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A SOCIAL ACCOUNTING MATRIX FOR MODELLING AGRICULTURAL POLICY REFORM IN SOUTH AFRICA¹

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In this paper the format of a Social Accounting Matrix (SAM) for use as a database for the Computable General Equilibrium (CGE) modelling of agricultural policy reform in South Africa is detailed. It is shown that the published South African SAMs impose limitations upon their suitability as databases for CGE models, but that they can be readily modified. An additional benefit of a SAM is its use as a framework for the specification of the behavioural relationships necessary to the development of a model. Finally, a Macro SAM for 1993 is reported and the proposed disaggregation of the agricultural sector is identified.

'N SOSIALE REKENINGE MATRIKS VIR DIE MODELLERING VAN LANDBOUBELEIDSHERVORMING IN SUID-AFRIKA

Hierdie referaat verskaf 'n volledige oorsig van die formaat van 'n Sosiale Rekening Matriks (SAM) vir aanwending as 'n databasis vir 'n Algemene Ewewigsmoedel (CGE) vir die modellering van landboubeleidshervorming in Suid-Afrika. Daar word aangetoon dat gepubliseerde SAMs van Suid-Afrika beperkings het en nie geskik is vir aanwending in 'n CGE moedel nie. Dit kan egter met enkele modifikasies reg gestel word. Die SAM het die bykomende voordeel dat die SAM raamwerk gebruik kan word om verwantskappe te spesifiseer wat noodsaaklik is vir die ontwikkeling van 'n moedel. 'n Makro SAM vir 1993 word beskryf en verder word die voorgestelde disagregasie van die landbou geïdentifiseer.

1. INTRODUCTION

A social accounting matrix (SAM) is a powerful system for the organisation of information about the economic and social structure of a country, region, city, village etc., which ensures that the system is described in a complete and consistent way. Consequently it can provide a unifying structure within which the statistical authorities of a state etc., can compile and present

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economic, especially national, accounts. The potential benefits of SAMs have been recognised in the United Nations' System of National Accounts (see Keuning, 1994; UN, 1993). However, as an organisational framework, SAMs are not limited to economic data. Considerable discussion has been devoted to the extension of SAMs to encompass the social, demographic and environmental features of economic systems (Stone, 1982; Keuning, 1994).

A SAM is not an economic model,⁵ although the structure of a SAM has a Keynesian flavour, reflecting its origins in Leontief's input-output schema and Keynesian macroeconomics. But a SAM can provide the statistical basis for (empirical) economic models, indeed Pyatt (1987) has argued that every model has a corresponding SAM.⁶ In addition to data an economic model requires the specification of a series of economic relationships, e.g., production and consumption functions, and an institutional structure within which these economic relationships are played out. The relationships specified may be linear functions, e.g., as in the simple input-output model, or they may be non-linear functions, e.g., CES or translog functions, while the institutional arrangements can range from command to market economies. The choice of model will depend critically upon the nature of the (policy) variables an analyst seeks to evaluate, e.g., trade or taxation policies, and the outcomes an analyst wishes to emphasise, e.g., income distribution, government budget, exchange rates, etc.

A primary role of a SAM is therefore to provide the information, which can be used to calibrate a model. Consequently the structure of the SAM, and the data therein, must encompass all the commodities, production and consumption activities, agents and institutions that are relevant to the issues being addressed. Therefore the detail in a SAM depends not only upon the economic system for which it is developed, and the wealth of data about that system which is available, but also upon the purposes for which the SAM will be used. This generates a potentially disconcerting feature about SAMs that

⁵ *Contrary to the description of the South African SAM in CEAS (1986, pp vi-viii).*

⁶ "Since every economic model has its corresponding accounting framework, and since every such framework can be set out as a SAM, it follows that every economic model has a corresponding SAM." (p 330). This is in fact a more specific statement of a general principle stated earlier by Stone (1962): "It is perhaps of interest to realise that the framework of any model concerned with the economy as a whole is always an accounting system. This is true whether we work with highly aggregated models such as that underlying Keynes' *General Theory*, the input-output model of Leontief or the still more complicated variant with which this series [A Programme for Growth] is concerned." (p v).

appear in the literature: while SAMs have a general structure, the specifics tend to differ for each SAM. For a modeller a SAM can serve an additional role; it provides an organisational framework within which behavioural relationships can be identified and specified.

