threshold (the World Bank's high income category) will also progress to Part II of the List from 1996 with provision for exceptions on a case-by-case basis. In the meantime, DAC donors express their intention to continue or intensify the concentration of their aid in countries whose GNP per capita falls within the World Bank lending threshold ($4 715 in 1992), with some countries wishing to maintain selected and especially targeted assistance activities in countries and territories above that threshold.

* * * *

7. The DAC reconfirms that the DAC List is established for statistical purposes and that geographic aid allocations are national policy decisions and responsibilities. Member governments recognise the importance of the fundamental political changes in Central and Eastern Europe and the former Sovjet Union and will support the important process of reform in these countries. This support will not diminish their determination to give high priority to their development co-operation with the 'traditional' developing countries. The Developing Co-operation Directorate of the OECD collects, presents and analyses information on aid and other flows to all countries and territories on the new DAC List.

DAC List of Aid Recipients

Part I: Aid to Developing Countries and Territories (Official Development Assistance)

LLDCs	Other LICs (per capita GNP <$675 in 1992)	LMICs (per capita GNP $676–$2695 in 1992)		UMICs (per capita GNP $2696–8355 in 1992)	HICs (per capita GNP >$8355 in 1992)[2]
Mozambique	India	Bolivia	Iraq	Mauritius	Taiwan
Tanzania	Nigeria	Côte d'Ivoire	Korea, Democratic	Brazil	Cyprus
Ethiopia	Kenya	Philippines	Republic of	Malaysia	Israel
Sierra Leone	Guyana	Senegal	Lebanon	St Lucia	+Hong Kong
Uganda	China	*Armenia	+Macao	Venezuela	- - - - - - - -
Nepal	Pakistan	*Kyrgyzstan	Marshall Islands	Uruguay	+Bermuda
Bhutan	Nicaragua	Cameroon	Mongolia	Mexico	+Cayman Islands
Burundi	Ghana	*Georgia	Micronesia,	Suriname	+Falkland Islands
Chad	*Tajikistan	*Uzbekistan	Federated States of	Trinidad and	+French Polynesia
Malawi	Sri Lanka	*Azerbaijan	Niue	Tobago	+Gibraltar
Guinea Bissau	Honduras	Papua New Guinea	+St Helena	Gabon	+New Caledonia
Bangladesh	Zimbabwe	Peru	Syria	St Kitts and Nevis	
Madagascar	Egypt	Guatemala	Tokelau	- - - - - - - -	
Rwanda	Indonesia	Morocco	+Turks and Caicos	Cook Islands	
Laos	- - - - - - - -	Congo	Islands	+Mayotte	
Zambia	Eritrea	Dominican	+Wallis and	Nauru	
Mali	+Timor	Republic	Futuna		
Burkina Faso	Viet Nam	Ecuador	States of ex-	**Threshold for**	
Niger		Swaziland	Yugoslavia	**World Bank Loan**	
Equatorial Guinea		Jordan		**Eligibility**	
Sao Tome and		El Salvador		**($4715 in 1992)**	
Principe		*Turkmenistan			
Togo		Colombia		Antigua and	
Gambia		Jamaica		Barbuda	
Central African		Tonga		Seychelles	
Republic		Paraguay		Argentina	
Benin		Namibia		Oman	
Maldives		*Kazakhstan		Barbados	
Guinea		Tunisia		Korea, Rep. of	
Comoros		Thailand		Saudi Arabia	
Mauritania		Algeria		- - - - - - - -	
Lesotho		Turkey		+Aruba	
Kiribati		St Vincent &		Bahrain	
Solomon Islands		the Grenadines		Greece	
Cape Verde		Costa Rica		Libya	
Western Samoa		Fiji		Malta	
Vanuatu		Iran		+Montserrat	
Botswana[3]		Belize		+Netherlands	
Afghanistan		Grenada		Antilles	
Cambodia		Panama		+US Pacific	
Djibouti		Dominica		Islands (not	
Haiti		Chile		FSM or Marshall	
Liberia		Black communities		Islands)	
Myanmar		of South Africa		+Virgin Islands	
Somalia		- - - - - - - -		(UK)	
Sudan		+Anguilla			
Tuvalu		Angola			
Yemen		Albania			
Zaire		Cuba			

DAC List of Aid Recipients (continued)

Part II: Aid to Countries and Territories in Transition

CEECs/NIS	More Advanced Developing Countries and Territories
Lithunia	Bahamas, The[2]
Ukraine	Brunei[2]
Latvia	Kuwait[2]
Slovak Republic	Qatar[2]
Poland	Singapore[2]
Czech Republic	United Arab Emirates[2]
Russia	
Estonia	
Belarus	
Hungary	
Moldova	
Romania	
Bulgaria	

* CEECs/NIS + Territory

1. All countries and territories above this threshold in 1992, 1993 and 1994 to progress to more advanced status in 1996 unless exempted after case-by-case review.
2. Part II as from 1996: until 1996, aid to these countries is accounted as ODA, in line with the decision of 1992. More advanced countries and territories in this category are retained on the List even where aid receipts are minimal, to ensure comprehensive reporting of financial flows.
3. To be reclassified to UMIC in 1996.

Countries in Part I are listed in ascending order of GNP. Countries whose GNP is not accurately known are grouped below a dotted line in the category in which they are estimated to fall, in alphabetical order.

LIST OF ELIGIBLE SOURCE COUNTRIES, as presented in 'Rules and guidelines for the procurement of goods and works with financial development assistance from the Government of the Netherlands'

List of eligible source countries*:

a) The Netherlands

b) Afghanistan
Albania
Algeria
Angola
Anguilla
Antigua and Barbuda
Argentina
Armenia
Aruba
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belize
Benin
Bermuda
Bhutan
Bolivia
Botswana
Brazil
Brunei Darusalaam
Burkina Faso
Burundi
Cameroon
Cape Verde
Cayman Islans
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Cook Islands
Costa Rica
Cuba
Cyprus
Democratic Kampuchea
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Ethiopia
Falkland Islands
Fiji
Gabon
Gambia
Ghana
Gibraltar
Greece
Grenada
Guadeloupe
Guatemala
Guiana
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hong Kong
India
Indonesia
Iran
Iraq
Israel
Ivory Coast
Jamaica
Jordan
Kenya
Kiribati
Korea, Dem. People's Republic of
Korea, Republic of
Kuwait
Laos, People's Dem. Republic of
Lebanon
Lesotho
Liberia
Libya Arab Jamahiriya
Macao
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Martinique
Mauritania
Mauritius
Mayotte
Mexico
Mongolia
Montserrat
Morocco
Mozambique
Namibia
Nauru
Nepal
Netherlands Antilles
New Caledonia
Nicaragua
Niger
Nigeria
Niue
Oman
Pacific Islands (Trust Tr.)
Pakistan
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Polynesia, French
Qatar
Reunion
Rwanda
Sao Tome and Principe
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Singapore
Solomon Islands
Somalia
Sri Lanka
St Kitts and Nevis
St Lucia
St Helena
St Vincent & the Grenadines
Sudan
Suriname
Swaziland
Syrian Arab Republic
Taiwan
Thailand
Togo
Tokelau
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turks and Caicos Islands
Tuvalu
Uganda
United Republic of Tanzania
United Arab Emirates
Uruguay
Vanuatu
Venezuela
Viet Nam
Virgin Islands
Wallis and Futuna
Yemen
Yugoslavia
Zaire
Zambia
Zimbabwe

*) The Netherlands and countries according to the DAC list.
N.B. The list of countries on the DAC list may vary according to official decisions taken by the DAC. When in doubt whether a particular country is eligible please contact DGIS.

Appendix 5 Parliamentary questions and answers (1989-90 session)

Written questions from Member of Parliament Verspaget (Labour) on *fertiliser aid*, submitted 25 April 1989.

1. Will the Minister give an account of fertiliser-aid provision from 1985 to 1988, setting-out for each recipient country the amounts supplied (in volume and money terms) and the prices paid per tonne for each type in each year (indicating whether prices are cif or fob)?

2. What agreements if any exist between the government and the Dutch fertiliser industry on the amounts of fertiliser to be supplied? What agreements if any exist within the industry (and specifically between UKF and NSM) on prices and/or quantities supplied?

3. Will the Minister confirm that partially untied aid grants to Sri Lanka were replaced with tied grants after that country had on several occasions procured Dutch-funded fertiliser supplies in countries other than the Netherlands?

4. Will the Minister confirm that it has been regular practice in recent years for particular types of fertiliser to be offered as aid simply because Dutch producers were able to supply them on competitive terms?

5. Is the Minister aware that the practice to which Question 4 refers may lead to the supply of certain types of fertiliser, such as ammonium sulphate, which contain relatively few nutrients and can tend to make soils acid?

6. Have evaluations of fertiliser aid sought to determine the balance of costs and benefits associated with the use of fertilisers on different crops in the various recipient countries and, if so, what was the outcome?

7. Are figures available for the use of fertiliser in recipient countries and, if so, what proportion goes to better-off farmers and what proportion to the poorer?

8. Have evaluations of fertiliser aid looked into possible damage from fertiliser use in terms of erosion and rising soil acidity and, if so, what was the outcome? If the Minister is unable to provide this information, will he take steps to encourage the recording and study of acidity levels in recipient countries?

9. Is the Minister willing, with a view to minimising possible environmental damage from imprudent fertiliser use, to take steps to encourage the dissemination among farmers of information on the ecological implications of fertiliser use and to appoint ecologists able to monitor and optimise fertiliser use?

Written replies from Mr Bukman (Minister for Development Cooperation), submitted 25 April 1989.

1. The figures (cif basis) are available for inspection in the House library.

2. No agreements exist between the government and the Dutch fertiliser industry. I am not aware of any agreements between producers (specifically NSM and DSM/UKF) on the prices and/or quantities of fertiliser supplied under the aid programme.

3. It is not the case that partially untied aid grants to Sri Lanka were replaced with tied grants. On the contrary: under the rules which applied at the start of the 1980s the programme aid received by Sri Lanka was tied to procurement in the Netherlands on the grounds that Sri Lanka did not have Least Developed Country status. In late 1985 the rule was relaxed to the extent that partial untying could be considered if the Dutch tender price (cif) was significantly higher than the lowest comparable tender from another Eligible Source Country. All aid grants were partially untied in 1988.

4. This is not the case. The aim is to meet the needs of developing countries eligible for this form of aid in whichever way maximises the benefit to the recipients. Where a developing country's needs could be met by several different types of fertiliser, it is of course normal practice to suggest the purchase of types that can be supplied on competitive terms by Dutch producers.

5. While ammonium sulphate is not the main product that Dutch manufacturers can supply on competitive terms, it is true that the practice mentioned in Answer 4 could lead aid recipients to buy ammonium sulphate rather than other products; the number of countries affected and the amounts involved are relatively small, however. I accept the general desirability of reducing the amount of ammonium sulphate used, given the low nutrient content and tendency to raise acidity levels, but this is a gradual process and due regard must be had to local agricultural conditions.

6. As a rule evaluations of fertiliser aid include an examination of economic aspects of the use of fertiliser on the chief crops. The costs and benefits to farmers of fertiliser use are analysed, taking account of the effect in terms of increased yield and of local fertiliser and product prices (which can fluctuate). Some cost/benefit ratios for small farmers are given below:
   Use of urea on rice (Philippines): 3.3 (August 1988)
   Use of urea on rice (Bangladesh): 3.9 (1986), 5.6 (1987)
   (small farmers on land whose average quality is good)
   Use of NPK on maize (Zambia): 4.4 (1985-6), 2.5 (1986-7).

7. Exact figures cannot be given for the proportions of fertiliser aid going to better-off and poorer farmers, there being no firm dividing line between these two categories. Breakdowns showing the amounts going to farms of different sizes, however, are available for a number of recipient countries. In *Bangladesh* 62 per cent of farmers who use fertiliser fall into the 'small' category (>2.5 acres), 22 per cent into an intermediate category and 16 per cent into the 'large' category (<5 acres); on average small farmers use 37 per cent more fertiliser per hectare treated than do large farmers; small farmers account for around 37 per cent of total fertiliser use and farm around 36 per cent of all cultivated land. In *Zambia* large commercial farmers account for 30 per cent of total fertiliser use and small farmers for 70 per cent. In *Kenya* the proportions are: Estates, 36 per cent; Large farms, 21 per cent; Smallholders, 43 per cent.

8. Aid evaluations deal where appropriate with the effects of fertiliser use on soil acidity. Relevant sections of evaluation reports relating to Kenya and Zambia are available for inspection in the House library. The acid soils found in tropical and subtropical zones are virtually always the result not of fertiliser use but of the natural processes of soil formation. The low levels of fertiliser use current in developing countries do not generally give grounds for expecting adverse environmental effects in the short term. Monitoring by national research institutions is nevertheless to be encouraged, and where appropriate the Netherlands

has promoted the development of local capacity in this area (e.g. in Tanzania, Pakistan, Mali and Egypt).

9. Steps have already been taken through a range of Dutch-funded projects to encourage prudent fertiliser use (i.e. use which maximises agro-economic efficiency while minimising environmental damage). Both bilateral and multilateral projects are involved, the latter including an FAO programme geared to information and training in the area of fertiliser use. They can be seen as complementing the programme aid provided in the form of fertiliser aid.

Appendix 6. The Netherlands fertiliser industry

In 1988 there were eight manufacturers in the Netherlands, producing lime, nitrogenous and phosphate fertilisers. The Netherlands industry's output includes simple fertilisers (containing N, P, lime, trace elements), the simpler compound fertilisers, combined fertilisers, livestock feed and intermediate products (sulphuric acid, phosphoric acid, ammoniac, nitric acid, ammonium nitrate etc.). The structure of the industry in 1988 is shown in table 37 below.

Table 37 Structure of the Netherlands fertiliser industry in 1988

Producer	Parent company	Product				
		Lime	N	P	of which:	
					Phosphoric acid	Feed phosphate
1. Ankersmit	Ankersmit	*				
2. Kencica	Ankersmit + Enci	*				
3. Kemira	Kemira Oy (Finland)		*			
4. NSM	Norsk Hydro (Norway)		*			
5. DSM Fertilisers	DSM					
– IJmuiden			*	*		
– Geleen			*	*		
– Rotterdam			*	*	*	
6. Zuid-Chemie	Grande Paroisse (France)		*	*		
7. Amfert	ICL (Israel)			*		
8. Windmill	Norsk Hydro (Norway)		*	*	*	*

Source: Berenschot, Report on an environmental study of the fertiliser industry (in Dutch), Utrecht, March 1988.

Since 1988 DSM Rotterdam has been transferred to Kemira, the Norsk Hydro subsidiaries have been renamed Hydro Agri, and the Windmill (Hydro Agri) product range has been reduced to feed phosphates; a new producer in 1991 was Ammoniak Unie BV (50 per cent owned by BASF and 50 per cent by Kemira Oy).

The products of the Netherlands phosphate industry are mainly marketed in Western Europe, where for the most part they are used in the production of compound fertilisers.

Of the nitrogenous fertiliser produced in the Netherlands 89 per cent is exported to countries in Western Europe and beyond. Netherlands producers are in a fair to good competitive position in their Western European home market. Netherlands and other Western European producers are under pressure from dumping by Eastern European countries and by other countries that are rich in natural gas. Netherlands exports to markets outside Europe had previously suffered from the achievement of self-sufficiency by the largest customers (India and China) and growing production capacity in other developing countries (see table 38). India and China are now again major market participants, however, with annual imports of 6–10 million tonnes together.

Lime is produced as a raw material for use in fertiliser manufacture.

The fertiliser industry contributes 1,500–2,000 million guilders a year to the country's balance of payments and employs over 5000 people directly and at least a further 5000 indirectly. It supplies much of the Netherlands' own fertiliser needs and has helped this country to become a leader in the optimisation of agricultural production. The innovative technology in the areas of fertiliser composition and the production of fertiliser and feed phosphates has given the industry a strong competitive position. Moreover, this know-how is being exported in the form of licences and capital equipment.

