

Charlotte Benson and Edward Clay

1 INTRODUCTION¹

Droughts, however defined,² are frequent and severe in many African countries as a result of the extreme rainfall variability in the extensive arid and semi-arid areas, and the poor soil moisture retention capacity of most African soils.³ Many sub-Saharan African (SSA) economies are widely perceived as particularly vulnerable to the effects of drought as a result of the importance of rain-fed agricultural and livestock production in GDP, the limited infrastructure, and the low levels of per capita income. Moreover, parts of the Sahelian belt have been coping with an increasingly dry regime, with rainfall significantly below the norms of the period prior to the 1960s (Hulme 1992). The presence of armed conflict in several countries greatly exacerbates the effects of drought and is frequently responsible for turning drought into famine. Since the 1980s, economic decline and structural adjustment problems have also made many SSA economies potentially more vulnerable to internal and external 'shocks' (Elbadawi *et al.* 1992).

From an economic perspective, 'agricultural drought'⁴ may be viewed as an exogenous, but internal, supply-side shock which is widely recognized as resulting directly in sharp reductions in agricultural production, reduced export earnings, widespread losses of assets, reductions in employment and the losses associated with declines in rural income. In addition, meteorological drought may result in hydrological conditions that impact directly on non-agricultural production including hydro-power generation and on human water supply. The combination of these direct impacts, together with indirect

linkages and multiplier effects, implies that the economy-wide consequences of a drought shock could be considerable.

2 COUNTRY TYPOLOGIES

The impact of any exogenous shock depends not only on the nature and magnitude of the shock but on the structure and prevailing economic circumstances of the affected economy. As a first step in analysing the economic impact of drought shocks, it is useful to differentiate between four types of economy in terms of the role of rainfed and irrigated agriculture, the nature of intersectoral linkages in production and final expenditure, the intensity of water usage, levels of GDP per capita and natural resource endowments.⁵

i Simple Economies – predominantly rain-fed agricultural and livestock semi-subsistence economies with limited functioning infrastructure, low levels of per capita income and high levels of self-provisioning in the rural population. To the extent that a modern sector exists, there are few links between this and the agricultural sector.

ii Intermediate Economies – more diversified economies with economic growth occurring via the development of labour-intensive, low technology manufacturing sectors, typically dependent on domestically produced renewable natural resources and imported inputs and capital equipment, but with natural resources still representing a relatively important part of export earnings.

¹ This paper is part of the output from an on-going Overseas Development Institute research study on 'The impact of drought on sub-Saharan African economies and options for the mitigation of such impacts by national government and the international community', with support from ODA and the World Bank and benefitted substantially from the comments of a number of participants in seminars during 1993-94. For a fuller presentation of the arguments in this article and preliminary findings for case study countries, see Benson and Clay (1994).

² Droughts are notoriously difficult to define and there is an extensive literature on their definition. See Glantz 1987.

³ For example, the Africa Division of IFAD estimates that 'In SSA no less than 70 per cent of all cropping land ... or 717 million ha. is subject to drought; 30 per cent of this area is very sensitive to drought.' (IFAD, 1994)

⁴ Agricultural drought is defined as a reduction in moisture availability below the optimum level required by a crop during different stages of its growth cycle and resulting in impaired growth and reduced yields.

⁵ This typology builds on that initially presented in Nowlan and Jackson, 1992. They proposed a typology of subsistence, developing and complex economies as a way of explaining the need for different forms of international response required by drought-affected countries in Southern Africa in 1992.

iii Complex Economies – developed economies with a relatively small agricultural sector and proportionately small forward and backward linkages between the agricultural sector and other water-intensive activities and the rest of the economy.

iv Dualistic Economies – economies with a large extractive, minerals sector which is weakly linked to the rest of the economy, and so which is relatively immune to performance in other sectors of the economy. In such economies, a large proportion of the population continues to be based in the low (labour) productivity rural economy.

In reality, this typology is simplistic and some economies cannot be easily categorized in these terms. Instead, there is a continuum of cases. For example, Australia is a complex economy yet also has a large mineral sector. Meanwhile, India and Argentina, although falling into the second category, have substantial industrial sectors. Nevertheless, the typology is useful in focusing attention on how drought impacts on different types of economy.