The remainder of this paper is organised as follows. The next three sections are concerned with a SAM as a framework for the organisation of data. In section 2 the basic principles of a SAM are outlined. This leads to a discussion about the distinction between SAMs based on an 'input-output' table and those based on 'make' and 'use/absorption' matrices⁷ and hence the separation of activity and commodity accounts required for the latter formulation. Section 3 considers the treatment of trade in SAM databases. The fourth section moves beyond a SAM to consider the relationship between a SAM and a CGE model. In particular, it is shown how a SAM can be used to systematically specify the behavioural relationships used in a CGE model, and hence to identify the data requirements for a CGE which are not satisfied by the data within a SAM. A structure for a SAM database, which emphasises the food system in South Africa, is briefly outlined in section 5. The final section briefly discusses the way forward.

2 WHAT IS A SAM?

A SAM is a matrix in which each economic account has both a row and a column. The expenditures for each account are recorded as column entries while the incomes for each account are recorded as row entries. Thus a SAM is a form of double entry bookkeeping in matrix form; the entries in each cell identify the magnitude, source (expenditure) and destination (income) accounts of a transaction. Accordingly, total expenditures by each account must exactly equal the total incomes for each account: hence the respective row and column sums for a SAM must, and will, equate and the matrix will be square.⁸ A SAM therefore provides complete and consistent information about an economic system in an efficient and, ultimately, simple way, which reconciles with the macroeconomic accounts for the system. Moreover, a SAM captures the full circular flow of an economy.

⁷ Pyatt (1994a) presents a more general SAM that includes a 'marketing' matrix (pp 8-10).

⁸ It has been implied that a SAM may not be square, e.g., Naude, 1993, following the production of so-called non-square SAMs by Taylor (1990). Noting this requirement that the income and expenditure for each account must, by definition, equate, the illogicality of this implication can be seen,. Robinson (1991, p 1523, footnote 16) has also commented on this matter. This does not exclude the use of sub-modules to provide additional information (see Keuning, 1994).

A notable difference between many SAMs is the treatment of inter-industry transactions. In some SAMs, e.g., Pyatt & Round (1979), inter-industry transactions are recorded as an 'input-output' table, while in others, e.g., Stone, 1962b, and Roberts, 1992, they are recorded as two matrices; the make and use matrices. It is trivial to demonstrate that the 'input-output' version is a variant of the more general make and use version, since an input-output table is typically derived from make and use matrices (see Armstrong, 1975; UN, 1993). In this paper, for reasons that will become apparent, the discussion will relate to a SAM based on make and use matrices, and the term SAM will be reserved for such SAMs. When referring to the other variant, the term input-output SAM will be used. This distinction is particularly important for discussions about official South African SAMs since they are 'quasi' input-output SAMs. This imposes substantial limitations upon their usefulness as databases for flex-price models, and for the analysis of agricultural issues in fixed-price models.

2.1 Structure of a SAM

SAMs are generally constructed with 6 types of account and each type may contain numerous sub-accounts:

- commodity accounts,
- activity (or production) accounts,
- factor accounts,
- institutional accounts,
- capital accounts,
- rest of the world accounts.

A representation of the general structure of a SAM is provided in Table 1.

The commodity accounts record the demand and supply of commodities. The column entries identify commodity transactions according to whether they are made domestically or imported, inclusive of tariff revenues. The row entries sub-divide transactions in commodities between intermediate and final demands, where final demands are disaggregated across different institutions, the capital account and exports, inclusive of export subsidies. In equilibrium total demand for commodities is equal to total supply of commodities, i.e., the row and column totals equate.