Some economic indicators of the fertiliser industry:

Annual turnover:	3,600 mln guilders
Annual value added:	740 mln guilders
Annual exports:	2,300 mln guilders
Annual output:	6 mln tonnes.

Figures for Netherlands, EU and world production capacity are given in table 38.

Table 38 Netherlands, EU and world fertiliser production, 1980, 1986 and 1991

Product	The Netherlands						EU			World		
	1980		1986		1991		1980	1986	1991	1980	1986	1991
	T[1]	%[2]	T	%	T	%	T	T	T	T	T	T
P-NH3	2293	2.3	2819	2.6	3086	2.7	13336	12794	11693	99299	110205	113751
SA	114	1.9	114	2.1	114	2.3	1201	904	737	5995	5484	4936
Urea	740	2.5	734	1.8	681	1.5	3280	3202	2634	30178	40319	44451
AN	151	0.9	372	2.2	372	2.2	3110	3227	3090	16914	17189	16762
CAN	557	11.3	635	11.4	802	16.3	2219	2335	2256	4938	5588	4930
AP	40	0.7	40	0.6	40	0.5	316	292	153	5518	6819	7781
NP/NPK/NK	241	2.4	216	1.9	227	2.0	3509	3297	2685	10165	11353	11400
TSP	168	1.7	180	1.6	180	1.8	1119	1177	739	9849	11117	10223

1. Thousands of tonnes. In the case of TSP the figure relates to P_2O_5.
2. Percentage of world production.

Source: Commission of the European Communities and the European Fertilizer Manufacturers' Association, *The fertilizer industry of the European Community: The issues of today, the outlook for tomorrow*, December 1991.

Appendix 7. Fertiliser aid: amounts, sources, destinations and composition

Table 39 Net official development assistance and fertiliser aid, amounts (millions of guilders) and percentages

Year	Net ODA (Dfl mln)	Fertiliser aid (Dfl mln)	Fertiliser aid as % of net ODA
1976	1900.65	62.10	3.27
1977	2207.76	141.30	6.40
1978	2322.50	164.50	7.09
1979	2815.66	242.80	8.62
1980	3135.63	308.70	9.84
1981	3767.28	352.20	9.35
1982	3929.52	244.80	6.23
1983	3411.51	230.30	6.74
1984	4067.98	300.40	7.38
1985	3772.84	181.18	4.80
1986	4263.86	203.36	4.77
1987	4242.29	186.76	4.40
1988	4410.00	182.35	4.14
1989	4440.14	207.38	4.67
1990	4719.39	151.65	3.21
1991	4705.24	162.98	3.46
1992	4839.79	138.70	2.87
1993.	*4686.96	20.32	0.43

Sources: ODA figures from official DAC questionnaires; figures for 1975–84 from *Fertiliser Aid* (1984); figures for 1985–91 from Netherlands Investment Bank for Developing Countries (NIO) and Food Supplies Purchasing and Sales Section (VIB), Ministry of Agriculture, Nature Management and Fisheries.

Table 40 Sources of Netherlands fertiliser aid: The Netherlands versus other ESCs

Year	Absolute (millions of guilders)			Percentages	
	Total	Netherlands	Other ESCs	Netherlands	Other ESCs
1975	105.8	103.8	2.0	98	2
1976	62.1	61.2	0.9	98	2
1977	141.3	119.4	21.9	85	15
1978	164.5	155.5	9.0	94	6
1979	242.8	221.1	21.7	91	9
1980	308.7	274.3	34.4	89	11
1981	352.2	272.8	79.5	77	23
1982	244.8	194.3	50.5	79	21
1983	230.3	176.4	53.6	77	23
1984	300.4	245.9	54.6	82	18
1985	181.2	129.2	52.0	71	29
1986	203.4	112.5	90.9	55	45
1987	186.8	116.1	70.7	62	38
1988	182.4	132.6	49.8	73	27
1989	207.4	123.6	83.6	53	47
1990	151.7	85.4	66.3	56	44
1991	163.0	26.9	136.1	17	83
1992	138.7	22.4	116.3	16	84
1993	20.3	8.4	11.9	41	59
Total	3587.7	2581.9	1005.7	72	28

Table 41a Fertiliser shipments not sourced in the Netherlands, by country of origin[1] (millions of guilders and percentages of total)

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total	%
1. Morocco	14.2	8.7	6.3	–	11.2	13.5	79.3	23.4	–	156.6	23
2. Indonesia	–	13.5	17.1	16.2	24.0	–	17.7	7.9	–	96.4	14
3. Tunisia	13.0	4.6	5.6	–	14.9	14.8	17.5	13.6	–	84.0	12
4. Jordan	–	–	–	–	–	27.8	–	42.4	4.7	74.9	11
5. Iraq	–	20.7	13.1	10.9	5.9	–	–	–	–	50.6	8
6. Turkey	21.7	0.5	4.5	3.0	5.4	–	3.7	3.3	6.9	49.0	7
7. Senegal	–	2.8	3.4	–	9.1	7.9	6.0	9.4	–	38.6	6
8. Côte d'Ivoire	–	–	13.2	–	2.4	–	–	4.0	–	19.6	3
9. Saudi Arabia	–	11.9	–	–	–	–	–	0.9	–	12.8	2
10. Malaysia	–	–	2.9	8.8	–	–	–	–	–	11.7	2
11. Nigeria	–	–	–	6.6	–	–	1.8	–	–	8.4	1
12. Bangladesh	–	–	–	–	7.9	–	–	–	–	7.9	1
13. Kuwait	–	7.4	–	–	–	–	–	–	–	7.4	1
14. Argentinia	–	6.0	–	–	–	–	–	–	–	6.0	1
15. Korea	3.2	0.3	–	–	–	2.4	–	–	–	5.9	1
16. Venezuela	–	2.4	0.5	–	2.5	–	–	–	–	5.4	1
17. Brazil	–	–	–	–	–	–	–	4.9	–	4.9	1
18. Qatar	–	2.8	–	–	–	–	–	1.9	–	4.7	1
19. Costa Rica	–	0.8	3.8	–	–	–	–	–	–	4.6	1
20. Zimbabwe	–	–	–	4.3	–	–	–	–	–	4.3	1
21. Mexico	–	2.1	–	–	–	–	–	–	–	2.1	–
22. Israel	–	1.7	–	–	0.4	–	–	–	–	2.1	–
23. Dominican Rep.	–	1.8	–	–	–	–	–	–	–	1.8	–
24. India	–	1.6	–	–	–	–	–	–	–	1.6	–
25. Burma	–	1.4	–	–	–	–	–	–	–	1.4	–
26. Belgium	–	–	0.2	–	0.3	–	–	–	–	0.5	–
27. Bahrain	–	–	–	–	–	–	–	2.1	–	2.1	–
28. USSR	–	–	–	–	–	–	–	2.5	–	2.5	–
29. Guyana	–	–	–	–	–	–	–	–	0.3	0.3	–
30. Unknown[2]	–	–	–	–	–	–	10.0	–	–	10.0	2
Total	52.1	91.0	70.6	49.8	84.0	66.4	136.0	116.3	11.9	678.1	100.0

[1] As specified in the Certificate of Origin.
[2] The fertiliser in this category was probably supplied by Saudi Arabia or the United Arab Emirates and by Tunisia, Morocco or Jordan.

Table 41b Fertiliser shipments not sourced in the Netherlands, by country of origin[1] (percentages)

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993
1. Morocco	27.0	10.0	9.0	–	13.0	20.0	58.0	20.0	–
2. Indonesia	–	15.0	24.0	32.0	29.0	–	13.0	8.0	–
3. Tunisia	25.0	5.0	8.0	–	18.0	22.0	13.0	12.0	–
4. Jordan	–	–	–	–	–	42.0	1.0	36.0	39.5
5. Iraq	–	23.0	19.0	22.0	7.0	–	–	–	–
6. Turkey	42.0	0.5	6.0	6.0	6.0	–	3.0	2.0	58.0
7. Senegal	–	3.0	5.0	–	11.0	12.0	4.0	8.0	–
8. Côte d'Ivoire	–	–	19.0	–	3.0	–	–	3.0	–
9. Saudi Arabia	–	13.0	–	–	–	–	–	1.0	–
10. Malaysia	–	–	4.0	18.0	–	–	–	–	–
11. Nigeria	–	–	–	13.0	–	–	1.0	–	–
12. Bangladesh	–	–	–	–	9.0	–	–	–	–
13. Kuwait	–	8.0	–	–	–	–	–	–	–
14. Argentinia	–	6.5	–	–	–	–	–	–	–
15. Korea	6.0	0.5	–	–	–	4.0	–	–	–
16. Venezuela	–	2.0	0.5	–	3.0	–	–	–	–
17. Brazil	–	–	–	–	–	–	–	4.0	–
18. Qatar	–	3.5	–	–	–	–	–	2.0	–
19. Costa Rica	–	1.0	5.0	–	0.5	–	–	–	–
20. Zimbabwe	–	–	–	9.0	–	–	–	–	–
21. Mexico	–	2.0	–	–	–	–	–	–	–
22. Israel	–	2.0	–	–	–	–	–	–	–
23. Dominican Rep.	–	2.0	–	–	–	–	–	–	–
24. India	–	2.0	–	–	–	–	–	–	–
25. Burma	–	1.0	–	–	–	–	–	–	–
26. Belgium	–	–	0.5	–	0.5	–	–	–	–
27. Bahrain	–	–	–	–	–	–	–	2.0	–
28. USSR	–	–	–	–	–	–	–	2.0	–
29. Guyana	–	–	–	–	–	–	–	–	2.5
30. Unknown[2]	–	–	–	–	–	–	7.0	–	–
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] As specified in the Certificate of Origin.

[2] The fertiliser in this category was probably supplied by Saudi Arabia or the United Arab Emirates and by Tunisia, Morocco or Jordan.

Table 42 Fertiliser aid shipments by type (N, P, K, NP, NPK, raw materials, trace elements), 1976–93

Millions of guilders

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown	Total
1985	120.6	53.6	–	7.0	–	–	–	181.2
1986	101.4	32.9	1.7	49.4	10.1	1.9	6	203.4
1987	56.9	37.8	13.4	72.3	6.3	0.1	–	186.8
1988	83.1	23.4	38.1	37.7	–	–	–	182.3
1989	69.8	23.4	35.2	73.9	5.1	–	–	207.4
1990	26.2	28.4	40.7	42.3	14.1	–	–	151.7
1991	23.5	35.6	27.7	7.2	69.1	–	–	163.1
1992	26.4	23.1	10.2	5.2	73.8	–	–	138.7
1993	2.6	–	15.0	2.2	–	–	0.4	20.2
Total	510.5	258.2	182.0	297.2	178.5	2.0	6.4	1434.8

Thousands of tonnes

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown	Total
1985	212.0	107.9	–	11.8	–	–	–	331.7
1986	392.9	93.2	3.5	87.4	27.7	0.8	26.3	631.8
1987	189.6	108.3	31.2	126.7	21.7	0.2	–	477.7
1988	269.9	53.3	101.3	84.7	–	–	–	509.2
1989	216.4	56.8	86.7	240.0	9.9	–	–	609.8
1990	76.3	75.4	116.4	116.8	51.6	–	–	436.5
1991	63.9	95.1	62.0	10.5	88.1	–	–	319.6
1992	69.1[1]	72.9	27.1	9.1	[2]	–	–	178.2[1 2]
1993	5.6	–	36.0	5.2	–	–	–	46.8
Total	1495.7[1]	662.9	464.2	692.2	199.0[2]	1.0	26.3	3541.3[1 2]

[1] The tonnage of an N shipment to the value of 3,955,280 guilders is unkown.
[2] The tonnage of a shipment of raw materials to the value of 73,844,711 guilders is unknown.

Fertiliser types:

N	:	Urea Ammonium sulphate (AS) Calcium ammonium nitrate (CAN) Ammonium nitrate (AN)
P	:	Triple superphosphate (TSP) Single superphosphate (SSP) Double superphosphate (DSP)
NP	:	Diammonium phosphate (DAP) Nitrate/phosphate (NP: 23-23, 30-30, 17-50)
NPK	:	Nitrogen, phosphorus, potassium (NPK, 24 different formulations)
Raw materials	:	Rock phosphate, phosphoric acid
Trace elements	:	Boron (B), zinc (Zn)

(Table 42 continued)

Percentages

Year	N	DSP	NP	NPK	Miscel-laneous		
1975	56	6	5	–	33		
1976	43	–	52	–	5		
1977	73	4	–	1	22		
1978	70	3	14	3	1		
1979	51	9	10	1	27		
1980	54	12	9	1	24		
1981	74	10	–	7	9		
1982	20	40	20	6	14		
1983	49	23	6	9	13		
1984	69	10	8	5	8		
	N	P	NP	NPK	Raw materials	Trace elements	Unknown
1985	66	30	–	4	–	–	–
1986	50	16	1	24	5	1	3
1987	30	20	7	39	4	–	–
1988	45	13	21	21	–	–	–
1989	34	11	17	36	2	–	–
1990	17	19	27	28	9	–	–
1991	14	22	18	4	42	–	–
1992	19	17	7	4	53	–	–
1993	13	–	74	11	–	–	2

Table 43 Sources of fertiliser shipments, by type of fertiliser (1985–93)

Eligible Source Countries other than the Netherlands (in millions of guilders)

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown	Total
1985	3.3	48.8	–	–	–	–	–	52.1
1986	40.1	28.1	–	4.7	10.1	1.9	6.0	90.9
1987	20.6	23.8	3.4	16.4	6.3	0.1	–	70.6
1988	34.6	11.9	–	5.6	–	–	–	52.1
1989	37.3	22.8	8.2	9.9	5.1	–	–	83.3
1990	2.4	28.2	15.7	5.9	14.1	–		66.3
1991	15.6	35.6	10.6	5.3	69.1	–	–	136.2
1992	13.2	23.1	2.2	4.0	73.8	–	–	116.3
1993	0.3	–	11.6	–	–	–	–	11.9
Total	167.4	222.3	51.7	51.8	178.5	2.0	6.0	679.7

Netherlands (in millions of guilders)

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown	Total
1985	117.3	4.8	–	7.0	–	–	–	129.1
1986	61.3	4.8	1.7	44.7	–	–	–	112.5
1987	36.3	14.0	10.0	54.6	–	–	–	114.9
1988	48.5	12.5	38.1	33.4	–	–	–	132.5
1989	32.5	0.6	27.0	64.0	–	–	–	124.1
1990	23.8	0.2	25.0	36.4	–	–	–	85.4
1991	7.9	–	17.1	1.9	–	–	–	26.9
1992	13.2	–	8.4	0.8	–	–	–	22.4
1993	2.4	–	3.4	2.2	–	–	0.4	8.4
Total	343.2	36.9	130.7	245.0	–	–	0.4	756.2

(Table 43 continued)

Eligible Source Countries other than the Netherlands (percentages)

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown
1985	3.0	91.0	–	–	–	–	–
1986	40.0	85.0	–	10.0	100.0	100.0	100.0
1987	36.0	61.0	25.0	23.0	100.0	100.0	–
1988	42.0	49.0	–	14.0	–	–	–
1989	53.0	97.0	23.0	13.0	100.0	–	–
1990	9.0	99.0	39.0	14.0	100.0	–	–
1991	66.0	100.0	38.0	74.0	100.0	–	–
1992	50.0	100.0	23.0	83.0	100.0	–	–
1993	11.1	–	77.3	–	–	–	–

Netherlands (percentages)

Year	N	P	NP	NPK	Raw materials	Trace elements	Unknown
1985	97.0	9.0	–	100.0	–	–	–
1986	60.0	15.0	100.0	90.0	–	–	–
1987	64.0	39.0	75.0	77.0	–	–	–
1988	58.0	51.0	100.0	86.0	–	–	–
1989	47.0	3.0	77.0	87.0	–	–	–
1990	91.0	1.0	61.0	86.0	–	–	–
1991	34.0	–	62.0	26.0	–	–	–
1992	50.0	–	77.0	17.0	–	–	–
1993	88.9	–	22.7	100.0	–	–	100.0