Most of SSA's poorest economies would fall into the first category, with a small number in the second, including Nigeria, Zimbabwe, and, possibly, Kenya. South Africa is in the third. Botswana, Namibia, Niger and possibly Zambia fall into the ambiguous dualistic category. However, historical patterns of economic growth suggest that as less developed countries develop, they will initially diversify into manufacturing of relatively simple products utilizing domestically produced raw materials (Killick 1993), thus transforming from simple to intermediate and then complex economies.

3 THE ECONOMY-WIDE IMPACTS OF DROUGHT

The ways in which drought impacts directly on, or has a direct effect on, the productive sector is the same regardless of the type of economy, although the relative and absolute magnitude of each shock depends on country characteristics as well as the duration, timing and severity of the drought shock⁶. A decline in rainfall has an initial physical impact on agriculture, livestock and dairy production, hydro-electric power generation and other water intensive activities (Figure 1). Domestic availability of water is also restricted, with implications for health and

household time required to collect water. There is increased competition between sectors for water, with potentially important policy implications. In addition, within certain sectors, direct production needs may compete with consumption requirements of the workforce, as, for example, in the case of mines located in relatively remote areas. However, the impact may be lower in value than volume terms to the extent that reduced supply results in higher prices.

Drought shocks then have a range of second-round shocks, the nature and magnitude of which depend on particular country circumstances. For example, declines in production of relatively water-intensive goods may constrain output in sectors and sub-sectors linked to water-intensive industries. In addition, there may be a loss of earnings as labour is laid off, overtime bans are imposed and, perhaps, shorter shifts are worked. Such losses combined with losses in agricultural incomes may reduce demand in the economy in the economy. Drought shocks may also have important income redistributive impacts, for example between income groups, regions, sectors and sub-sectors and the formal and informal sectors. There are also potential external sector impacts of drought, including on merchandise, trade and external debt stocks as well as financial and government budgetary implications. For example, drought shocks reduce government revenues and place additional expenditure pressures on them, both for direct drought related needs and increased subsidies to affected parastatals. This may result in increased levels of domestic or external borrowing and reallocation of recurrent and capital expenditure.