The activity accounts record domestic production activities. The row entries identify the production of commodities by activities, while the column entries sub-divide production expenditures between intermediate inputs and value

Table 1: Structure of a SAM

	Commodities	Activities	Factor Payments	Households	Government	Capital Account	Rest of World	Total Incomes
Commodities		Combined Use Matrix		Household Consumption Expenditure	Government Consumption Expenditure	Investment & Inventory Expenditures	Export Revenue incl of Subsidies	Commodity demand
Activities	Domestic Make Matrix							Domestic production
Factors		Value Added		Domestic employment	Government employment		Factor Income from Abroad	Factor incomes
Institutions: Households			Labour incomes and distributed profits	Inter-household transfers	Government Transfers to Households		Remittances to Households from Abroad	Household incomes
Institutions: Government	Tariff Revenue	Indirect tax revenue less subsidies plus tariff revenue	Taxes on labour and profits	Tax Revenue from Households		Tax Revenue from Capital Account	Government Income from World	Government revenue
Capital Account				Household Saving	Government Saving		Current Account BoP	Total savings
Rest of World	Competitive Commodity Imports	Non-competitive Commodity Imports	Factor payments abroad	Household Transfer to World	Government Transfer to World			Total imports
Total Expenditures	Commodity Supply	Production	Factor outlay	Household expenditure	Government expenditure	Capital expenditure	Total exports	

added, and value added will be broken down into payments to different factors, expenditure taxes, e.g., VAT, paid by activities, and certain types of imports (see below). The column sums for the production accounts record the total inputs to activities and are equal to the row sums, i.e., total outputs by activities.

This separation of commodity and activity accounts has substantial benefits. In particular, it allows the separate tracking of commodities and activities, and thereby the construction of models in which the behavioural relationships are more intuitively appealing, e.g., consumer demand is for commodities whereas value added is created by activities. Furthermore, it allows greater detail about policy instruments, e.g., indirect taxes and subsidies relating to activities, and import tariffs relating to commodities.

The sum of payments to factors by domestic activities plus factor incomes from abroad is by definition GNP at factor cost. These factor incomes must then be distributed between the institutions that ultimately own the factors: these expenditures by the factor accounts are recorded by the column entries.⁹ The institutions identified depend upon the nature of the economic system. As a minimum a SAM would typically contain sub-accounts for multiple types of households and the government, and may contain sub-accounts for corporations and non-profit organisations (see Stone, 1985). Incomes to institutions are then recorded as row entries with expenditures as column entries. Three features of these sub-accounts are of note. First, the behavioural determinants of commodity demand are likely to differ across sub-accounts. Second, intra- and inter-institutional transfers are economy specific. And third, the entries for the government account are related to government policy instruments. These are defined by reference to government income sources, e.g., VAT on intermediates etc., tariffs on imports, direct taxes, profit taxes etc., and government expenditures, e.g., transfers to households, corporations etc.

The final two accounts are the capital account and the rest of the world account. The former refers to investment and its funding. Investments are recorded in the capital account column, whereas the funding of investment is made up of savings by institutions and transfers from abroad, e.g., foreign

⁹ In some SAMs factor incomes are first distributed to a 'forms of income' account before they are distributed to institutions, e.g., McDonald and Roberts (1997) and Robinson et al. (1990); this follows Stone (1985). A 'forms of income' account is included in the macro SAM reported in Table 3.

investments. Trade transactions are recorded in the rest of the world account. This includes current and capital accounts, and visible and invisible trade. How entries are made in the rest of the world account is important since it reflects assumptions about the nature of trade relations and thus profoundly influences the trade policy issues which can be analysed (see section 3 below).

The main concerns here are the commodity, activity and rest of the world accounts, the interactions between the other accounts are not discussed. This reflects two considerations. First, the major behavioural relationships specified in CGE models relate to these accounts. And second, these are the accounts for which major differences will be introduced in the development of a food system SAM for South Africa.

2.2 Activity and commodity accounts

The distinction between a SAM and an input-output SAM hinges upon the separation of commodity and activity accounts. There are three issues of particular interest here; first the classification of firms/plants to activity groups, second the implicit limitations for modelling exercises imposed by an input-output SAM, and third the differences in the representation of trade relations allowed by the two types of SAM.

A standard procedure for the classification of firms to activity groups is by reference to the commodities they make. This procedure recognises that firms may make different commodities, hence the need for a make matrix, and then allocates them to activities by their principal product. Therefore for each commodity category there is an activity category, and both the make and use matrices will be square and the elements on the principal diagonal of the make matrix will dominate.¹⁰ It is not the only classification scheme that can be justified (see Pyatt, 1994a:12-14, and below).