Table 44a Fertiliser shipments by country and year, 1975–93 (in millions of guilders)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	TOTAL
ASIA																				
India	50	22	76	76	156	155	209	21	94	135	61	42	–	24	33	57	69	82	–	1362
Bangladesh	7	–	26	28	29	36	15	84	33	46	52	34	29	20	26	21	27	20	–	533
Pakistan	5	33	22	33	23	28	–	50	27	20	7	15	44	25	25	25	15	8	–	405
Philippines	–	–	–	–	–	–	–	–	–	–	–	–	20	25	24			–	–	69
Sri Lanka	10	5	2	16	6	11	71	12	24	20	16	11	20	15	16	12	4	–	–	271
Vietnam	–	–	–	–		–	–	–	–	–	–	–	–	–	–		12	–	–	12
Nepal	–	3	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	3	–	10
Subtotal	72	63	126	153	218	230	295	167	178	221	136	102	113	109	124	115	127	113	–	2662
AFRICA																				
Sudan	–	–	–	–		17	14	2	4	–	10	23	2	18	7	3	5	3	–	108
Egypt	–	–	–	–	–	–	–	–	–	–	–	3	–	–	5	–	–	–	–	8
Kenya	–	–	–	–	5	18	6	37	12	15	10	9	7	3	3	7	–	–	–	132
Tanzania	20	–	11	8	7	20	20	18	8	15	8	11	5	9	9	–	–	5	–	174
Burkina Faso	–	–	–	–	–		–	4	–	–	4	–	12	–	13	8	1	7	3	52
Mali	–	–		–	–	–	–	–	–	11	10	11	9	13	24	14	8	5	–	105
Zambia	–	–	–	–	–	16	12	–	8	17	–	26	26	18	7	5	–	–	–	135
Niger	–	–	–	–	–	–	–	–	–	–	–	2	–	1	–	–	–	–	–	3
Ghana	–	–	–	–	–	–	–	–	–	–	–	–	–	6	7	–	–	–	–	13
Yemen	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–	–	4	–	–	4
Ethiopia	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	12	37
Guinea Bissau	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–		–	3
Rwanda	–	–	–	–	–	–	–	–	–	–	–	–	3		–	–	–	–	–	3
Zimbabwe	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	2
Chad	–	–		–	–	–	–	–	–	–	–	3	5	–	–	–	–	–	–	8
Mauritania	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–	–	–	–	0
Cape Verde	–	–		–	–	–	–	–	–	–	–	–	0	–	–	–	–	–	–	0
Subtotal	35	–	11	8	12	71	55	63	32	58	42	88	69	68	75	37	28	20	15	787
LATIN AMERICA																				
Bolivia	–	–	–	–	–	–	–	–	10	11	–	2	4	–	11	–	6	4	4	52
Peru	–	–	5	–	4	–	–	–	–	9	3	11	1	6	–	–	–	–	–	39
Nicaragua	–	–	–	–	–	9	3	13	7	3	–	–	–	–	–	–	2	2	–	39
Jamaica	–	–	–	4	10	–	–	2	4	–	–	–	–		–	–	–	–	–	20
Surinam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Subtotal	–	–	5	4	14	9	3	15	21	23	3	13	5	6	11	–	8	6	5	151
TOTAL	107	63	142	165	244	310	353	245	231	300	181	203	187	183	210	152	163	139	20	3600

Sources: Food Supplies Purchasing and Sales Section (VIB), Ministry of Agriculture, Nature Management and Fisheries; Netherlands Investment Bank for Developing Countries (NIO).

Table 44b Fertiliser shipments by country and year, 1975–93 (percentages)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	TOTAL
ASIA																				
India	47	35	54	46	64	50	60	9	41	45	34	21	–	13	16	37	42	59	–	38
Bangladesh	7	–	18	17	12	12	4	34	14	15	29	17	16	11	12	14	17	14	–	15
Pakistan	5	53	16	20	9	9	–	20	12	6	4	8	24	14	12	16	9	6	–	11
Philippines	–	–	–	–	–	–	–	–	–	–	–		11	14	12		–	–	–	2
Sri Lanka	9	7	1	10	2	3	20	5	10	6	9	5	11	8	7	8	2	–	–	8
Vietnam		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7			–
Nepal	–	3	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–
Subtotal	67	100	89	93	89	74	84	68	77	72	76	51	62	60	59	75	77	81	–	74
AFRICA																				
Sudan	–	–	–	–	–	6	4	1	2	–	5	11	1	10	3	2	3	2	–	3
Egypt	–		–	–	–	–	–	–	–	–	–	1	–	–	2	–	–	–	–	–
Kenya	–	–	–	–	2	6	2	15	6	5	5	4	3	1	2	5	–	–	–	4
Tanzania	19	–	8	5	3	6	5	7	3	5	4	6	3	5	4	–	–	4	–	5
Burkina Faso	–	–	–	–	–	–	–	2	–	–	2	–	6	–	6	5	1	5	15	2
Mali	–	–	–	–		–	–	–	–	3	5	6	5	7	12	10	5	4	–	3
Zambia	–	–	–	–	–	5	3	–	3	6		13	13	10	3	3	–	–	–	4
Niger	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	
Ghana	–	–	–	–	–	–	–	–	–	–	–	–	–	3	3	–	–	–	–	–
Yemen	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3		–	–
Ethiopia	14	–	–	–	–	–	–	–			–	–	–	–	–	–	6	–	60	1
Guinea Bissau	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–		–	–	–	–
Rwanda	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Zimbabwe	–	–	–	–	–	–	–	1	–	–	–	–	–			–	–	–	–	–
Chad	–	–	–	–	–	–			–	–	–	1	3	–	–	–	–	–	–	–
Mauritania	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cape Verde	–	–	–			–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Subtotal	33	–	8	5	5	23	15	26	14	20	22	43	35	37	36	25	18	15	75	22
LATIN AMERICA																				
Bolivia	–	–	–	–	–	–	–	–	4	4	–	1	2	–	5	–	4	3	20	1
Peru	–	–	3	–	2	–	–	–	–	3	2	5	1	3	–	–	–	–	–	1
Nicaragua	–	–	–	–	–	3	1	5	3	1	–	–	–	–	–	–	1	1	–	1
Jamaica	–	–	–	2	4	–	–	1	2	–	–	–	–	–	–	–	–	–	–	1
Surinam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	1
Subtotal	–	–	3	2	6	3	1	6	9	8	2	6	3	3	5		5	4	25	5
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Sources: Food Supplies Purchasing and Sales Section (VIB), Ministry of Agriculture, Nature Management and Fisheries; Netherlands Investment Bank for Developing Countries (NIO).

Table 45 Aid procedure: financial versus technical (millions of guilders)

Year	Financial	Technical	Deposit[1]	Total	% not-financial
1985	177.0	4.2	–	181.2	2.3
1986	200.4	3.0	–	203.4	1.5
1987	161.4	25.4	–	186.8	13.6
1988	174.8	–	7.5	182.3	4.1
1989	192.6	12.7	2.1	207.4	7.1
1990	143.6	8.0	–	151.6	5.3
1991	145.7	17.3	–	163.0	10.6
1992	136.8	1.9	–	138.7	1.4
Total	1332.3	72.5	9.6		

[1] Under this arrangement payment takes place in accordance with the technical aid procedure but the funds are deposited with the Netherlands Investment Bank for Developing Countries (NIO).

Table 46 Funding: grants versus loans (millions of guilders)

Year	Loans	Grants	Loans as % of total
1985	75	106	41
1986	56	147	28
1987	0	191	0
1988	24	160	13
1989	25	183	12
1990	67	85	44
1991	69	94	42
1992	0	139	0
1993	0	20	0

Table 47 Tendering procedure: through VIB or otherwise (millions of guilders)

Year	Through VIB	Through other agency	VIB as % of total
1985	34	147	19
1986	50	153	25
1987	81	112	42
1988	93	91	51
1989	124	83	60
1990	44	107	29
1991	31	132	19
1992	41	98	29

Appendix 8. Procurement practices

Procurement procedure

Responsibility for fertiliser procurement rests with the recipient country, which may make use either of a local procurement agency or, if it so wishes, of the Food Supplies Purchasing and Sales Section (VIB) of the Netherlands Agriculture Ministry. In some cases the Directorate General for International Cooperation (DGIS) recommends VIB involvement. The type and amount of fertiliser to be sought is decided before the procurement procedure begins; how the decision is reached and what part is played by the recipient varies from one country to another. The next step is appraisal by DGIS; if approval is given, the procedure is initiated. Its stages are:

1. the issue of an invitation to tender (with a closing date) and the receipt of tenders;
2. evaluation of the tenders received and awarding of the contract.

Formal international tendering is covered by the DGIS Guidelines for Procurement, which include the following provisions:

- Tender documents are forwarded to the embassy concerned for its comments, which must be received within a month. The invitation to tender must appear in at least one publication and be notified to the Netherlands government at least six weeks before the closing date for receipt of tenders.
- Tender documents must be submitted in the usual language of international contracts.
- Only tenders from suppliers in Eligible Source Countries (including the Netherlands) may be considered.
- Suppliers must have at least six weeks to respond to the invitation to tender.
- After the closing date for receipt of tenders no information may be released on the tendering procedure until the successful tender has been formally announced.
- All tenders are checked by the recipient country.

- If all tenders are rejected as unsatisfactory the recipient country may, in consultation with the Netherlands, enter into negotiations with one or more low bidders.
- Commercial factors other than price may be taken into account in determining which tender offers best value for money.
- The Netherlands government must have the opportunity of making comments and recommendations at all stages of the procedure. Before a final decision is reached the recipient must inform the Netherlands of the name of the successful bidder and give a detailed account of the evaluation of tenders and the comparison of prices. If there has been any departure from the Guidelines the recipient is asked for an explanation. The Netherlands may appoint an adviser or observer to monitor the tendering procedure.

The Guidelines include specific provisions relating to VIB:
- VIB must be authorised by the recipient country concerned to undertake procurement. The authorisation must state that VIB may obtain payment from NIO, up to a predetermined amount, on presentation of invoices and shipping documents. NIO must be informed accordingly by the bank in the country concerned.
- VIB is an institution acting on behalf of the government and must comply with the Guidelines. The invitation to tender (in English or Dutch) must be sent by telex to suppliers in the Netherlands and other Eligible Source Countries. (Bidders in the Netherlands and other ESCs are eligible to submit tenders, which must be drawn up in English or Dutch and submitted by telex.) Copies of the telex are forwarded to DGIS and OSL.
- VIB then draws up a list of tenders received and sends it by telex to DGIS with its recommendation as to which should be accepted. DGIS forwards it to the embassy concerned which in turn submits the documentation to the authorities in the recipient country. The recipient agency makes its choice and informs VIB, the embassy and DGIS accordingly.
- The supplier must draw up a contract in triplicate. VIB checks it and signs on behalf of the recipient country, returning one copy to the supplier and forwarding two to DGIS; one of these is then sent on via the embassy to the recipient agency.
- Quantity and quality are checked by an internationally recognised institution (ICM/SGS).
- Transport by sea is normally organised by the supplier, who informs VIB accordingly. The latter notifies the recipient agency via the embassy.
- Transport insurance may be arranged by VIB or, as is often the case under the financial aid procedure, by the recipient.
- VIB forwards the shipping documents and invoices to NIO with an application for payment. Final payment is authorised by the customer.

Payment

Application for payment by NIO is made when delivery has taken place; payment follows once the appropriate documents have been approved.

The documents required in the case of direct payment are:
- the original invoices,
- form invoices,
- bill of lading,
- certificates of origin,
- reports on checks on quality and quantity,
- certificates of insurance.

The documents required in the case of reimbursement are:
- the contract between purchaser and recipient,
- the original invoice for the goods,
- bills of lading,
- reports on shipment checks,
- reports on arrival checks.

Appendix 9. Disbursement pressure

Objective

The purpose of this part of our study was to determine whether fertiliser aid was affected by pressure to complete budget disbursement by the end of the financial year and whether aid efficiency suffered as a result.

Method

All fertiliser transactions made in 1985–91 under the financial aid procedure were examined to determine whether the course of events was influenced by disbursement pressure. For the purposes of this study a transaction was defined as the payment for one shipment of one type of fertiliser; a payment relating to the supply of three types of fertiliser, for example, was thus considered to constitute three transactions. Our analysis focused on three points:

- the dates of signature of appraisal memoranda;
- the dates of contracts with suppliers (data from Fertecon on 224 transactions);
- payment dates, distinguishing direct payment and reimbursement (data from NIO on 335 transactions).

The following points need to be borne in mind here:

- DGIS records show a total of 106 transactions over the period 1985–91 but only 63 appraisal memoranda (59 per cent) were available for examination. Most of the 43 transactions for which no memoranda were available took place in 1985–87, when full memoranda were not yet a required part of the fertiliser aid project cycle.
- Fertiliser expenditure under the financial aid procedure between 1985 and 1991 amounted to 1,505,848,454 guilders; expenditure in respect of which appraisal memoranda were retrieved amounted to 879,920,067 guilders, 58.4 per cent of the total.

The analysis which follows relates to those transactions for which appraisal memoranda could be found, i.e. to virtually all transactions over the period 1988–91. We examined the three sets of data (relating to the dates of appraisal memoranda, contracts and payment) to determine whether there were any peaks in particular months of the year and to identify any correlations between them. Where there was a peak in payments (authorisations) we determined whether there was also a peak in expenditure.

In the case of those appraisal memoranda that were signed in the months of October, November and December, we then considered whether the related expenditure had been incurred in the same calendar year, this being seen as a sign of disbursement pressure. We looked at:

- the sum involved in these transactions, both in absolute terms and as a percentage of total fertiliser aid spending;
- the payment procedure (direct payment or reimbursement);
- possible adverse effects in the form of higher prices;
- possible adverse effects in terms of the month of delivery in relation to the crop cycle in the recipient country.

Results

Table 48 and figure 23 show the numbers of appraisal memoranda and contracts signed and payments made in each month of the year.

As figure and table show, the figures for the approval of appraisal memoranda peak in the months of February and October (with a smaller peak in June), while those for the signature of contracts have their main peaks in June and July, followed by May and October. The number of payments shows an absolute peak (38 per cent of the total) in December, with a smaller peak in November and another in September; 31.7 per cent of all spending on fertiliser aid was concentrated in the month of December. Of the 127 transactions or payments made in December, 36 (28.3 per cent) were reimbursement claims.

Of the 16 appraisal memoranda (25 per cent) signed in the months of October, November or December, nine were followed by payment the same year and five in the subsequent year; in one case payment had been made the previous year and in a further one the contract and payment dates were not known.

The nine cases in which appraisal memoranda approved in the last quarter of the

Table 48 Appraisal memoranda and contracts signed and payments made: monthly absolute and percentage figures (financial aid procedure, 1985–91)

Month	Appraisal memo		Contract		Payment			
	n	%	n	%	DP	RE	Total	%*
Jan	3	4.8	6	2.6	8	0	8	2.4
Feb	9	14.3	4	1.8	5	2	7	2.1
Mar	3	4.8	9	4.0	5	0	5	1.5
Apr	3	4.8	11	4.9	7	0	7	2.1
May	6	9.5	28	12.5	14	2	16	4.8
Jun	6	9.5	36	16.1	20	0	20	6.0
Jul	8	12.7	35	15.6	16	1	17	5.1
Aug	6	9.5	24	10.7	24	0	24	7.2
Sep	3	4.8	20	8.9	31	6	37	11.0
Oct	10	15.9	28	12.5	23	6	29	8.7
Nov	4	6.3	15	6.7	31	7	38	11.3
Dec	2	3.2	8	3.6	91	36	127	38.0
Total	63	100.1	224	99.9	275	60	335	100.2

DP = Direct payment; RE = Reimbursement.