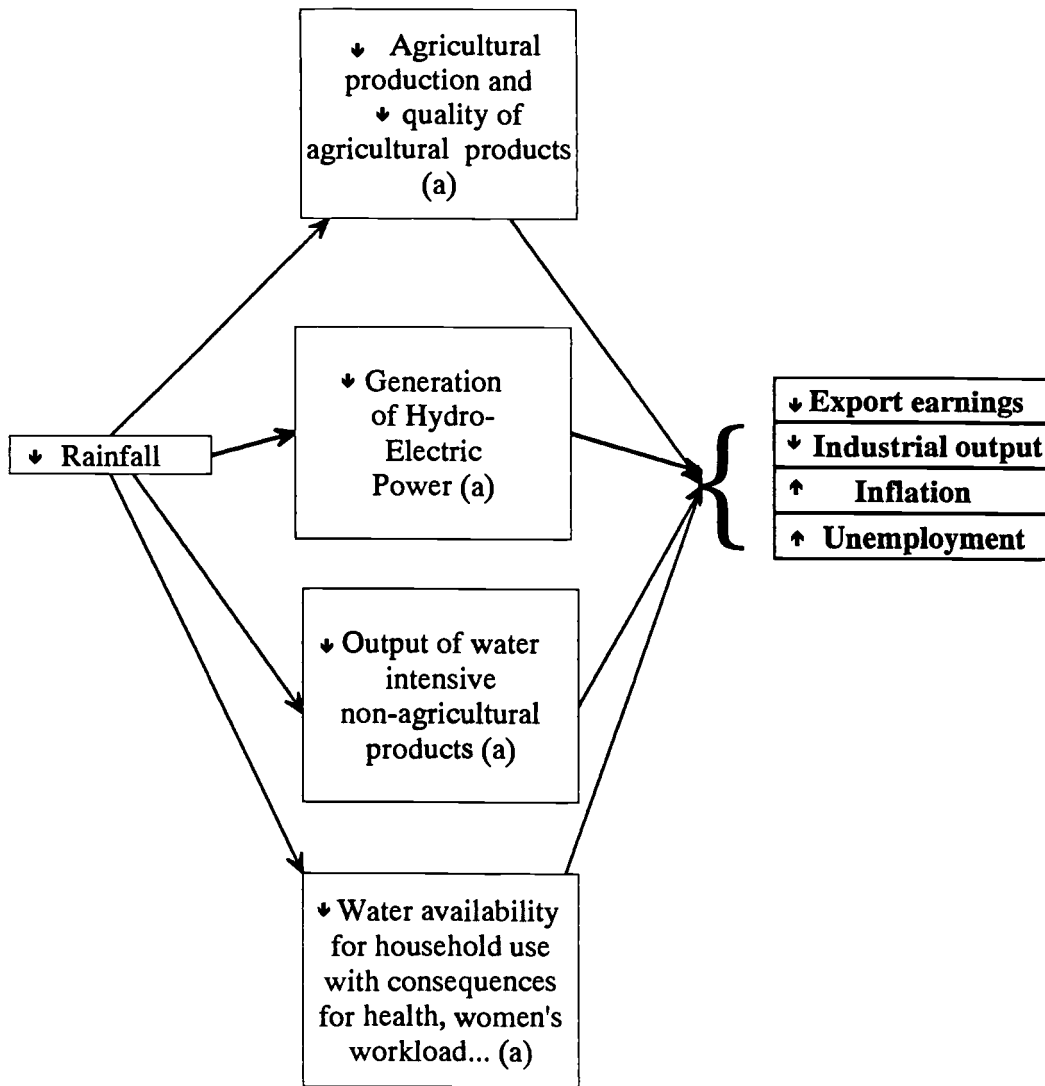
The different ways in which drought theoretically impacts in each of the four country typologies is explored in greater detail below.

Simple Economies In a simple economy, the economic impact of drought is largely felt via its direct impact on the agricultural sector, in turn reflected in substantial percentage declines in GDP, agricultural exports and employment opportunities and widespread sale of assets. Due to the relative importance of the agricultural sector, the impact of drought can be particularly great in such economies. Severe drought also results in widespread nutritional stress, increased morbidity and, occasionally, loss of human life. However, due to weak inter-sectoral

methodological difficulties entailed in trying to incorporate them.

⁶ The flow-chart abstracts from the 'social' consequences of drought. Such costs are not directly considered in this article because of the

Figure 1: Physical impact of a drought shock



(a) There is competition between sectors for water, with policy implications

linkages, a high degree of self-provisioning and relatively small non-agricultural sectors, the multiplier effect through the rest of the economy is fairly limited, largely occurring through a decline in consumer expenditure. The effects of drought are likely to be concentrated in the rural economy.

Recovery from drought in simple economies may be faster than in more diversified economies. Assuming

timely availability of sufficient seed, other agricultural inputs and tools, and predominantly annual cultivation cycles, good rains in the following year can restore levels of GDP approximately back up to pre-drought levels. However, drought may leave a legacy of increased economic difficulties such as higher levels of internal and external official and private debt, reduced capital assets (livestock, household items, etc), increased government and balance of payments deficits.

Intermediate Economies Effects of drought spread more widely through intermediate than simple economies due to larger manufacturing sectors, utilizing domestically produced raw materials; more developed financial and commodity markets; and higher levels of monetized consumption. The multiplier effects of agricultural sector expenditure are also greater. Balance of payments difficulties, arising as a consequence of lower exports and higher drought-related imports, impinge not only on final consumption and capital imports but also on intermediate good imports, on which reliance is much higher than in simple economies, also constraining production.