When constructing a SAM for analyses of the food system it is often useful, and important, to separately identify commodities and activities. Indeed it is common to find different agricultural systems producing the same commodity, and systems producing multiple commodities. For instance, beef might be produced by both intensive, e.g., feedlots, and extensive, e.g., ranching, systems which have very different input structures yet produce, basically, the same commodity. Consequently neither the make nor the use

¹⁰ Pyatt (1994a) comments unfavorably on this method of classification, and argues that as a result "there is actually very little new information contained in the make matrix" (p 13). But even a diagonal make matrix may have benefits for the treatment of trade.

matrix need be square, but the SAM will be square.

A limitation imposed by an input-output SAM is an inability to incorporate differences in input structure for activities that produce the same commodity. A less obvious, but arguably more severe restriction, relates to the treatment of trade relations, and substitution possibilities consequent upon movements in relative prices. This does not present a problem in the general linear model, or SAM Leontief model, with its presumption that the coefficients are fixed and independent of prices and quantities.¹¹ But, if attention turns to how an economic system responds to changes in the structure of incentives, then the treatment of trade in an input-output SAM becomes highly restrictive. Since policy reform, almost by definition, involves changes in relative prices it is important to be clear about the treatment of trade.¹²

3. TRADE RELATIONS IN A SAM

As a general rule trade relations should be recorded according to the border price paradigm, and should separately identify trade taxes and subsidies. The treatment of exports is relatively simple. When export demand is for commodities, then it is arguably appropriate to include exports as incomes to the respective commodity accounts,¹³ while other export categories can be regarded as simple monetary flows. The treatment of imports is both more difficult and more interesting.

Consider first the demand for imported intermediate inputs for use in production. It is reasonable for the demand for imported intermediates by production activities to be defined in terms of commodities, and that, *ceteris paribus*, activities would be indifferent between the country of origin of intermediate inputs. However, in an input-output SAM, e.g., the published South African SAMs, it is implicitly presumed that imports are consumed in fixed proportions to outputs. Thus imported intermediate inputs are recorded as the total value of intermediate imports by each activity, which implies that imported intermediates are regarded as, in the term used by Stone (1962a), complementary, i.e., imported intermediates are treated as another type of

¹¹ Pyatt (1994a, pp 14-20) examines the properties of the general linear model. Pyatt (1994b) extends the analysis so that prices and quantities are interdependent.

¹² The most obvious examples of this type of concern have been the Structural Adjustment and Stabilisation Programmes promoted by the World Bank and the IMF in recent years, e.g., van der Hoeven & van der Kraaij (1994).

¹³ Dervis, et al., (1982) include exports as income to the respective activity accounts; although in this case each activity only makes a single commodity.

primary input. This requires the substitution possibilities between domestically produced and imported intermediates to be limited, and thus inhibits the development of models in which substitution takes place in response to changes in relative prices.

The alternative polar extreme is to presume that all imports are perfect substitutes, or competitive.¹⁴ In a SAM this amounts to recording intermediate imports as part of the supply of commodities to the economy, and defining the use matrix to be inclusive of both imported and domestically supplied intermediate inputs. Since both polar extremes are highly restrictive, a number of SAMs have classified intermediate imports according to whether they are 'competitive' or 'complementary', as illustrated in Table 1, e.g., Roberts (1992).

Similarly, the recording of commodity imports by institutions as an entry in the respective column of the SAM implies the presumption that these imports are complementary. Where these imports are deemed to be competitive they can be introduced as imports by the respective commodity account; the demand for commodities by institutions can then be defined as the demand for a commodity irrespective of its country of origin. This will be economically reasonable, from the demand-side perspective, if the assumption that commodity demand, *ceteris paribus*, is independent of country of origin is accepted. Again this does not rule out some imports being complementary, nor does it rule out other non-commodity transactions by the various domestic accounts with the rest of the world.