* Figure shows share of the sum of DP and RE in the month concerned.

year were followed by payment in the same year were assumed to reflect disbursement pressure. Further analysis of the nine shows that:

- three related to reimbursement claims (to a total value of 66,795,658 guilders), so that the date of payment could not have had any adverse effect on prices or delivery dates;
- the remaining six (representing 9.5 per cent of all approved memoranda) related to the following shipments:
  - India (one memorandum, two transactions in 1989 to the value of 6,213,888 guilders),
  - Mali (three memoranda, ten transactions in all, to the value of 2,833,850 guilders in 1986, 12,669,535 guilders in 1988 and 19,988,096 guilders in 1989),
  - Sri Lanka (one memorandum, in all four transactions in 1990 to a total value of 11,896,182 guilders),
  - Egypt (one memorandum, in all nine transactions in 1986 to a total value of 2,988,722 guilders);
- the nine cases affected by disbursement pressure together represent aid totalling 127,367,291 guilders, 14.5 per cent of all fertiliser-aid spending in respect of which appraisal memoranda were available (see table 49);
- deliveries to India, Mali, Sri Lanka and Egypt, which did not involve reimbursement, amounted to 60,571,633 guilders, 6.9 per cent of all fertiliser-aid spending in respect of which appraisal memoranda were available (see table 49).

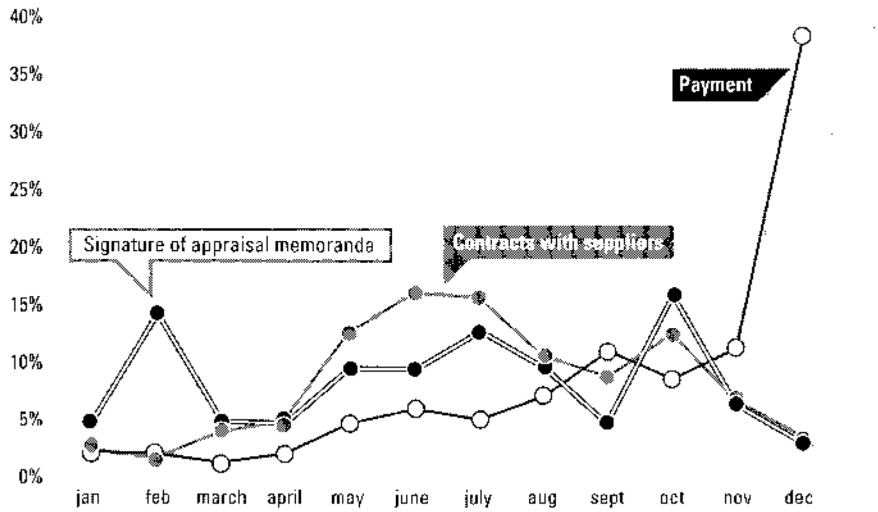


Figure 23 **Dates of signature of appraisal memoranda, of contracts with suppliers and of payment, 1985–1991**

There remains the question of the efficiency, in terms of prices and delivery dates, of shipments to India, Mali, Sri Lanka and Egypt: did it suffer as a result of disbursement pressure?

Comparisons of fertiliser prices (appendix 10) had already shown that only Sri Lanka had paid relatively high prices; however, this was the result of the aid being tied rather than of disbursement pressure. The case of Egypt was not included in the price comparison.

Payment is made by NIO once the fertiliser is on board ship and all relevant documents have been submitted; where payment is made at the end of the year the shipment arrives in the recipient country early the following year. In the case of Mali and Egypt delivery at this time is reasonably convenient, since planting normally begins in April or May; it is also convenient for Sri Lanka and India, where several harvests a year are the norm.

Conclusions

A relatively large proportion (38 per cent) of fertiliser-aid payments under the financial-aid procedure are made in the month of December. The value of December payments is also quite large at 31.7 per cent of the annual total. Fourteen

Table 49 Fertiliser aid 1985–91: aggregate spending and spending in respect of which appraisal memoranda are available

1. Total expenditure on fertiliser aid under the financial aid procedure from 1985 to 1991	Dfl 1,505,848,454
2. Expenditure in the month of December	Dfl 477,777,853
As fraction of 1	31.7%
3. Total expenditure on fertiliser aid under the financial aid procedure from 1985 to 1991 in respect of which memoranda are available (representative of the period 1988–91)	Dfl 879,920,067
As fraction of 1	58.4%
4. Last-quarter expenditure following last-quarter approval of memoranda (including reimbursement)	Dfl 127,367,291
As fraction of 3	14.5%
5. Last-quarter expenditure following last-quarter approval of memoranda (excluding reimbursement)	Dfl 60,571,633
As fraction of 3	6.9%

per cent of appraisal memoranda signed in the last quarter of the year resulted in payments being made in the same year, indicating some disbursement pressure. The sum involved is 127,367,291 guilders, 14.5 per cent of the total value; deducting reimbursement claims leaves 54,357,745 guilders, 6.9 per cent of the total.

This indicates that a small proportion of December payments peak is the result of disbursement pressure. For the rest the December peak is inherent in the annual project cycle: this comprises identification appraisal, the obtaining of tenders, the awarding of contracts, in some cases the production of the fertiliser to be supplied, and payment, with the last phase taking place wherever possible in the same year as the rest of the cycle.

Where transactions were affected by disbursement pressure this seems to have had little adverse effect on efficiency; relatively high prices were paid only in the case of Sri Lanka, but these were an effect of the aid being tied rather than of disbursement pressure. The delivery dates too were convenient as regards the farming calendar in the countries concerned.

Appendix 10 Price comparison of Netherlands' fertiliser aid deliveries with prevailing market prices

1 Problems connected with fertiliser price comparison

It has often been suggested that price levels of commodity aid are usually higher than those of comparable commercial transactions. The causes for this phenomenon should be sought in the fact that aid is often fully or partially tied to suppliers in the donating country, who can thus benefit from the so-called preferential margin: i.e. a margin, usually 15%, which domestic suppliers can add to prevailing prices of foreign suppliers. In the cadre of this study it was considered opportune to investigate whether the Netherlands' fertiliser aid policy had indeed led to higher prices than strictly necessary, which would indicate reduced value for money.

A price comparison could also address the question whether there was any effect of procurement modality on fertiliser prices. This issue can be dealt with neatly, since Asian countries have predominantly procured their donated fertilisers through their own procurement agencies, following their own procedures, while the African countries have consistently used the services of VIB which adheres strictly to the prescribed rules for tendering set out by DGIS.

The approach for the price comparison has been as follows. In order to be able to assess the majority of fertiliser aid deliveries in the period under consideration (1985–91), it was decided to evaluate all deliveries in this period to the ten main recipients of fertiliser aid. After taking stock of all transactions, it appeared that 140 transactions* would need to be analysed. Fertecon, an independent British organisation which monitors fertiliser tender information world-wide, was requested to provide prices paid for aid deliveries and prices of other suppliers in the same period.

* When more than one shipment took place under the same contract and at the same price, they have been considered as one transaction.

Fob prices, and whenever possible cif prices, of fertilisers delivered under the Netherlands' fertiliser aid programme have been compared with prevailing prices in the most important production areas: Western Europe, Eastern Europe, the Caribbean, the Middle East, Northern Africa and the US Gulf. Fertecon composed a range of prices for each production area during the month in which an aid transaction took place. Reasonable prices would have to fall within this range.

During analysis of the Fertecon data, numerous methodological problems appeared which rendered simple comparisons of prices with price ranges difficult in most cases and at times even impossible. To put the price analysis into proper perspective, these methodological problems are discussed in some detail.

- Only few fertiliser products can be considered homogenous and are traded frequently enough to allow an objective price comparison at a global level. Urea and NPK 15-15-15 are such products. Other fertiliser products are usually of a more unique character, such as compounds with a variable composition and quality, or products that are strongly associated with a particular country or region, such as DAP (USA) and NPK 23-23-0 (Western Europe and Turkey). Less current products are often not traded frequently enough to facilitate the composition of a price range.
- Fertiliser prices do not always bear a direct relationship with production costs: producers and traders obviously try to realise maximum margins, which means that the quoted price could lie well above, but also well under, the production costs. This implies, moreover, that prices for these 'unique' products are not always the result of competitive forces. Also, for the more regular products, a supplier who is situated close to the importing country may benefit from this proximity by converting the lower freight costs into a higher fob price. Likewise, for reasons of competitive strategy, an overseas supplier can decide to set his price at below cost price level. This implies that price comparison on fob-basis can only be effected within the same production region, whereas cif prices at the level of the recipient can be compared with similar deliveries from any production area, since cif prices comprise all competitive effects. The problem with comparison on cif-basis is that importing countries seldom import the same item twice in the same month, hence cif price ranges cannot be composed.
- An additional problem is constituted by the size of the transactions. The shipment of small quantities means relatively higher production and shipping costs per tonne. However, this was not consistently so: sometimes small quantities were expensive indeed, while in other instances they were in or even below the range of reasonable prices.
- Finally, the obligation for International Competitive Bidding does not guarantee

that suppliers with the lowest prices will react to the tender, perhaps because of their stock position or other market opportunities. In other words: the procuring organisation may not always have had access to the cheapest sources. This remark could disqualify the whole price comparison, were it not that this exercise compares tender prices only and the fact that aid shipments are attractive to suppliers because of the sure and prompt payment. It should also be borne in mind, however, that tender prices are usually somewhat higher than those arrived at in direct negotiations since suppliers need to cover their (currency) risks during the sometimes lengthy tender procedure.

To remedy some of these problems, a number of intermediate solutions have been selected. For example: to be able to compare prices of complex compounds, the various NPKS compositions have been compared with prices for NPK 15-15-15, increased with a premium of US $ 30 which reflects the added micro-nutrients. Some cif prices have been compared with prices of deliveries of the same product to other countries in the same region.

Despite the methodological problems and the need for intermediate solutions to operationalise the comparison, some distinct trends could be observed. A first comparison on fob-basis is presented below, followed by analyses of some cases where, at first sight, the ranges of reasonable prices have been exceeded. The analyses of these cases will be supported by region- or country-specific information and cif price comparisons.

2 Fob-price comparisons of fertiliser aid deliveries financed by the Netherlands in the period 1985–91

In table 50, based on annex 10a, fob-contract prices of Netherlands-financed fertiliser aid deliveries are compared with a range of prices of the same or comparable products from the same region (US Gulf, Western Europe, Eastern Europe, North Africa, Middle East and the Caribbean). A range depicts the lowest and highest contract prices negotiated for typical contracts during the month of the transaction under review. If a price paid for aid fertiliser falls outside this range, it can be assumed that for one reason or another it was either exceptionally cheap or exceptionally expensive. In this analysis, attention is given only to prices that were higher than the top of the range: the possible reasons are discussed in order to establish whether these high price levels were due to exceptional circumstances or simply to the tying of aid.

The table unveils two groups of countries: one which has occasionally or fairly often exceeded the price range, and the other which has structurally exceeded the range. The first group comprises Bangladesh, the Philippines, India, Kenya, Tanzania and the Sudan, accounting for 17, or approximately one-quarter, of the 69 cases in which the range had been exceeded; the second group, consisting of Sri Lanka, Pakistan, Mali and Zambia, accounts for 52, or three-quarters, of the 69 cases.

The first group also distinguishes itself from the second in that the degree of excess was fairly modest and in many cases negligible. The excesses were in the case of Bangladesh in the order of US$ 2–3; the Philippines US$ 2; India one and two dollars only and Sudan US$ 2–12. In the cases of Kenya and Tanzania, prices for CAN were compared with those from Turkey, which had offered CAN some US$ 3–15 more cheaply, but this comparison is purely theoretical since Turkey had shown no interest in tenders for these countries. The price differences for this group, amounting to a few dollars in most cases, are not alarming and can be attributed to market vagaries and to the limitations of obligatory tendering mentioned above.

Table 50 Comparison of Netherlands fertiliser aid contract prices with range of prevailing market prices in the same month and region, for the period 1985–91

Country	No. of transactions	No. of transactions within price range	No. of transactions exceeding price range	Range on average exceeded by (US$ per tonne)
Sri Lanka	22	3	19	23.5
Bangladesh	18	16	2	2.5
Philippines	6	5	1	2.0
Pakistan	5[1]	0	5	45.4
India	8	6	2	1.5
Kenya	10	8	2	9.5
Tanzania	9	6	3	13.6
Mali	21	6	15	33.7
Zambia	16[2]	3	13	47.2
Sudan	17	10	7	6.5
Total	132	63	69	

[1]Total number of transactions was actually 12, but for seven (NPK 23-23-0) no comparable transactions could be found.

[2]Total number of transactions was actually 17, but one (NPK 19-19-10/14S) could not be compared.

Source: NIO and Fertecon.

The second group is distinguished by the fact that the price range has been consistently exceeded. In view of the methodological limitations of the exercise, it is necessary to look closely at these cases before coming to any conclusions. The cases for the countries in this group: Sri Lanka, Pakistan, Mali and Zambia, are discussed in some detail below.

Sri Lanka

In the period 1985–91, Sri Lanka received predominantly Ammonium Sulphate and TSP under the Netherlands fertiliser aid programme. Smaller quantities of Urea and NPK 15-15-15 were also delivered. The period covers in total 22 transactions, 18 of which were effected in the Netherlands.

Until 1988, donations to Sri Lanka were tied to delivery from the Netherlands, provided that contract prices were not more than 15 per cent higher than those for comparable products from ESCs. Where this preferential margin was exceeded, Sri Lanka could request delivery from an ESC other than the Netherlands. The prices for AS and TSP from the Netherlands, however, generally exceeded the 15 per cent in comparison with other AS deliveries from the Netherlands and TSP deliveries from Northern Africa. (Comparison with Northern Africa was considered valid considering that sea freight from Western Europe to Sri Lanka does not differ much from Northern Africa to Sri Lanka).

The following explanations for the AS and TSP price levels can be offered. AS is a typical bulk product which normally can be provided by producers in the Netherlands at competitive prices. In the case of Sri Lanka, the recipient insisted on delivery in bags for logistical reasons. Bagging at delivery in a Sri Lankan port was ruled out by the recipients, for fear of poor bagging and subsequent damage claims. The supplying company in the Netherlands offered the explanation that it had no bagging facility of its own and had to contract this service out to another company, which cost some US$ 25–30 per tonne, while bagging by the supplier normally amounts to US$ 5–10. This difference largely explains the high prices which exceeded the range by US$ 33 or less. VIB was notified of this extra cost during the tender procedure, but conceded.

In the case of TSP the Netherlands' suppliers had no specific interest in exporting under the Netherlands' aid programme, since they were among the few TSP suppliers in Europe. They therefore fixed their prices at opportunity cost level.

Urea and NPK 15-15-15 deliveries originating in the Netherlands during this period were almost exactly 15 per cent higher than the top of the range, indicating that suppliers simply maximised their profits under the circumstances. This can be explained by the fact that international price comparisons for these products are relatively easy to make, and competition on the rather transparent market for the products is fierce.

From 1988 onwards, prices appeared to be more reasonable, i.e. generally not exceeding the top of the range by more than 15 per cent, but they were seldom within or under the range. Reasons for the lower price levels were a further loosening of conditions for tied aid, international tendering and more VIB involvement in tender procedures.

It can therefore be concluded that, in the case of Sri Lanka, the formal tying of fertiliser aid to supply from the Netherlands prior to 1988 led to higher prices. For the regular products this remained limited to the preferential margin, whereas AS and TSP deliveries were priced at their opportunity costs constituted by sales opportunities on the West European market, in the case of AS further compounded by the fact that bagging had to be contracted-out by the supplier.

Pakistan

The period 1985–91 covers 12 transactions, all of which were effected in the Netherlands. Between 1985 and 1987 some special NPKS compounds were delivered and from 1987 onwards the shipments were exclusively 23-23-0.