Consumer purchasing power may also be constrained by a range of potential factors such as increases in food prices, losses in earnings as employment opportunities decline, nominal wage freezes and reduced availability and increased cost of credit. Declining profits, a consequence of demand and supply constraints, and dampened private sector sentiment, possibly combined with tight monetary conditions, may result in delayed investment in new capital and technology, with longer term economic implications. Tighter money market conditions, in turn, reflect possible wide-scale late payment or default on agricultural credits, part of which may be held directly or indirectly with the commercial banking sector, a run down in savings, increased government sector domestic borrowing to meet increased budgetary pressures and government efforts to contain the inflationary pressures of drought.

Rates of recovery are also slower in intermediate than simple economies, constraining longer term gains in output. Recovery is not only dependent on better rainfall but on reversal of other drought-induced adverse economic trends affecting non-agricultural sectors. For example, following the 1991/92 drought in Zimbabwe, agricultural sector production bounced back relatively rapidly. But non-agricultural sector performance remained sluggish, depressed by lack of demand, high nominal interest rates and tight credit conditions, in part a legacy of the drought shock (World Bank 1993). See Box 1, following page.

A schema for analysing the impact of drought on the productive sector of intermediate economies is shown in Figure 2 (see page 29). This schema is also useful for analysing economy-wide effects in the case of simple and complex economies. However, because of weak inter-sectoral linkages and the greater importance of imports of final rather than intermediate goods (with the important exception of oil) in simple economies, the linkage effects are likely to be small. The relative unimportance of the agricultural sector in complex economies implies small linkage effects, also rendering the schema less insightful in these cases.

Complex Economies Agricultural drought constitutes a relatively smaller exogenous shock than in simple or intermediate economies, with the impacts fairly easily absorbed. In part, this reflects the typically smaller contribution of agriculture to GDP, exports and, particularly, employment. Water resources are also likely to be better managed. The relative unimportance of agro-processing industries also implies relatively weak linkages between agriculture and the rest of the economy.⁷ In addition, complex economies are typically both more open and have sufficient foreign exchange to import normally domestically sourced items without constraining other imports. Declines in production may also partly be offset by the draw-down of existing stocks (in part the consequence of agricultural policies) of certain drought-afflicted crops, such as cereals. Foodstuffs also account for a smaller percentage of household expenditure, implying that even if some food prices rise, purchasing power of most groups is relatively unaffected.

Thus, the impact of drought is largely confined to directly affected agricultural enterprises and households dependent on agriculture-related incomes, necessitating relatively small relief programmes. The costs of these programmes can be absorbed fairly easily by government, avoiding substantial increases in public domestic or external borrowing. Nevertheless, the affected segment of the population may be severely hurt in terms of loss of income, assets and savings.⁸

⁷ The scale of impact is illustrated by the Australian drought of 1982: agricultural output, which had represented only 5.2 per cent of GDP in 1991, fell by 29 per cent, but GDP declined by only 2.8 per cent.

⁸ For example, Purtil *et al.* (1983) estimated that farm incomes for Australia's broadacre properties fell by an average of 45 per cent during the 1982-3 drought, with declines as high as 96 per cent in Victoria. Debt held by drought-afflicted farms increased four-fold over the period between June and November 1982. The drought also resulted in a 2 per cent fall in employment nationwide.

Box 1: Impact of drought on the manufacturing sector in Zimbabwe

Largely as a result of the 1991/2 drought, Zimbabwean manufacturing output declined by 9.3 per cent in 1992. The drought alone led to a minimum 25 per cent reduction in volume of manufacturing output, a 6 per cent reduction in foreign currency receipts from manufactured exports and a 2 per cent reduction in total export receipts. All sub-sectors declined with the exception of drink and tobacco. The most severely affected sub-sectors were textiles (including cotton ginning), clothing and footwear, non-metallic mineral products, metal and metal products and transport equipment. The drought impacted on the manufacturing sector via the following channels:

Shortage of Water – most municipalities imposed rationing, with severe water shortages occurring in the cities of Mutare, Chegutu and Bulawayo.

Shortage of Electricity – load shedding, rationing from September 1992 and increased electricity tariffs affected the whole country. Load shedding imposed particular costs on sub-sectors with batch or continuous processing. The system of rationing discriminated against smaller manufacturers.