It may seem easy to define complementary imports as those not produced domestically, e.g., commodities dependent upon some missing specific factor, and to define perfect substitutes as identical homogenous commodities, but in reality there are few perfect substitutes.¹⁵ A solution to this was provided by Armington (1969) whereby domestic and imported commodities are treated as imperfect substitutes, which are combined, on the basis of relative prices, to form a composite commodity that is supplied to and demanded by the economic system.¹⁶

¹⁴ Derois et al., (1982) discuss the treatment of imports in an input-output table.

¹⁵ An obvious example would be the differences between American and African maize.

¹⁶ The Armington assumption is central to most trade based CGE model. De Melo & Robinson (1989) explore the properties of such models.

4. SAMS AND BEHAVIOURAL RELATIONSHIPS IN A CGE MODEL

The conventional SAM Leontief model imposes relatively simple behavioural relationships. Typically it is presumed that a unique set of output prices can be determined independent of the level of production, and that a unique set of output quantities can be determined independent of relative prices. Examples of this type of model are the general linear model and the Stone model of commodity balances (see Pyatt, 1994a). The restrictive nature of the requisite assumptions has long been recognised and has encouraged the evolution of CGE models.

CGE models are calibrated, not estimated. The process of calibration entails specifying behavioural relationships and then calibrating their parameters so that the model replicates the initial conditions, usually recorded by a SAM, which are presumed to represent equilibrium. In this context, the various sub-matrices of a SAM provide an invaluable organisational framework: the cells in each sub-matrix represent the outcome of the behavioural relationships which need to be specified. Table 2 illustrates the use of a SAM framework to specify behavioural relationships, and clearly indicates the link between data and theory, which underpins CGE models.

The details of CGE models are well documented in the literature¹⁷ and therefore the discussion here will be limited to comments on the treatment of trade, production functions, household utility functions and macroeconomic closure rules. The treatment of trade usually adopts the Armington assumption of imperfect substitution; competitive commodity imports are combined with domestically produced commodities to form composite commodities that are then distributed between the domestic and export markets. Commodity supply is determined by the maximisation of utility subject to relative prices, while demand is determined by the maximisation of profits subject to relative prices (see Devarajan *et al.*, 1990).¹⁸ The treatment of production relations often follows the lead set by Johansen (1960), a value added production function with primary inputs as substitutes is specified with intermediate input use, domestic or (complementary) imported,

¹⁷ Reviews are provided by Shoven and Whalley (1984), Robinson (1989) and Gunning & Keyzer (1995).

¹⁸ Note that a CGE model is Walrasian and only defines relative prices.

Table 2: Behavioural Relationships in a SAM Structure

	Commodities	Activities	Factor Payments	Households	Government	Capital Account	Rest of World
Commodities		Fixed Coefficients		Utility functions, e.g., LES, AIDS.	Fixed in real terms	Fixed shares of Income Net of Taxes	Armington (CET) and Export Demand functions; export subsidy rates
Activities	Armington (CES) functions & Fixed Coefficients						
Factors		Value Added production functions, e.g., Cobb-Douglas, translog					Fixed in REAL terms
Institutions: Households			Share of Income Net of Taxes	Share of Income Net of Taxes	Fixed in REAL terms		Fixed in REAL terms
Institutions: Government	Tariff rates	Indirect tax, subsidies, and tariff rates	Tax rates on labour and profits	Direct tax rates		Tax Rates	Fixed in REAL terms
Capital Account				Share of Income Net of Taxes	Residual		Residual
Rest of World	Armington (CES) functions	Fixed Coefficients	Share of factor Income Net of Taxes	Share of household Income Net of Taxes	Fixed in NOMINAL terms		

determined by fixed coefficients. Households are typically assumed to maximise utility, with consistency achieved by the use of a demand system, e.g., Linear Expenditure System (LES), Almost Ideal Demand System (AIDS).

These three series of behavioural relationships identify the major requirements for data over and above the SAM. Specifically, estimates of elasticities of substitution between domestic goods and imports and between domestic goods and exports are required for the Armington functions. And the export demand functions require estimates of the elasticities of demand for exports; estimates of the quantities of primary inputs are needed for the production functions; and income elasticities of demand are required for the household utility functions.