Price comparisons for the special NPK compounds show that in all cases the price range had been exceeded by 22 to 71 US$ per tonne. The NPKS (tobacco) compounds have been compared with prices for NPK 15-15-15, plus US$ 30 for the addition of Sulphur. These special tobacco compounds have several particular properties which render them expensive: they contain five per cent points more nutrients than the 15-15-15, representing US$ 20; Pakistan required the formulae to be fully water-soluble and chlorite-free, and such a complex formula with a low N-content is apparently more difficult to produce. Whether these factors fully explain the noted price differences cannot be judged from here.

Prior to 1985, fertiliser aid from the Netherlands consisted of NP only. In 1985 Pakistan banned these NP imports in favour of DAP, also an NP product but with a lower N-content (18-46-0), because local production of N in the form of Urea was causing already N-surpluses. The Netherlands has no comparative advantage in DAP production, and fertiliser aid was subsequently shifted to NPKS compounds, also from the Netherlands, for use in Tobacco and Sugar production. The high prices for these compounds were also spotted by an evaluation mission (NEI 1987) and reversion to NP compounds was recommended. NP deliveries from the Netherlands were resumed in 1987, immediately after relaxation of the import ban on NP compounds by the Government of Pakistan.

Due to its uniqueness, price comparisons for NP 23-23 are extremely difficult. A recent evaluation (NEI 1992) established, however, that per nutrient kg, 23-23 was generally 35 per cent more expensive than DAP (DAP contains 64 per cent nutrients against 46 per cent for 23-23). In the absence of any price comparison, the fact that the Netherlands is the sole eligible supplier of 23-23 in Europe and the conclusion that it was 35 per cent more expensive than DAP, justifies a closer look at the choice for this product and the prices paid.

NP 23-23 is a typical wheat fertiliser, attractive for its balanced composition of Nitrogen and Phosphorus. Pakistan, a major wheat producer, had therefore established its own 23-23 plant in Multan, but this could not fully satisfy domestic demand. Importation of 23-23 seemed logical, but because there was considerable local capacity for Urea production (46 N), 23-23 was banned for its high N content. Instead it was decided to import DAP, which has a rather low N content as compared to its P content (18-46). For the wheat, which requires balanced NP application, this meant that DAP had to applied in combination with Urea. Price comparisons with 23-23 should therefore be based on this combination.

A further note with regard to the agronomic properties of the different products should be added. Pakistan required 40 per cent of the N in 23-23 to be in the form of nitrate and the P to be minimally 90 per cent water-soluble, in order to facilitate quick uptake by the plant. Nitrate is a more expensive form of N than Ammonia. The N in DAP is in the form of Ammonia and the P is less than 90 per cent water-soluble. It has been reported that 23-23 gives 10–20 per cent more yield in wheat production compared to the DAP/Urea combination. It seems, therefore, that a straight comparison on nutrient basis between DAP and 23-23, as was done in the above mentioned NEI-evaluation, is not fully justified.

It should also be noted that the prices paid for 23-23 destined for Pakistan were some US$ 50 under those prevailing on the market in the Netherlands, as appears from table 51. The reason for this was the potential competition from other 23-23-0 suppliers outside Europe, such as Turkey. Table 51 shows an interesting exception, namely, for the contract of 1 December 1990, where the market price came close to the regular market price in the Netherlands. Due to budget pressure, quick disbursement was important and the supplier was willing to extract the required quantity from commitments in the Netherlands to enable immediate delivery; hence, the opportunity price could be asked.

Table 51 Comparison of tender price (fob) for 23-23-0 delivered under the Netherlands' fertiliser aid programme to Pakistan with the prevailing price on the market in the Netherlands in the same period

Date	Quantity (tonnes)	Tender price[1] (US$)	Price in Netherlands (US$)
- -87	27,300	175	223–225
17-07-88	66,750	171	217–219
19-07-89	74,612	153	196–198
15-04-90	69,463	184	223–225
01-12-90	13,161	220	234–236
11-05-91	29,820	166	218–220

[1]From the fob price listed in appendix 10a, US$ 5–7 has been deducted to compensate for the empty bags that were part of shipments to Pakistan.

Source: FERTECON and VKP.

In conclusion, the rather high price levels for Pakistan can largely be explained by the fact that special compounds were manufactured on the basis of particular specifications. With regard to the 23-23-0, the conclusion from an evaluation mission stating that this compound was approximately 35 per cent too expensive, should be regarded in the light of its use in wheat growing, where application of DAP plus Urea seems to be less effective* and on balance not definitely cheaper.

Mali

The period 1985–91 covers 21 transactions, 15 of which exceeded the price range. The odd feature in the case of Mali is that all but one of the 12 regular product deliveries (Urea, DAP and 15-15-15) exceeded the range, whereas the special cotton compounds were generally within the price range (15-15-15 + US$ 30). Only in four of the nine special compound deliveries were there (sometimes substantial) excesses, which can all be attributed to small quantities, whereas special compound shipments larger than 10,000 tonnes were reasonably priced. All tenders were international and handled by VIB.

If one looks at the price excesses of US$ 20 and higher (10 cases), it is striking to note that eight of these transactions were effected in neighbouring countries: seven

* Corroborated in a report of the Pakistan Agricultural Research Council on the 'Farming for Self Sufficiency' programme in the period 1978–79 to 1980–81.

in Senegal and one in Côte d'Ivoire; the other two in the Netherlands. This probably confirms the assertion that countries in the same region usually take advantage of their proximity by raising fob-prices by an estimated amount of sea freight which overseas suppliers have to take into account. This does not mean that this price difference constitutes a net profit to African producers; their production costs are generally higher than those of European producers, due to high energy costs and the import of raw materials.

VIB confirms that producers in adjacent countries are often chosen because their transport costs to Mali are lower. Comparison of cif-costs between deliveries from countries in the region and from overseas confirms this (extremely small shipments excluded): freight and insurance costs to Mali are on average US$ 35 (i.e. sea freight) lower within the region (approximately US$ 145 from overseas and approximately US$ 110 in the region). This advantage, however, is offset by the higher fob-prices explained above.

This does not explain why most fob-prices, also from overseas, are rather high. Some explanations can be provided. For instance, the 15-15-15 delivered in 1990 and 1991 had to be Ammonia-based. Using 15-15-15 for cotton is a rather sensitive issue (discussed elsewhere in this report) and the strong desire for cotton compounds resulted in two small and therefore expensive complex compounds in the same years. The rest of the excesses can largely be explained by the fact that Mali often ordered small quantities (<10,000 tonnes).

Prices for Mali are therefore high because of the high transport cost: sea transport is expensive because ships often have to return empty and inland transport is mainly by truck, which is more expensive than by train and monopolised by a few firms. Moreover, the ordering of small quantities of regular or special products has a distinctly negative impact on prices. The high price levels are therefore not a result of the tying of aid or procurement modality.

Zambia

In the period 1985–91, 17 fertiliser aid transactions were effected for Zambia, ten of which comprised special compounds, five comprised urea. AN and TSP were imported only once under the Netherlands' aid programme. Of the 17 cases, 13 prices were well beyond the top of the price range, and one could not be compared. This means that only three, perhaps four, transactions were completed at reasonable price levels.

To a large extent, Zambia's landlocked position is comparable to that of Mali. Cif-costs (sea + inland transport) from overseas suppliers average some US$ 65, whereas neighbouring Zimbabwe charges US$ 30. What is immediately striking is the rather low cost for sea and inland freight and insurance compared to Mali: less than half! Not only is Zambia further removed from Western Europe, it has also suffered from the war in Mozambique which cut its most economical supply route through Beira. This confirms that transport companies in Mali, Senegal and Côte d'Ivoire charge monopolistic prices, which are hardly mitigated by the fact that many fertiliser hauls by truck are supposed to be cheap because they constitute return fares for cotton hauls to the West African coast. Zambia further benefits from the fact that, contrary to Mali, most of its fertilisers arrive by train from the sea ports, and ships can usually organise return freight to Europe or elsewhere.

Also noticeable is that neighbouring Zimbabwe more than compensates its transport edge over suppliers from overseas: its fob-prices are approximately US$ 80 higher compared to Western Europe. In fact, for Zambia fob-prices exceed the range across the board, including the special compounds. The reason for this may be that quantities are generally below 10,000 tonnes. Urea prices are reasonable, except for one exceptionally small shipment, which was a so-called insurance shipment compensating for earlier damages. The high price for the single shipment of TSP from Tunisia cannot be explained.

It should also be noted that fertilisers with a very low N content are rather difficult to manufacture. The tobacco formulae requested by Zambia not only have a low N, they also wanted the N in two forms: Nitrate and Ammonia-based. Moreover, the K for tobacco had to be chlorine-free, which further added to the price for these special compounds.

The high prices for Zambia can therefore be explained by the fact that imported quantities were generally small and that sometimes very specific compounds were required.

3 Cif-price comparisons for the Netherlands' fertiliser aid transactions in the period 1985–91

Price comparison on basis of cif-prices has proven extremely difficult. In principle, such a comparison would be most pure since it would compare the border prices of two identical products irrespective of where they originated. The problem remains that not all suppliers would have reacted to the tender, but nevertheless it would be shown whether a product was relatively expensive or cheap. In practice, however, two identical products are seldom ordered from different sources in the same month. Some products are difficult to compare by their very nature, e.g. special compounds.

Moreover, the cif price is determined by the quality of the product, buyer's preferences, supply conditions, stock position and traditional markets of the supplier: sometimes suppliers are little interested in tenders for developing countries.

Fertecon has nevertheless tried to provide some comparative transactions, making use of similar product shipments earlier or later in the year, sometimes even to different destinations. This has yielded a very patchy picture of cif-prices, as can be seen in the last column of the tables in annex 10a. This comparison should therefore be regarded with extreme care as illustrating the complexity of such comparisons.

Only some very rough observations can therefore be made for the four countries singled out on basis of the fob-price comparison: Sri Lanka, Pakistan, Mali and Zambia.

Cif-prices for Sri Lanka are consistently higher than to other ports in the region, e.g. Calcutta, Rangoon and Bangkok. The prices can be considered fairly comparable since Sri Lanka imported regular products such as AS, TSP and Urea. This may corroborate the findings of the cif price comparison.

In the case of Pakistan, cif-prices are not known since all tenders requested bids on fob-basis. Yet for two special compound shipments comparable cif prices are given for Sri Lanka, which are below fob-prices to Pakistan. For the 23-23-0 shipments, cif-prices of 20-20-0 deliveries to Calcutta and Nepal have been provided, but comparison between the two was not considered valid due to the different properties of the product.

Comparison for Mali and Zambia is even more difficult. In the few cases where cif-price comparison was valid (i.e. comparison with a shipment to the same or a neighbouring landlocked country), prices for Mali and Zambia were consistently higher.

In conclusion, on the basis of cif-price comparison, however scanty, there is no need to change the conclusions reached on the basis of fob-prices for Sri Lanka, Pakistan, Mali and Zambia. In other words, where fob-prices were found to be high, they were not offset by lower prices for insurance and freight.

A quick look at the remaining countries shows that only in the case of Sudan were cif-prices often higher than comparable shipments (indicated by the >-sign between columns for cif-price and comparable cif-price in appendix 10a). The higher prices apply to urea; TSP has been delivered at reasonable prices. Eleven urea transactions have been listed for Sudan, nine of which are more expensive on cif-basis. Of these nine, four cases can be attributed to small shipments (< 3000 tonnes); prices for these shipments were US$ 8–44 higher. Of the remaining five cases, four amounted to only a few dollars more (US$ 2–10). The remaining case, a shipment of 10,000 tonnes from the Netherlands, was US$ 35 more expensive than a shipment from Rumania, delivered under a special government-to-government deal to Sudan. In view of the above, it was not deemed necessary to include Sudan in the list of countries that have consistently been confronted with exceptionally high prices.

4 The cost of partially untied aid

The above fob-price comparisons have been limited to the shipment's region of origin since price differences with other areas could have been compensated in the cif-price quotations and hence would have made no difference to the recipient. Yet, it would be interesting to see how prices compare between regions and whether any pattern can be discerned. For this purpose, all transactions for which more than one price range has been provided by Fertecon, are summarised in table 52. It is not surprising that only some widely traded, standard fertiliser products had price quotations in more than one region.

Table 52 Comparison of fob-price ranges for four frequently traded fertiliser products: number of times a region scored lowest compared to one or more other regions

	Western Europe	Eastern Europe	North Africa	M. East Caribbean	US Gulf	Total
Urea	3	33	–	3	–	39
TSP	–	–	5	–	27	32
DAP	–	–	–	–	4	4
AS	-	–	5	–	1	6

With regard to DAP and AS, the number of transactions is rather limited, albeit consistent: DAP comes cheapest from the United States and AS from Northern Africa. DAP is usually cheaper per nutrient kg than 23-23-0 or 20-20-0, but some properties of DAP with regard to water solubility and the ammonium-based N often make this product less attractive to users. The USA does not figure on the list of ESCs, hence if DAP is preferred by users, it cannot be bought there under the Netherlands' aid programme unless the aid is fully untied.

This is much more pronounced for the much traded Urea and TSP, which appear to be consistently cheaper in non-ESCs, namely Eastern Europe and the United States respectively. Whether this can be interpreted as a negative aspect of partially untied aid will be discussed below.

Urea

The price for urea from Eastern Europe is usually 10 to 20 US dollars below the price charged by West European producers, who are probably among the most efficient in the world. Assuming that transport costs from Eastern and Western Europe to the major recipients of Netherlands fertiliser aid in Africa and Asia will not differ much, it can be stated that there is a definite cost to partially tied aid. Recipient countries could have had better value for money had they been allowed to procure urea in Eastern Europe.

It should be added, however, that there are serious allegations against East and Central European producers with regard to dumping; they are accused of selling urea below cost-price. Several cases of dumping have been reported to, and investigated by, the European Commission, as appears from the Official Journal of the European Communities (e.g. No. L 317/1 of 7-11-1987 and No. L 52/37 of 24-2-1989). Several cases were indeed considered to be dumping and additional levies were imposed on urea imports from Czechoslovakia, the then German Democratic Republic and the USSR, while cases from Hungary and Rumania were less clear. To date, West European producers continue to present cases of dumping to the European Commission. If cases are proven, it is customary not to use those sources for fertiliser aid programmes.

Under free choice or fully untied aid, a recipient country would have been able to obtain more tonnes of product for the same amount of money, irrespective of dumping ethics. In practice, however, it seems that there is no preference for East European urea because timely delivery is less certain, and products as well as bags are often of low quality.

Middle Eastern countries also have been reported for dumping. West European producers have alleged that the presence of free energy (natural gas that otherwise would have been burned off) constituted a case of unfair competition. They were particularly dismayed when the Gulf States were included in the ESC list. The tables in appendix 10a, however, show that Middle Eastern countries are not competitive at all in the case of urea. This can be explained by the fact that they are not interested in a very large world market share at low cost, but prefer to realise a maximum margin by concentrating their deliveries to nearby countries.

TSP

Deliveries of TSP under the Netherlands fertiliser aid programme have been concentrated on three countries: Bangladesh, Sri Lanka and Sudan (see appendix 10a). The prices of American TSP are generally five to 20 US dollars below the rather competitive prices of Northern Africa. A drawback of American TSP is that it is 10 per cent less water-soluble than North African TSP, which mainly explains its lower price. It should further be noted that American TSP has to travel a longer distance to Africa and Asia compared to the North African product. A firm conclusion on a possible cost of partial tying in the case of TSP is therefore not possible; most probably American TSP has no edge over the product from North Africa.

5 Effect of procurement agency on import prices

We have attempted above to show the possible effects of tied and of partially untied aid on procurement prices, and also whether there was any influence on prices by procurement modalities. The distinction has been made between African recipients, which have made consistent use of the services of VIB, and Asian recipients which arrange imports under the aid programme through their own agencies.