Shortages of Inputs – the drought reduced the availability and increased the cost of most agricultural inputs, with knock-on implications for manufacturers. Notable exceptions were larger formal sector food processors, such as grain millers, through which drought-related imports were channelled, diverting business away from smaller rural plants; and the meat processing industry which benefitted, at least in the short-run, from increased slaughter rates.

Reductions in Demand – the drought contributed to reduced demand both for both agricultural inputs and other basic consumer goods such as clothing and footwear. The contractionary aspects of the structural adjustment and trade liberalization programmes, the latter resulting in penetration of competitive imports, also contributed to this trend.

Macroeconomic conditions – manufacturers faced high inflation and tight credit conditions, in part as a consequence of the drought. Sub-sectors where working capital requirements had increased sharply due to parastatal price rises (eg, for steel) were particularly severely affected.

Thus, for example, the International Finance Corporation identified the Zimbabwe Stock Market as the worst performer of 54 world stock markets in 1992, with a decline in value of 62 per cent. Although increased costs of production were partly passed on to consumers, manufacturers faced a deterioration in their financial viability.

Summarized from Robinson and Benson (1994)

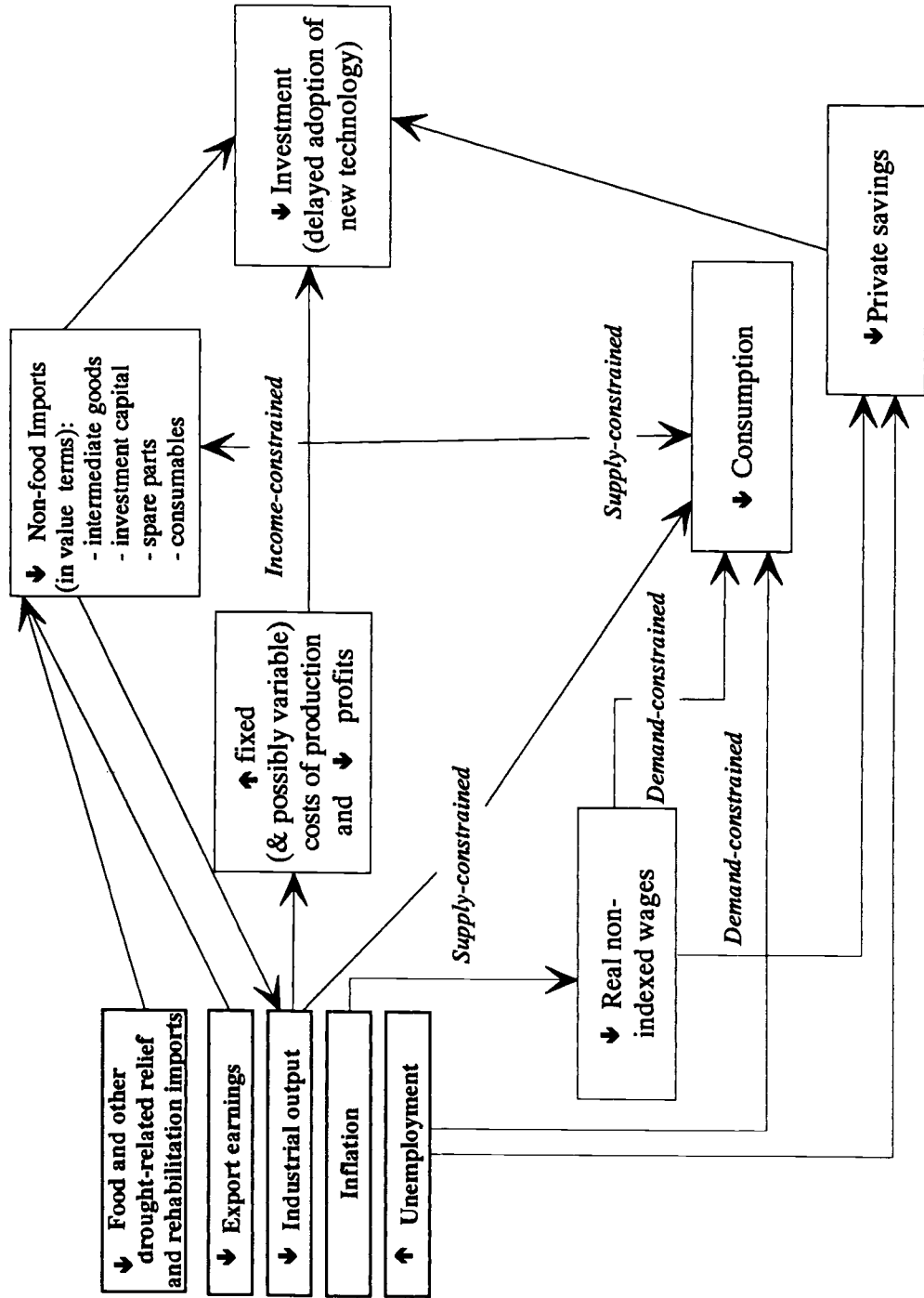
Dualistic Economies Some drought-prone economies in SSA exhibit a high degree of dualism, with a large capital intensive extractive sector which features significantly in the trade account, but which is weakly linked with other sectors of the economy. Unless the extractive sector is water-intensive and fails to insulate itself from variable water supply, the economic impact of drought is likely to be limited to variability in the agricultural sector with limited multiplier effects. The macroeconomic impact of