The issue of macroeconomic closure rules has been a source of substantial debate in the literature (see Robinson, 1989, and Robinson and Roland-Holst, 1988). In fact much of that debate is irrelevant in the present context. While the description of a CGE model has largely been neoclassical, the data requirements across the range of CGE models are broadly similar, even for the so-called 'structuralist' models (see Taylor, 1990). Hence, the choice of a SAM as the organising framework for data etc., does not necessarily limit the choice of closure rule.

Finally it is necessary to comment on the issue of the inclusion or omission of a financial sector. It is self evident that the current SAMs for South Africa, and the proposed Food System SAM for South Africa (see below), do not include details on the financial sector. Clearly there is a case for the development of a financial SAM for South Africa, and there is now a well-developed literature on the subject of financial SAMs (FSAM) and CGE models (see Bourguignon *et al.* 1992, and Robinson, 1991). The absence of a FSAM for South Africa should not delay the development of real side CGE models: the literature has indicated how these models can contribute substantially to an understanding of the trade, income distribution, government budget and macroeconomic implications of policy changes.

5. A FOOD SYSTEM SAM FOR SOUTH AFRICA

The previous discussion indicates the general structure of SAM being developed for use in a CGE model to analyse agricultural policy reforms in South Africa. In this section initial details of the food system SAM are reported.

Table 3: Provisional Macro SAM for 1993 (R'000)

	Commodities	Activities	Factors	Forms of Income	Corporations	Household	Government	Capital	Rest of the World
Commodities	0	330,203	0	0	0	206,954	21,384	56,188	92,858
Activities	631,431	0	0	0	0	0	0	0	0
Factors	0	289,620	0	0	0	3,586	53,064	0	2,251
Forms of Income	0	0	339,908	0	76,558	0	0	0	0
Institutions: Corporations	0	0	0	128,588	0	0	20,887	0	0
Institutions: Household	0	0	0	277,621	227	0	16,390	0	603
Institutions: Government	(3,283)	11,608	0	10,257	12,669	57,580	1,572	6,848	-1,401
Capital Account	0	0	-3,064	0	59,820	26,543	-14,286	0	0
Rest Of The World	76,155	0	11,676	0	202	178	122	5,977	0
Total	707,586	631,431	348,520	416,466	149,475	294,841	99,132	69,013	94,310

The base year for the SAM is 1993. This is the latest year for which reliable inter-industry data were available and during which the climate confronting agriculture, both economic and environmental, and the economy as a whole were reasonably stable. A preliminary Macro SAM for 1993 is reported in Table 3. This SAM differs appreciably from previous SAMs for South Africa. First, there are separate commodity and activity accounts; this allows for a more general representation of trade relations. Trade relations will also be recorded in terms of competitive and complementary imports. Second, a third institutional account, 'Corporations', has been added; the macro SAM clearly identifies the importance of the corporate sector to transactions in South Africa. And third, a 'forms of income' (dummy) account has been included to help resolve the "from-whom to-whom" (Stone, 1985) problems encountered when mapping the distribution of factor income to institutions. The final food system SAM will differ from previous SAMs for South Africa in three major respects. First, information from the input-output tables will be used to disaggregate the food-processing sector, thus providing greater detail about downstream activities of the food system. Second, those industries primarily responsible for agricultural inputs will be disaggregated, especially those responsible for the production of fertilisers and agro-chemicals. And third, the agriculture sector will be disaggregated.

The disaggregation of the non-agriculture sectors will depend on the classification scheme adopted for the Central Statistical Service's input-output data. The current classification scheme for the disaggregation of the agricultural sector is reported in Table 4. This reflects an important feature of agricultural production systems; farm types typically produce multiple outputs and different farm types produce the same output. The decisions as to the commodity groups and the farm activities chosen reflects a compromise between detail and expediency as dictated by the available farm data.¹⁹

In other respects much of the structure and many of the institutional accounts appear similar to those of previous SAMs for South Africa; however some modifications are necessary. There are two main areas of concern. First, the catch-all account 'Gross Operating Surplus' not only conflates returns to capital, land, property, self-employed labour etc.²⁰, it also incorporates as