Within the confines of the Eligible Source Countries, it has been concluded that imports have generally been effected efficiently, except for Sri Lanka where high prices were due to formal tying, poor port facilities and several small shipments.

It can be concluded, therefore, that there is no discernible influence of procurement modality on import price levels, provided the importing agency has sufficient access to market intelligence, whether through its own experience or through use of the services of VIB.

APPENDIX 10a: Statistical annex to price analysis

Below, fertiliser aid transactions are listed for the period 1985–91. As much pertinent information as possible is included in the tables, which show price comparisons on fob- as well as cif-basis. These data have been analysed in appendix 10.

The following are some explanatory notes with regard to the tables.

General:

- The tables are based on information provided by NIO and Fertecon;
- Prices are in US dollars, calculated from guilders using the exchange rate prevailing in the contract month.
- The 'range' (sixth column) depicts the lowest and highest contract prices negotiated for typical contracts during the month of the transaction under review (first column). If a price paid for aid fertiliser falls outside this range, it can be assumed that it was either exceptionally cheap or exceptionally expensive. In this analysis, attention is only given to prices that were higher than the top of the range. The difference between such a high price and the top of the range is depicted in the eighth column: 'Top of range exceeded by'.

With regard to comparison on fob-basis:

- Unless otherwise stated under 'Remarks', the price range applies to the area of the country of origin;
- For Asia no price ranges are available; the lowest and highest prices of all other areas combined are taken as proxy ('Rest of the World');
- Special compounds (NPKS and NPKSB) and 17-17-17 have been compared with the price for regular 15-15-15 plus US$ 30, as advised by Fertecon;
- Some other fertiliser products can hardly be compared because they are not widely traded, such as CAN and 23-23-0, while others, such as TSP and DAP, come predominantly from one or a few countries only;
- To compare bulk with bagged product, US$ 20 has been added to the bulk product, as advised by Fertecon;
- Some contracts have been split in two or more separate shipments, with different prices for each lot. This has been depicted as: price & price, in the case of two shipments or as a range: price–price, in the case of several shipments.

With regard to comparison on cif-basis:

It has been very difficult to find comparable transactions on cif-basis, since it is unlikely that a country will order the same product within one month in more than one source country. The column with comparable cif-prices therefore represents a wide array of transactions, only some of which can be regarded as valid comparisons. The closest comparisons were often transactions in other months and/or in other countries and/or with similar products. Sometimes offers were used from tenders which did not materialise. These deviations could not be covered in a single column, hence it is only indicated when the comparison pertains to a transaction of another importing country, usually in the same region. These figures have therefore played a minor role in the analysis; they have been carefully used to corroborate findings and patterns emanating from the fob-price analysis.

Table 53 BANGLADESH, fertiliser aid: price comparison 1975–1991
(18 transactions, of which 2 exceeding price range by 2 and 3 US$, i.e. on average 2.5 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
24-08-84	TSP	Morocco	28,500	142	135–145			166	163.19
		Tunisia	26,150	143	135–145			167	163.19
24-08-85	TSP	Turkey	47,200	136	135–145	(N. Africa)		153	166.50
24-08-85	TSP	Morocco	14,899	113	135–145			123	n.a.
14-06-86	TSP	Iraq	63,078	119	138–145	(N. Africa)		134	150.53 (Burma)
06-06-87	TSP	Turkey	15,750	146	155–165	(N. Afrika)		166	169.45
02-07-87	TSP	Tunisia	18,160	146	150–160			166	175.90
02-07-87	TSP	Iraq	41,080	149	150–160	(N. Africa)		169	181.45
30-04-88	TSP	Iraq	21,083	185	180–185	(N. Africa)		210	>205.50
30-04-88	TSP	Tunisia	23,790	188	180–185		3	213	225–230
20-07-89	TSP	Tunisia	36,480	147	165–170			196	205.65
19-09-89	TSP	Iraq	14,760	141	157–166	(N. Africa)		183	205.65
26-08-90	TSP	Tunisia	20,895	156	155–160			201	>198.52
26-08-90	TSP	Morocco	20,895	146	155–160			196	196.14
20-10-90	TSP	Morocco	16,125	163	160–170			213	219.87
23-10-91	TSP	Indonesia	17,658	151	150–155	(N. Africa)		205	>198.40
23-10-91	TSP	Morocco	19,253	139	150–155			203	197.00
02-07-91	TSP	Tunisia	36,050	136	150–155			197	>194.25
n.a.-85	Urea	Korea	4,100	195	170–193	(Rest of the world, Jan. 85)	2	225	245

Table 54 INDIA, fertiliser aid: price comparison 1975–1991
(8 transactions of which 2 exceeding price range by 1–2 USS, i.e. on average by 1.5 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
n.a.-85	Urea	Netherlands	105,428	175	165–173		2	n.a.	>150.00
15-05-86	Urea	Netherlands	178,603	97	95–100			n.a.	126.50
n.a.-90	DAP	Jordan	43,914	163	170–180	(North Africa)		n.a.	–
04-08-88	23-23-0	Netherlands	30,000	168	174–184	(Dutch tender for Pakistan)		n.a.	215 (20-20-10 Nepal)
04-08-88	15-15-15	Netherlands	45,000	142	140–150			n.a.	180 (Thailand)
n.a.-89	15-15-15	Netherlands	20,045	150	155–165			n.a.	–
19-10-90	17-17-17	Netherlands	106,555	186-211	190–210	(Split shipments)	1	n.a.	295.00 (Pakistan)
21-07-89	15-15-15	Netherlands	80,000	144	155–170			n.a.	250.88

Table 55 KENYA, fertiliser aid: price comparison 1975–1991
(10 transactions of which 2 exceeding price range by 4–15 US$, i.e. on average 9.5 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
n.a. -85	CAN	Netherlands	10,000	109	105–111	(Netherlands domestic retail prices)		154	–
13-11-85	CAN	Netherlands	10,000	95	90– 95	(Turkish tender)		140	–
24-06-86	CAN	Netherlands	10,000	102	134–138	(Netherlands retail bulk + US$ 20)		n.a.	–
22-10-86	CAN	Netherlands	15,000	88	83– 84	(Turkish tender) Split shipment	4	114&129	118.60 (9/86)
30-06-87	CAN	Netherlands	10,000	70&79	>88	(Turkish tender) Split shipment		144	–
08-10-87	CAN	Netherlands	20,000	88-115	>99.6 cif	(Turkish tender) Split shipment	15	133-160	–
09-11-88	CAN	Turkey	10,000	99	83–130	(Turkish tenders)		150	147.60
09-11-88	CAN	Turkey	10,000	97	83–130	(Turkish tenders)		148	–
30-11-89	CAN	Netherlands	24,850	135	127–147	(Cif prices! Various tenders)		135	162 (Malawi)
21-10-86	25-25-5-S	Netherlands	5,000	108	155–185	(15-15-15 + US$ 30)		138	140 (25-5-5-5S in 8/86)

Table 56 PHILIPPINES, fertiliser aid: price comparison 1975–1991
(6 transactions of which 1 exceeds price range by 2 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
17-09-87	Urea	Malaysia	11,000	115	105–115	(Rest of the world)		129 bags	170.50 (Bulk)
17-09-87	Urea	Indonesia	64,000	117	105–115	(Rest of the world)	2	131	>123
n.a.-88	Urea	Malaysia	27,246	149	135–150	(Rest of the world, Sept 88)		163 bags	160 (Bulk)
n.a.-88	Urea	Indonesia	10,277	138	135–150	(Rest of the world, Sept 88)		156	–
n.a.-88	Urea	Indonesia	42,579	132	135–150	(Rest of the world, Nov 88)		150	–
01-09-89	Urea	Indonesia	78,866	103	90–110	(Rest of the world)		118 bags	112 (Bulk)

Table 57 TANZANIA, fertiliser aid: price comparison 1975–1991

(9 transactions, of which 3 exceed price range with 2–36 US$, i.e. on average 13.6 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
03-05-85	CAN	Netherlands	5,044	114	105–111	(Netherlands domestic retail prices)	3	156	>122 (Nigeria)
23-06-86	CAN	Netherlands	23,220	91	110–115	(Netherlands domestic retail prices)			
30-06-87	CAN	Netherlands	17,300	101	122–137	(Netherlands domestic retail prices)			
21-06-88	CAN	Netherlands	20,000	100	140–142	(Turkish tender)			
03-08-89	CAN	Netherlands	56,000	79&81	95	(Turkish tender) Split shipment			
03-05-85	Urea	Netherlands	9,000	142	130–140		2	184	>136.50 (Sudan)
23-06-86	Urea	Netherlands	6,960	90	110–115				
21-06-88	Urea	Nigeria	10,000	133	135–145				
23-06-86	AN	Netherlands	3,500	140 cif	104 cif	(Zambian tender cif East London)	36	140	>88.00 (Zambia, bulk)

Table 58 SUDAN, fertiliser aid: price comparison 1975–1991
(17 transactions of which 7 exceed the price range by 2–12 US$, i.e. on average 6.5 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
n.a.-85	Urea	Netherlands	20,000	106	110–115			146	>132–136
25-06-86	Urea	Qatar & Kuwait	40,000	85	80– 85			100	>98 (Ethiopia)
09-07-86	Urea	Saudi Arabia	16,000	87	80– 85		2	102	>98 (Ethiopia)
10-07-86	Urea	Qatar	1,500	91	80– 85		6	106	>98 (Ethiopia)
n.a.-86	Urea	Saudi Arabia	32,000	85	80– 85			100	>98 (Ethiopia)
30-06-87	Urea	Netherlands	3,000	118	115–120			158	>128.5
n.a.-88	Urea	Netherlands	48,135	127	25–130			7	208 (Tanzania)
11-05-89	Urea	Netherlands	10,000	148	135–140		8	183	>147.95 (Rumania)
02-07-90	Urea	Netherlands	3,000	147	125–135		12		
29-07-91	Urea (Gr)	Netherlands	915	165	150–155	(Pr. & Urea & + US$ 10 for gran.)	10	237	>191–193 (+US$ 10)
29-07-91	Urea(Gr)	Netherlands	2,815	148	150–155	(Pr. & Urea + US$ 10 for gran.)		220	>191–193 (+US$ 10)
25-07-86	TSP	Turkey	1,000	151	135–140	(North Africa)	6	201	–
30-06-87	TSP	Iraq	1,800	157	155–165	(North Africa)		187	236.5 (Zambia)
24-06-87	TSP	Iraq	4,010	159	155–165	(North Africa)		189	236.5 (Zambia)
11-05-89	TSP	Turkey	5,300	177	172–178	(North Africa)		212	–
02-07-90	TSP	Tunisia	7,000	152	145–150		2	187	246 (Ghana)
29-07-91	TSP	Turkey	9,720	150	150–155	(North Africa)		191	>189.2

Table 59 SRI LANKA, fertiliser aid: price comparison 1975–1991
(22 transactions of which 19 exceeding price range by 2–52 US$, i.e. on average by 23.5 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
10-12-84	AS	Netherlands	20,000	100	80– 95		5	–	
08-11-85	AS	Netherlands	6,000	103	65– 70		33	135	–
07-05-86	AS	Netherlands	16,875	85	60– 65		20	–	
01-12-87	AS	Netherlands	14,390	88	60– 75		13	133–158	–
n.a.-89	AS	Netherlands	15,000	82	65– 80	(for 1989)	2	132	155.75 (Calcutta)
10-02-89	AS	Netherlands	10,450	80	75– 80			130	155.75 (Calcutta)
22-10-90	AS	Netherlands	12,000	69	35– 45		24	109	>60 (Thailand)
22-10-90	AS	Korea	12,000	81	35– 45	(W. Europe)	36	115	>60 (Thailand)
22-01-85	TSP	Netherlands	6,000	215	155–165	(North Africa)	50	247	>170.45 (Bangladesh)
n.a.-86	TSP	Netherlands	7,500	217	155–165	(North Africa, Dec. 1984)	52	257	>156.90
03-12-86	TSP	Netherlands	1,186	180	133–140	(North Africa)	40	217	>173.31 (Burma)
13-10-86	TSP	Netherlands	6,600	167	135–140	(North Africa)	27	217	>173.31 (Burma)
27-10-86	TSP	Netherlands	500	181	135–140	(North Africa)	41	218	>173.31 (Burma)
20-11-86	TSP	Netherlands	10,895	169	133–140	(North Africa)	29	219	>169.45 (Bangladesh)
09-06-87	TSP	Netherlands	11,000	180	155–165	(North Africa)	15	218	>169.45 (Bangladesh)
n.a.-87	TSP	Netherlands	4,400	167	160–170	(North Africa, Dec. 1987)		217	249.44
12-06-91	TSP	Tunisia	10,200	158	147–153		5	194	>189.75
02-12-86	Urea	Indonesia	5,500	93	75– 80	(Carib./Middle East)	13	111	>97
02-12-86	Urea	Myanmar	5,467	93	75– 80	(Carib./Middle East)	13	111	>97
01-04-88	Urea	Netherlands	24,750	143	130–135		8	184–250	>158.77
10-02-89	Urea	Netherlands	22,000	119	165–175			169–174	>154.50
29-04-87	15-15-15	Netherlands	3,300	162	130–140		22	–	–

Table 60 PAKISTAN, fertiliser aid: price comparison 1975–1991

(12 transactions of which 7 not comparable, remaining 5 all exceed price range by 22–59 US$, on average 45.4 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
24-10-85	10-20-20-S	Netherlands	10,700	193	165–170	(15-15-15 + US$ 30)	23	–	144.75 (Sri Lanka)
06-09-86	10-20-20-S	Netherlands	14,545	224	155–165	(15-15-15 + US$ 30)	59	–	137.25 (Sri Lanka)
06-09-86	13-13-21-S	Netherlands	15,750	187	155–165	(15-15-15 + US$ 30)	22	–	
n.a.-87	23-23-0	Netherlands	27,300	180	n.a.			–	189.00
n.a.-87	10-20-20	Netherlands	15,750	246	170–175	(15-15-15 + US$ 30, Oct)	71	–	
n.a.-87	13-13-21	Netherlands	56,584	227	170–175	(15-15-15 + US$ 30, Oct)	52	–	
17-07-88	23-23-0	Netherlands	66,750	176	n.a.			–	215 (20-20-0 cif Calcutta)
19-07-89	23-23-0	Netherlands	74,612	158	n.a.			–	238.25 (20-20-0 cif Nepal)
15-04-90	23-23-0	Netherlands	41,678	189	n.a.			–	205 (20-20-0 cif Calcutta)
15-04-90	23-23-0	Netherlands	27,785	189	n.a.			–	205 (20-20-0 cif Calcutta)
01-12-90	23-23-0	Netherlands	13,161	225	n.a.			–	219 (20-20-0 cif Nepal)
11-05-91	23-23-0	Netherlands	29,820	171	n.a.			–	231.36 (20-20-0 cif Nepal)