drought therefore appears small and similar to that in a complex economy. In fact, this impression is deceptive, overlooking the intensification of food insecurity and water related health risks and significant loss of livelihoods which affect much of the population. However, the broad revenue base and scope for financial stability provided by taxing the extractive sector provides considerable opportunity for countervailing measures.⁹

⁹ For example, in Botswana (Drèze and Sen, 1989) and also Namibia in 1992/93 (Thomson, 1994) the macro aggregates and trade account

effects were modest and governments had the resources to finance substantial relief programmes.

Figure 2: Domestic economic impact of a drought shock



4 POLICY RESPONSES BY GOVERNMENTS AND DONORS¹⁰

The country typology, if broadly sound, has potentially important policy implications for drought responses. For example, in relatively simple highly dualistic economies, measures to provide targeted direct relief, for example through food distribution or rural works programmes, are likely to be superior to more general anti-recession measures. In such contexts, such actions are likely to be both more efficient in providing relief to affected populations and more cost effective than indirect fiscal and monetary measures. In contrast, in intermediate economies, as impacts are spread more widely through the economy, instruments for managing overall levels of expenditure and other economic aggregates potentially become more effective.

An issue of considerable topical importance is the interaction between drought as a form of economic shock and the process of economic reform that is being widely attempted in Africa. For example, six out of seven countries examined in the ODI study were currently involved in some form of structural adjustment or economic reform programme with the support of the international financial institutions and bilateral donors.

In the longer term, successful structural adjustment probably increases economic resilience to drought, particularly to the extent that it strengthens overall economic performance. It may also stimulate increased private sector drought mitigation measures, as economies become less regulated and private sectors expand. However, the relationship between the process of structural adjustment and economic resilience to drought is more complex in the short-term.

Experience has demonstrated that structural adjustment needs to occur against a backdrop of macroeconomic stabilization, making the immediate post-drought period an unsuitable time to commence a major reform programme. Yet, natural disasters may, in fact, be an important factor contributing to the adoption of a structural reform programme. For example, Killick and Malik (1991) found, in a survey of 17 randomly selected developing countries with IMF programmes, that in six of them natural disasters - and, in four cases, drought specifically - had

been an 'important, perhaps dominant factor' in the adoption of the programme.

Drought shocks can also present an obstacle to the smooth implementation of reform programmes, particularly when they occur during the earlier stages of a programme when components such as price liberalization, the removal of consumer subsidies and market liberalization are likely to be being implemented. For example, in the case of Zambia, the 1992 drought delayed the liberalization of agricultural markets and inhibited the development of autonomous agricultural financial institutions. In Zimbabwe, drought hampered efforts to reduce the budget deficit and restructure the civil service and parastatals (Benson 1994). On some occasions, drought has even contributed to the abandonment of reform programmes as, for example, in Senegal in 1980. This example is particularly ironic since drought was also a factor contributing to the decision to adopt the reform programme in the first place.