¹⁹ *The data to disaggregate the agriculture sector were primarily derived from agricultural census data. The number of commodity and activity groups reflects the information available and may be modified in light of data consistency and modelling considerations.*

²⁰ *The extent of the potential distortion is illustrated by the proportions of value added accounted for by GOS in the 1988 SAM; there range from 83.7% (for agriculture) to 17.9%, with an average of 52.4%. This range is even more pronounced in the 90-sector*

operating surplus' returns that are not directly related to the level of production by the activity. This results in potentially ill-defined relationships between factors and their payments. It is important therefore to disaggregate Gross Operating Surplus. And second, while the subdivision of households by race and income levels was appropriate for the purposes of earlier SAMs, and may still yield important information for policy makers, it is necessary to review this classification scheme. The focus on agricultural policy reforms provides a strong argument for also classifying households according to place

Table 4: Commodities and Activities for Agriculture

Agricultural Commodities	Agricultural Activities
Summer Cereals	Field Cropping
Winter Cereals	Horticulture
Oilseeds	Extensive Animal Production
Legumes	Intensive Animal Production
Fodder	Mixed Farming
Sugar Cane	Small Scale Farming In Former Homelands
Other Field Crops	Other Production
Potatoes And Vegetables	
Wine-Grapes	
Citrus	
Subtropical Fruit	
Deciduous Fruit	
Nuts	
Tea	
Other Horticultural Products	
Cattle	
Pigs	
Sheep And Goats	
Poultry	
Milk And Cream	
Wool, Pelts, Mohair, Etc.	
Game	
Other Animal Products	
Forestry	
All Other Agricultural Products	

of residence, e.g., rural and urban. Furthermore, there are reasons to believe that the survey data on household incomes and expenditure (CSS, 1997) by

IO tables.

race may be less reliable now²¹.

The identification of rural and urban institutions is important when the intention is to model the effects of rural policy reform; especially land reform. In particular there are substantive arguments for separating out the estimated effects on employment and national income, as a result of agricultural policy reforms, according to their different implications for the rural and urban sectors. This is especially important where the alleviation of rural poverty is a prime objective of the government. The simulation exercises will produce estimates of the implications for rural employment, production and consumption, rural-urban migration, poverty alleviation and the major macro-economic aggregates. Concern as to the (economic) sustainability of agricultural policy reforms will be assessed through the impacts of the reforms upon farm incomes, government budgets and balance of payments. This will identify potential constraints upon the effectiveness of policy changes.

Apart from modelling the effect of land reform, this model will also be helpful in assessing the impact of other policy changes in the agricultural sector such as water policy reform or the effect on the economy of subsidised imports of EU beef, etc.

6. CONCLUDING COMMENTS

Modelling policy reforms requires comprehensive and consistent databases. When the objective is the construction of flex-price models, in particular CGE models, the natural choice of database is the SAM, although it is important that the SAM allows the separate treatment of commodities and activities if trade relations are to be satisfactorily modelled. Consequently the published South African SAMs are limited as databases for CGE models,²² and need extending by the inclusion of commodity accounts. Given the currently available data this is a somewhat complicated exercise, which requires the use of estimation techniques. However, the improvements in the modelling of trade relations and the increased detail about transactions make this a worthwhile exercise.

Similarly the disaggregation of the food system offers the opportunity to use models to identify the extent to which policy reforms will impact upon

²¹ *The introduction of non-racial majority rule in South Africa has understandably made its citizens reluctant to answer survey questions that have apartheid connotations.*

²² *The published SAMs were designed for specific purposes and are well adapted to those purposes. Hence this is NOT a criticism of those SAMs.*

different agricultural commodities and systems. This will be extremely useful where the policy reforms include the substantial restructuring of rural institutional arrangements associated with land reform policies.

It is important however to recognise the complementarities between different modelling schema. Although the use of CGE models is not limited to national economies (see Taylor & Adelman, 1996), their greatest benefits are likely to be realised when the focuses of concern are income distribution, macroeconomic variables and inter-sectoral effects. Consequently they are not, and are never likely to be, perfect substitutes for multi-market, farm household and partial equilibrium models.

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