Table 61 MALI, fertiliser aid: price comparison 1975–1991
(21 transactions of which 15 exceed price range by 2–106 US$, i.e. on average 33,7 US$)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
02-11-85	Urea	Netherlands	12,000	113	110–115			248	>126.75 (Nigeria)
01-08-87	Urea	Netherlands	5,288	115-122	115–120	(Split shipments)	2	250–260	>123
12-08-88	Urea	Netherlands	3,910	149/162	135–145	(Split shipments)	17	284–297	>188.88 (Tanzania)
20-10-89	Urea	Venezuela	4,600	106	85– 95		11	261 fot	> appr. 214 (Cam)
25-09-90	Urea	Netherlands	20,105	147–178	140–150		28	302–333	>214.85 (Ethiopia)
09-09-91	Urea	Nigeria	2,960	142–173	145–165	(Rest of the world)	8	292–323	>300 (B. Faso)
20-10-89	DAP	Senegal	3,000	235	200–215	(N. Afr., bulk + US$ 20 bags)	20	329 (fot)	>240 (Ethiopia)
03-10-90	DAP	Senegal	3,050	261	225–230	(N. Afr., bulk + US$ 20 bags)	31	373	>224
09-09-91	DAP	Senegal	1,000	249	210–212	(N. Afr., bulk + US$ 20 bags)	37	356	–
02-10-90	15-15-15	Netherlands	285	200	160–180		20	400	
09-09-91	15-15-15	Senegal	120	216	160–165	(Western Europe)	51	323	>299 (B. Faso)
09-09-91	15-15-15	Senegal	7,800	220	160–165	(Western Europe)	55	327	>299 (B. Faso)
01-11-86	14-22-12	Senegal	7,850	147	132–137	(15-15-15 + US$ 30, W. Eur.)	10	–	
01-11-86	14-22-12-S	Netherlands	12,252	119	132–137	(15-15-15 + US$ 30)		–	
08-07-87	14-22-12-S	Senegal	2,000/ 2,639	156/139	165–170	(W. Europe) Split shipment		–	
08-07-87	14-22-12-S	Côte Ivoire	5,719	198	165–170	(Western Europe)	28	–	
12-08-88	14-22-12-S	Netherlands	15,289	167	170–180	(15-15-15 + US$ 30)		317	>224 (cif Benin)
29-06-89	14-22-12-S	Netherlands	18,435	152	185–200	(15-15-15 + US$ 30)		302	>217 (cif Benin)
29-06-89	14-22-12-S	Senegal	10,755	186/192	185–200	(id., W. Europe) Split shipment		286-292	>217 (cif Benin)
01-10-90	14-22-12	Senegal	400	316	190–210	(15-15-15 + US$ 30, W. Eur.)	106	428	–
09-09-91	14-22-12-S	Senegal	435	277	190–195	(Western Europe)	82	397	–

Table 62 ZAMBIA, fertiliser aid: price comparison 1975–1991

(17 transactions of which 1 not comparable; of remainder, 12 exceed price range by 4–152 USS, i.e. 47.2 US$ on average)

Date	Product	Origin	Tonnage	fob-price	Range	Remarks	Top of range exceeded by	cif price	comp. cif price
22-07-86	20-10-5-S	Netherlands	24,000	135	155–185	(15-15-15 + US$ 30)		245	>140 (Kenya)
04-05-87	4-18-15-S	Netherlands	1,000	218	160–170	(15-15-15 + US$ 30)	48	293	>250
04-05-87	6-18-12-S	Netherlands	3,000	218	160–170	(15-15-15 + US$ 30)	48	278	>253
04-05-87	20-10-5	Netherlands	15,000	184	160–170	(15-15-15 + US$ 30)	14	254	>189 (Kenya)
04-05-87	10-20-10-S	Netherlands	5,000	242	160–170	(15-15-15 + US$ 30)	72	312	>164.42 (Ghana)
18-03-88	6-18-12-S	Netherlands	4,000	221	190–210	(15-15-15 + US$ 30)	11	–	
18-03-88	6-18-12-S	Zimbabwe	5,000	286	190–210	(15-15-15 + USS 30, W. Eur.)	76	316	>271 (Tanzania)
18-03-88	4-18-15-S	Zimbabwe	2,200	291	190–210	(15-15-15 + US$ 30, W. Eur.)	81	321	>247 (Cameroon)
18-03-88	20-10-5-S	Netherlands	8,097	216	190–210	(15-15-15 + US$ 30)	6	286	>271 (Tanzania)
n.a.-88	19-19-10-S	Netherlands	4,597	182	–	No comparable prices found			–
01-06-89	AN	Netherlands	14,300	99				214	>207.40
05-02-90	**TSP**	Tunisia	10,000	199	155–160		39	264	>183 (Sudan)
18-04-86	Urea	Indonesia	25,613	117	110–120	(Western Europe)		187	>126.30 (Kenya)
n.a.-87	Urea	Netherlands	3,735	124	115–120	(May 87)	4	194	>97 (cif Dar)
04-05-87	Urea	Netherlands	28,915	130	115–120		10	200	>185
18-03-88	Urea	Netherlands	990	206/287	130–135	(Split shipment)	152	–	
18-03-88	Urea	Nigeria	8,000	131	115–140	(Rest of the World)		221	223.76

Appendix 11 Evaluations of support projects concerned with fertiliser use

1 Project categories

Our analysis of evaluation reports (table 8) showed that missions devoted a relatively large measure of attention to institutional aspects of fertiliser distribution and use and to the micro-level effects of fertiliser use, even where this was not requested in their terms of reference. This led us to compile a list of Netherlands-funded projects which can be regarded as supporting the recipient country's fertiliser sector; the period covered is 1985–91. More general rural-development projects were not included.

In relation to the sums disbursed annually as fertiliser aid, Netherlands-funded projects specifically intended to support fertiliser use are small in number (27 in the period 1985–91), despite repeated recommendations by evaluation missions that supplementary technical assistance be offered. In addition to funding projects, the Netherlands deployed in the same period some 14 associate experts to FAO programmes or bilateral projects in support of soil research and services.

The projects concerned fall into five categories:

1. projects in the framework of the FAO Fertiliser Programme providing direct support in connection with fertiliser use;
2. projects providing support in connection with logistics and distribution;
3. projects providing support in connection with policy;
4. projects which support the fertiliser industry;
5. support for soil research and services (these projects support soil science in general and have a less direct impact on fertiliser use than the Fertiliser Programme, for example).

Our analysis of these evaluations focused chiefly on project objectives, the approach used, the context in which projects were carried out, the importance attached to the priorities of Netherlands aid policy (environment, women in development, popular participation, etc.), project results and likely sustainability. Again, no attempt has been made to assess the quality of evaluation reports and their conclusions are not necessarily those of IOV.

Table 63 Support projects directly concerned with fertiliser use, 1985–91

	FAO Fertiliser Programme	Logistics and distribution	Policy support	Fertiliser industry	Soil research and services	Total
Asia	3	2	0	4	–	9
Africa	2	3	4	–	6	15
Latin America	1	–	–	–	1	2
World	–	–	–	–	1	1
Total projects	6	5	4	4	8	27
Total evaluations	13	1	1	2	4	21

Table 63 shows a reasonably even spread of projects across the various categories, with a modest peak in the area of support for soil research and services. The marked concentration of projects in Africa is a noteworthy feature. Numbers of evaluations are not proportional to numbers of projects: the many evaluations (13) of the six FAO projects are explained by the fact that, within the UN system, regular evaluations are often mandatory. They are usually tripartite, i.e. carried out by donor, recipient and UN.

On the basis of available evaluation material, projects in three categories are discussed:

- projects in the framework of the FAO programme;
- support for soil research and services;
- others.

2 Projects under the FAO Fertiliser Programme

The FAO Fertiliser Programme (FP) was launched in 1961, in collaboration with the fertiliser industry, as part of the Freedom from Hunger Campaign. Its long-term objective is very general: to raise rural living standards by developing agricultural production. In the short term this implies increasing output and raising small farmers' incomes by the efficient use of fertiliser. Figures for 1992 show that after more than 30 years, the number of FP projects is now in rapid decline.

The majority of FP schemes are demonstration projects geared to information and training for local farmers. The Netherlands has funded such projects in four countries: Nepal, Sri Lanka, Tanzania and Bolivia (in Nepal and Tanzania a second phase has been funded); Netherlands-funded projects are currently under way in Tanzania, Bolivia and Sri Lanka. The Netherlands not only provides funding for FAO fertiliser projects involving field trials and demonstrations but also participates in FAO support for the National Fertiliser Development Centre in Pakistan and provides fertiliser for use in the FAO Rural Stores project in Sudan.

FP demonstration projects follow a set pattern, their objectives and activities being virtually the same in all countries. The approach is a phased one, beginning with simple trials; the second phase comprises field demonstrations, while the final phase is concerned with distribution and credit schemes. The programme focuses on areas of high agricultural potential, where the poorest people rarely live. Activities are not geared to the specific local situation and do not respond adequately to major policy developments.

The projects in Sudan and Pakistan are of a different kind: in Sudan the project is carried out by the Agricultural Input Bank of Sudan, which distributes inputs to small farmers in irrigated areas outside the major irrigation schemes (five per cent); in Pakistan, Netherlands aid funds have gone into an FAO project supporting the National Fertiliser Development Centre. NFDC has the job of studying all fertiliser-related problems with a view to giving the Pakistani government and fertiliser industry full and professional advice on planning and formulating fertiliser policy. Pakistan is engaged in privatising and deregulating the fertiliser market, and NFDC has provided the Planning Commission with information for the development of options for the removal of subsidies and the formulation of fertiliser policy.

Project results and sustainability

Evaluations of the projects concerned with information and training focus principally on numbers of field trials, field demonstrations and group demonstrations, numbers of farmers and trainers receiving training, courses abroad for government personnel and numbers of block demonstrations (these last involve a group approach whereby farmers with neighbouring parcels of land use the same cultivation methods as far as possible and receive credit for the purchase of fertiliser). Long-term implications for food supplies, output levels and the relief of poverty are evaluated only in the case of Nepal.

Almost all reports take a predominantly favourable view of the quality of the results, especially in the case of the activity most recently added to the FAO's Fertiliser Programme, i.e. the block demonstration. A report on the progress of the FAO Fertiliser Programme in Nepal in 1990 and 1991 found block demonstrations to be an effective means of transmitting know-how. It is noteworthy, however, that criticisms are at least as numerous as plaudits and weightier in substance: field activities do not reflect farmers' interests; no practical and affordable recommendations are given; trials need to be conducted under conditions more closely resembling those facing farmers; newly introduced techniques are not always economically attractive to farmers on account of the risks involved, the increased labour required and the uncertain ratio of benefits to costs; the education and training value of field demonstrations is low and activities need to focus more strongly on the transmission of information.

The evaluations frequently refer to the adverse effects on project implementation and results of external factors such as problems in the areas of fertiliser availability, crop marketing and transport. These problems are often associated with a weak physical and institutional infrastructure in the recipient country, and it is questionable whether FP projects have sufficiently emphasised its improvement.

Important aspects of sustainability such as economic viability at farm level, ecological sustainability and viability in relation to macro-economic factors such as international trade and exchange-rate policies, are generally not covered at all; and where they are touched upon the assessment is predominantly negative. Nor do missions focus much attention on the long-term impact of project results such as the effects on agricultural output and farm income; rather, they concentrate on more easily quantifiable short-term effects.

The Netherlands' input into the design of FP is mainly geared to ensuring that it adequately reflects the concerns of Netherlands development policy. Nevertheless, the conclusion is inescapable that little has been achieved in the projects in relation either to the integrated approach or to such Netherlands priorities as the relief of poverty, the advancement of women, and protection of the environment; only one project, in Tanzania, includes integrated women's activities, and 20 per cent of the trainers in this project are women. However, the report on the progress of the FAO Fertiliser Programme in Nepal in 1990 and 1991 concluded that in 1991 the proportion of women attending field days had risen to 33 per cent.

The FAO's Fertiliser Programme has traditionally sought to increase the use of inorganic fertilisers, and four missions (to Bolivia and Nepal) considered that there was insufficient emphasis on the use of organics and of organic/inorganic combinations. Since 1991 integrated plant nutrition systems (IPNS) have been included in the Fertiliser Programme, at the Netherlands' request.

The reports on FP projects in Pakistan and Sudan are predominantly positive. A Sudan report notes that high profit margins have been achieved notably in horticulture, but that it is not clear what part the Rural Stores have played in this. With regard to the sustainability of rural complexes in Sudan, the conclusion is that the Stores have brought substantial financial yields to farmers and that 26 of the 36 services are profitable. The need for scarce foreign currency to fund imports means that the project remains dependent on donor support.

When the evaluation was carried out, Pakistan's National Fertiliser Development Centre (NFDC), supported by FAO, had a recognised role as a centre for the provision of information and policy support and had made a major contribution to the planning and improvement of fertiliser stocks; many project activities had been carried out which represented a qualitative and quantitative improvement on the first phase.

3 Projects which support soil research and services

The Netherlands has endorsed projects which support soil research and services in seven countries, the aim being to strengthen their contribution to agricultural development and land-use planning. The Netherlands input has included laboratory equipment, funding for research material and maintenance, the deployment of experts, and the training of personnel. The services' main activities are soil mapping, land evaluation and soil research. Evaluation reports give little or no information on the context of projects. As well as the support given to soil services, a world-wide study has been funded involving the testing and introduction of a urea injector.

The projects have helped to improve the infrastructure, the quality of research and the organisation of services. Soil services that are operational have seen an increase in such areas as the number of trials and experiments with fertiliser. Criticisms focus on internal problems facing the services in relation to personnel, the skewed development of various departments, and inadequate concern with the development of human resources. Two projects, in Mali and Mozambique, include special environment-related activities, studies concerned with reducing soil acidity and the use of organic fertiliser and the development of a national low-input fertiliser strategy.

The activities of the services and effects of the projects are mainly assessed in quantitative terms. The projects' narrow focus on the direct objectives of the research itself means that no indication is given either of the extent to which trials and experiments are geared to farmers' needs or of how far the results find their way to the target group through information and training. There is criticism of the lack of cooperation with other sections of the Agricultural Ministry such as information and training services, which themselves are not adequately tied in with research activities.

The urea project included on-farm and on-station trials involving the pneumatic injection of urea into the soil in five countries of Africa and Asia. The project has not been evaluated but the results, detailed in a final report, have been submitted to the supervisory group for the injector project. Among the conclusions are that injecting urea deep into the soil greatly reduces nitrogen losses and increases irrigated rice yields; that the method is labour-intensive compared with surface application; and that under certain circumstance injection is a viable option for both large and small farmers. The supervisory group felt that the cost/benefit analyses gave too optimistic an impression and called for supplementary research into farmer acceptance (for which it proved impossible to obtain funding). Interest still exists in the equipment and it is to be introduced on a commercial basis in Indonesia.

4 Other projects

The Netherlands also supports various other projects (page 291, categories 3–5): distribution and logistics, projects that support policy development, and projects that support the fertiliser industry. However, only a limited number of evaluation reports are available.

Five projects have been funded in the area of *fertiliser distribution and logistics* with the aim of improving farmers' access to fertiliser supplies; they involved improvement of the physical infrastructure through the construction of storage depots in Bangladesh and Tanzania, support for logistical planning with the deployment of technical expertise, and support for a Logistic Planning Unit in Zambia.

Direct goals are easily measurable: ten storage depots have been built in Bangladesh and in Zambia four measures have been taken to improve distribution (road improvements, an oxcart loan scheme, supply of spare parts, infrastructural improvement). The missions did not have enough data to reach conclusions as to the long-term objective of improving agricultural production. In Zambia the mission doubted the project's impact in terms of improving the planning process.

The storage depots in Bangladesh were not sustainable in financial terms. In 1989 a maintenance project was launched with Netherlands funding; it was noted that the executive agency concerned would need to be reorganised if maintenance services were to be effective. The Logistic Planning Unit in Zambia would only be effective if the new distribution system set up by FAO was adopted as part of official government policy.

Three projects have been carried out in the area of *policy support*; a financial contribution has also been made to the Fertiliser Advisory, Development and Information Network for Asia and the Pacific (FADINAP). In Burkina Faso the Netherlands was involved in a joint-financing project with the World Bank/International Development Association, the French *Caisse Centrale de Coopération Économique* (CCCE) and the FAC geared to the removal of fertiliser subsidies and the promotion of alternative approaches to the maintenance of soil fertility; the Netherlands funded one-third of the fertiliser supplied. In Togo the Netherlands helps to fund the International Fertiliser Development Centre (IFDC Africa). A project in Kenya had the aim of improving the infrastructure by means of a monitoring and data-collection system covering the fertiliser situation. (NFDC project in Pakistan, mentioned earlier, also in fact falls into the category of projects geared to policy support.)