More recently, the international financial institutions (IFIs) appear perhaps more willing to adjust structural reform programmes in the aftermath of drought, as indicated by recent experience in both Zambia and Zimbabwe.

In practice, governments and the international community have typically responded to droughts in SSA by mounting large-scale relief operations, without regard to the way in which a drought shock impacts on an economy and its people. These relief operations absorb substantial resources of the affected countries and of the aid programmes of donor organizations¹¹. The primary objective of such operations is invariably to minimize the loss of human life and suffering. Efforts designed expressly to mitigate the impacts of droughts on the macro economies of SSA are generally accorded much lower priority regardless of country requirements.

The response to the 1991/92 drought in Southern Africa represents an important exception. Some members of the international donor community displayed far greater willingness to provide untied or non-food balance-of-payments support in response to this crisis than following any previous drought.¹² (See next page for footnote 12) However, this may not necessarily reflect a change in the nature of

¹⁰ Policy implications of the ODI study are developed more fully in Clay, E.J. and Walters, H., forthcoming, 'Droughts in sub-Saharan Africa: A Policy Agenda'. Washington DC: World Bank.

¹¹ For instance 7.5 percent of the UK Aid Programme was expended on the response to the drought and famine crisis in Africa during the financial years 1984/5 and 1985/6 (Borton *et al.*, 1988)

international response to drought shocks, so much as an exceptional response to a very particular set of circumstances. The prior existence of on-going external programmes of economic assistance to a number of countries in the region, in support of structural adjustment programmes, facilitated the provision of such assistance, providing a monitoring system which allowed the international donor community to assess the economic implications of the drought. The generosity of the donor response and the unprecedented degree of attention to economic considerations may also have been motivated partly by the donors' desire to ensure that the structural adjustment programmes remained broadly on schedule. It remains to be seen whether the donor response in Southern Africa during 1992/93 marked a turning point in donor perspectives on the economic implications of drought shocks.

5 CONCLUSION

Drought shocks can have potentially large, but highly differentiated economy-wide impacts, which have important implications for drought relief and mitigation programmes. The likely frequency, scale and character of these impacts depends on the structure and resource endowments of an economy, as well as

¹² For example in 1992 the World Bank approved a US\$150mn Emergency Recovery Loan to Zimbabwe and made additional drought related modifications to credits of US\$50mn for Malawi and US\$100m for Zambia. The UK ODA provided both Zambia and Zimbabwe with £10mn (approximately US\$18mn) in balance-of-payments support for drought related imports between March and June 1992. Some donors, for example Germany, modified existing financial assistance to allow these funds to be used for

more prevailing economic conditions. Regardless of their economy-wide consequences, droughts invariably have severe food security implications in SSA. However, counter-intuitively, some of the relatively more developed SSA economies, such as Senegal, Zambia and Zimbabwe may be more vulnerable economically to drought shocks than least developed and more arid countries, such as Burkina Faso and Mali, or countries receiving media attention because of conflict related emergencies, such as Mozambique and Somalia. Both drought mitigation and relief strategies need to be more sensitive to these differences in circumstances. Such strategies are likely to be poorly calibrated if based on Africa-wide or even more general prescriptions for drought mitigation and relief. Furthermore, economic and relief instruments should not be regarded as separate, more or less autonomous areas of policy action, but rather as tools which should be used in conjunction with each other, with their relative balance determined by prevailing country circumstances. Finally, the provisional findings of ODI's study indicate that the complexities of economic structure and resource endowment justify further and closer exploration of the dynamics of highly drought-vulnerable economies, to provide a firmer basis for policy analysis.

procurement of drought related food and other imports. The United States also organised large 'blended' packages of support for food imports including export credits, food aid credits and grants to Zambia and Zimbabwe to address the direct balance-of-payments aspect of the drought. Other food aid donors also provided a combination of programme aid to relieve balance-of-payments pressures as well as conventional relief for distribution to affected populations.

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