FADINAP, set up in 1978, falls under the agricultural division of the UN Economic and Social Committee for Asia and the Pacific (ESCAP) in Bangkok. Some 20 countries belong to the FADINAP network. Netherlands funding was provided under the budget category for special UN programmes; a number of associate experts have also been deployed. FADINAP exists to meet the need for information on the fertiliser industry and fertiliser use; its work includes collecting and distributing published material on agricultural chemicals, research into fertiliser marketing costs and the provision of training programmes.

Only one evaluation report in this category was available for the period 1985–91; it concerns the IFDC Africa project, which was evaluated for the second time in 1993. The evaluations are favourable as regards the number and quality of the international experts deployed. The Institute of Agricultural Economics (LEI/DLO) in The Hague initially had an important role in the deployment of experts and in providing backstopping for this project.

IFDC Africa has built up a network of correspondents in Sub-Saharan Africa, the African Fertiliser Trade and Marketing Information Network (AFTMIN), roughly paralleling the FADINAP structure. The correspondents supply IFDC Africa with information on the fertiliser sector which is then stored along with other data in a freely accessible database, the African Fertiliser Information Database (AFID). The information is distributed monthly in a bulletin and by telex. Several country studies have been carried out; there have been fertiliser sector studies in Benin, Togo, Burkina Faso and Niger, and studies are now in progress in Mali and Ghana.

The first evaluation criticised the quality of the studies (at the time only the Benin study had been completed and the Togo study was under way). The analyses were not deemed thorough enough to underpin concrete policy recommendations while the active involvement of the countries covered was judged inadequate. The second evaluation gave a much rosier view of the country studies and noted a higher level of involvement on the part of the countries concerned; policy recommendations had been taken seriously and projects geared to their implementation were attracting the interest of donors (e.g. the World Bank in Burkina Faso and the European Union on Togo). Both evaluations took a favourable view of the operation of AFTMIN and AFID, stressing the value of the monthly bulletins of fertiliser market information and annual theme-based meetings of correspondents and other interested parties.

A final focus of criticism was the poor integration of the DGIS-funded marketing project with IFDC Africa's other activities, financed by a variety of donors.

Projects like IFDC Africa (and NFDC in Pakistan) must be judged on the extent to which they have actually influenced fertiliser policy, or agriculture policy in general, in the countries concerned. The broad approach that marks these projects and their focus on concrete policy questions have evoked favourable responses from evaluators. Such policy-support activities are also relevant to the planning of improvements in research, information and training, and logistics and distribution; their results could also be used to improve the planning and execution of projects in other categories.

The last category is that of *projects which support the fertiliser industry*. A 1720-km gas main was laid to supply six fertiliser plants in India and storage tanks for phosphoric acid were built in Bangladesh. Two training projects were launched with the aim of improving technical know-how in the fertiliser industry in Pakistan and Bangladesh, the Fauji Fertiliser Technical Training Centre and the Training Institute for the Chemical Industry; both were financially significant projects (with commitments of 7–10 million guilders), with a training centre being set up by Stamicarbon (part of DSM Chemicals) and training provided in the Netherlands. The training projects' aim was to improve the functioning of the fertiliser industry and thus increase productivity.

While both evaluation reports expressed satisfaction with results so far, the impact in terms of increased production efficiency – the ultimate goal – was not measured in the case of Pakistan, and could not be measured in that of Bangladesh as the training courses had yet to begin. In Bangladesh the training centre still needed both technical and financial support, and even in Pakistan, where project implementation was further advanced, there was still dependence on foreign funding and Stamicarbon personnel.

The missions' criticisms should certainly be noted. Training capacity in Pakistan (200 enrolments a year) has remained very much under-utilised: in 1987 47 students enrolled, of whom 15 later withdrew, and 90 enrolments were expected in 1988. Training capacity in Bangladesh, in contrast, is already forecast to be insufficient. There is also some uncertainty between DGIS and Stamicarbon regarding the further implementation of the project.

5 Projects related to agricultural production in Bangladesh, Mali and Zambia

Bangladesh

In the last ten years there have been three projects linked directly to fertiliser, namely, the construction of ten storage facilities for food and fertiliser, the establishment of a training centre for the chemical industry, and support for the TSP plant.

The Netherlands has been involved in the *construction of storage facilities* since 1980, first on the islands of Hatya and Sandwip, then in Pabna and Rajshahi and later in Sylhet. The objective was to improve the storage and distribution system and thereby ensure the availability of fertiliser at more stable prices. Netherlands involvement was prompted chiefly by the rapid increase in fertiliser use (nine per cent per year in the first half of the 1980s) and by the need for additional storage facilities. The introduction of the new distribution system in 1978, when a start was made on privatising the wholesale and retail sectors, meant that the BADC needed storage space at new locations if it was to fulfil its new role.

In 1986 an evaluation mission concluded that a proper programme of maintenance was needed for the storage sites and that the BADC would need to be reorganised for this purpose, urging financial and technical support for such a programme.

Netherlands development funds have also gone into the establishment of the *Training Institute for the Chemical Industries* (TICI) within the Bangladesh Chemical Industries Corporation (the holding company for all the country's fertiliser factories), ten million guilders being earmarked for this purpose. The project's goal is to make fertiliser manufacture more efficient by improving the quality and expertise of technical and managerial staff.

When construction of the training centre was completed, an evaluation mission recommended in 1990 that an early start be made with the next phase of the project. Little work had yet been done on the centre's institutional structure or training programme and it was feared that the capacity (144 technicians and operatives per year) was already too small. Appraisal of the second phase was deferred after an evaluation mission from Twente Technical University concluded that the expertise of the agency that had implemented the first phase was not of such a nature that further tenders need not be sought.

The TSP plant received Netherlands support for the *construction of a granulating facility* in 1984 and subsequently for the construction of storage tanks for phosphoric acid, a storage facility for TSP and various parts. Over the years the Netherlands has given large amounts of phosphoric acid but during the 1980s the plant was never economically viable.

The Netherlands has also provided funding for the CARE 'Local Initiatives for Farmers' Training' project since 1991 and, through Dutch co-financing organisations, for local non-governmental organisations involved in support and training for the landless and in activities in the areas of horticulture and agroforestry.

Mali

Together with balance-of-payments support in the form of fertiliser aid, the Netherlands also provides Mali with project aid within the framework of rural development. Slightly over half of all aid spending between 1975 and 1992 was in this sector. The projects in the target areas (areas of irrigated rice and cotton cultivation), which also receive the bulk of fertiliser aid, are shown in table 64.

Mention must also be made here of the *Recherche sur la production primaire au Sahel* (PPS) project (1976–83), which involved research into the productive capacity of grazing land in the Sahel and dissemination of the results. The research showed that the critical factor in primary production was not water but soil fertility. The regional PPS project was given funding up to 1988 (Production Primaire au Sahel), while the Sotuba laboratory was funded from 1985 onwards. The PPS project was followed in 1991 by a project for sustainable production in the soudano–sahelian region, i.e. Production Soudano-Sahélienne (PSS), which *inter alia* investigates how access to fertilisers can be improved to reduce environmental degradation and stimulate rural development.

The project *Amélioration de la Riziculture Paysanne dans l'Office du Niger* (ARPON) has been actively concerned with rice-growing for more than ten years and is judged by the Operations Review Unit to be reasonably successful. Considerable increases in output have been achieved by combining the maintenance and improvement of irrigation systems with improved farming methods and increased fertiliser use.

The *Fonds de Développement Villageois* (FDV), set up as part of the ARPON project, concerned itself from 1989 to 1992 with the supply of inputs, particularly fertiliser. FDV is well-known to farmers and has played an active part in promoting privatisation. It has been proposed that FDV should also function as a bank in the *Office du Niger* region alongside the official bank, BNDA.

Balance-of-payments support in the form of fertiliser aid fits in well with these projects.

Netherlands project aid in cotton-growing areas falls into three main categories:
- farming systems research: *Direction de Recherches sur les Systèmes de Production Rurale*, Royal Tropical Institute of Amsterdam;
- applied research and implementation: *Projet de Lutte Anti-Érosive, Foresterie Rurale* Segou, *Aménagement des Terroirs Villageois* (PATV) Fana (Royal Tropical Institute of Amsterdam, Organisation of Netherlands Volunteers);
- other programmes in the area of rural development (mainly through the Organisation of Netherlands Volunteers).

All projects collaborate with CMDT, with varying degrees of closeness.

The Sotuba soil-science laboratory in Bamako is supported by the Netherlands in the areas of finance and personnel. The laboratory has begun to issue concrete recommendations aimed at maintaining and improving fertility in various regions, taking account of differences in soil quality.

Many projects are geared to making more efficient use of soil fertility and to creating conditions for viable fertiliser use. There is a clear coherence between project aid of this type and balance-of-payments support in the form of fertiliser aid: each reinforces the other.

Table 64 Agro-environmental aid projects in ON and CMDT areas, 1984–92

Executive agency	Name of project	Date	Netherlands agency	Focus of concern
In the area covered by the *Office du Niger* (rice-growing)				
ON/ARPON, including:		1979–	DGIS	Rehabilitation of irrigation system
	– *Besoins en Eau* (BEAU)		LUW	Study of water requirements
	– *Gestion d'Eau* (GEAU)		LUW	Water management study
	– *Centre de Formation Agricole* (CFA)		DGIS	Agricultural training and information
	– *Fonds d'Intrants Agricoles* (FIA, later FDV)		DGIS	Credit system, mechanisation
IER	Kogoni Rice Project	1985–	DGIS	Applied research (rice-growing)
DREF	*Bois de Village*, Ségou	1984–85	DGIS	Forestry
DREF	*Foresterie Rurale*, Ségou	1986–93	SNV	Forestry
In the area covered by the *Compagnie Malienne pour le Développement des Textiles et des Fibres* (cotton-growing)				
CMDT	*Projet de Lutte Anti-Érosive* (PLAE)	1986	KIT	Erosion control and land management
CMDT	*Appui à l'Animation Féminine*	1987–90	KIT	Women in rural development (phase 1)
	Projet Femmes et Développement	1991–94	KIT	Women in rural development (phase 2)
CMDT*	*Aménagement des Terroirs Villageois* (PATV), Fana	1987–	SNV	Erosion control, rehabilitation and improvement of village lands
CMDT*	*Greniers de Prévoyance*	1988–	SNV	Establishment of grain bank/ social and economic development
CMDT*	*Maraîchage*, Dioila	1989–	SNV	Horticulture/women in development
IER	*Direction de Recherches sur les Systèmes de Production Rurale* (DRSPR)	1977–82	KIT	Applied agricultural research
IER	*Profil d'Environnement, Mali Sud*	1989–92	KIT	Environmental profile
DREF	*Reboisement*, Dioila	1983–88	SNV	Reforestation, wood-burning stoves
DREF	*Bois de Village*, Ségou	1983–84	DGIS	Forestry
DREF	*Foresterie Rurale*, Ségou	1986–	SNV	Forestry
DREF	*Appui a la Foresterie Villageoise*	1985–	SNV	Forestry

* In 1991 these projects were incorporated into SNV Support for the CMDT programme.

DFER *Direction Régionale des Eaux et Forêts*
IER *Institut d'Économie Rurale*
KIT Royal Tropical Institute of Amsterdam
LUW Wageningen Agricultural University
SNV Organisation of Netherlands Volunteers

Based on: IOV 1994.

Zambia

Netherlands project support has mainly been concentrated in Western Province, one of the least developed provinces of Zambia. Central themes of the development programme include: rural development, agricultural production and food security. The following projects have been executed with support from the Netherlands:

- The Land and Water Management Project (LWMP) aimed at assisting small farmers to improve their agricultural production through the introduction of improved land and water use.
- The Rice Promotion Programme (RPP) was started on the basis of agro-hydrological and soil research by LWMP in the Lui river valley. These studies showed that rice could be grown under natural irrigation conditions and RPP was geared to developing paddy production in Western Province, notably in the Lui valley.
- The Western Province Adaptive Research Planning Team (ARPT-WP) generally aims at developing gender-specific recommendations to help small farmers to improve their farming systems in a sustainable way. ARPT-WP started its operations in 1981/82 and has been partially supported by the Netherlands since December 1982. Research themes comprise: maintenance of soil fertility, crop diversification, intensification of 'wetlands', animal husbandry and its interaction with agriculture. (ARPT-WP is now called Farming Systems Research Team-Western Province, FSRT-WP.)
- Netherlands assistance to the Kalabo Agricultural Project (KAP) was initiated in 1980. KAP aims specifically at the sustainable development of animal husbandry in the region in order to raise farm incomes and to improve food security.
- The Masese Agricultural Project (MAP) is a small-scale activity, implemented separately from the project programme for Western Province. MAP is directed at the interaction between agriculture, animal husbandry and animal traction, as well as at community development. At present, MAP seems to be extending into community natural resource management.
- The People's Participation Project (PPP) is a so-called multi-bi project executed by FAO in cooperation with the Home Economics Section of the extension branch of the Zambian Ministry of Agriculture, Food and Fisheries. PPP aims to improve the plight of the rural poor, with special attention for women, through the establishment of small, informal self-help groups for which income-generating activities are being developed. The emphasis is on agricultural activities such as the production of maize, rice, cassava, millet, vegetables, groundnuts, etc.
- In 1992 Netherlands resources were allocated to the Senanga West Agricultural Development Area Project (SWADA) as part of the Senanga District Projects identified on basis of the Senanga District Development Plan.

- The Animal Draught Power Project (ADPP).
- The Livestock Development Project (LDP).

Since 1989 the Netherlands has supported the Logistic Planning Unit (LPU) in Southern Province. LPU aims at reducing the substantial losses of maize and agricultural inputs through improving maize and input storage and distribution. The Netherlands funds the improvement of roads, credit for ox-carts, spare-part distribution and infrastructural facilities.

In 1989 and 1990 experts from the Netherlands assisted in the improvement of fertiliser distribution by Nitrogen Chemicals of Zambia.

Appendix 12 The Operations Review Unit (IOV)

The Operations Review Unit, better known by its Dutch acronym IOV or Inspectie Ontwikkelingssamenwerking te Velde, was established in 1977. IOV is responsible for conducting evaluations of Netherlands aid policy. Internal evaluations of projects are the responsibility of the operational units, i.e. the country or programme desks.

IOV is part of the Directorate General for International Cooperation (DGIS) of the Ministry of Foreign Affairs. It is a completely independent unit which directly reports to the Minister of Development Cooperation through the Director General. The Minister submits the reports to Parliament; they are discussed with the Permanent Committee on Foreign Affairs with respect to follow-up actions.

Initially, IOV placed the emphasis in its work on individual project evaluations. From 1977 up to the mid-1980s the reports were primarily intended for departmental management purposes. The status of these reports was confidential. During this period about 250 evaluation reports were produced. Gradually a need developed for more general evaluations based on project findings. In the mid-1980s a number of sector reports were prepared, such as those on drinking water, animal husbandry, women in agriculture and rural development, and primary health care.

Since then, emphasis has shifted from individual project evaluations to comprehensive thematic studies; they focus on policies and modalities of implementation and cover sectors, themes or programmes. They contain a review of relevant literature, and compare results with those of other donors concerning the same subject matter.

On average, the duration of these thematic evaluations is one to two years. The studies are carried out under the responsibility of IOV, with outside experts participating in various phases of the research. Field studies are undertaken by teams of independent external consultants. Increasingly, local institutions or experts are invited to participate in these field missions.

The synthesis report, based on the various field and desk studies, is written by IOV staff and published under its responsibility. Three to four such studies are published annually. Examples of recent evaluation studies published by IOV are: import support, export transactions relevant to development, food aid, the sector programme for rural development, project evaluation and monitoring in Netherlands bilateral aid, cooperation in higher education, environment and development cooperation, the Netherlands development programme with Tanzania 1970–92, the Netherlands development programme with Mali 1975–92, the Netherlands development programme with India 1980–92, and humanitarian aid to Somalia.

A reference group consisting of external experts and DGIS staff is appointed for every study. The reference group has three functions: to advise on methodology and approach, to counsel on relevant development theories, and to give feedback on evaluation results.

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