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AGRICULTURAL GROWTH LINKAGES IN ZIMBABWE: INCOME AND EQUITY EFFECTS

Romeo M. Bautista
Marcelle Thomas
International Food Policy Research Institute

Trade and Macroeconomics Division
International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.

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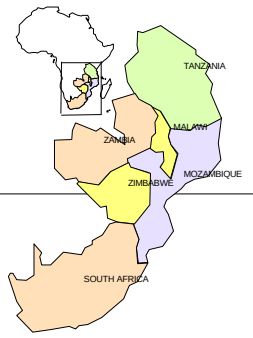

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Abstract

The comparative effects on GDP and household incomes associated with various pathways of agricultural growth in Zimbabwe are investigated, based on SAM (social accounting matrix) multiplier analysis. Among the five growth paths considered, the "smallholder road to agricultural development" yields the largest increase in national income. It benefits smallholder households the most, but the income gains to the two other low-income household groups are lower compared to those arising from the four other agricultural growth paths. Foodcrop production, in which smallholders have a dominant share, shows a larger GDP multiplier than both the traditional (tobacco and cotton) and nontraditional (horticulture) export crop sectors, which are dominated by large-scale commercial farms.

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1. Introduction

There is wide agreement in the development literature that sustained economic growth in heavily agricultural countries is not likely to be achieved without a prior, or simultaneous, development of agriculture. Indeed, the positive association between agricultural growth and overall economic growth among developing countries is a firmly established empirical generalization (Timmer 1988). That agricultural development is a significant determinant of growth in other sectors of the economy has been argued persuasively for a number of countries in historical terms and in counterfactual model simulations.[1] An important general finding is that the "consumption linkage" effect of the induced increases in rural income represents the more potent intersectoral influence than the "production linkages" of agricultural growth.

Where poverty is a substantially rural phenomenon, which appears to be the case in most low-income countries, accelerated growth of agricultural production can also lead to significant reductions in poverty and income inequality. A critical determinant of this outcome is the structure of agricultural growth and its linkages to the rest of the economy. Broadly-based agricultural growth is associated with strong labor-intensive linkages on the consumption side, enhancing the employment and income multiplier effects that cut across rural and urban sectors. By contrast, if the rural income gains from agricultural growth are concentrated in the more affluent households, the pattern and growth of rural household expenditures will favor capital-intensive products and imported goods rather than labor-

[1]Among others, see Mellor (1976) on India, Adelman (1984) on Korea, Adelman and Taylor (1990) on Mexico, Delgado *et al.* (1994) on four sub-Saharan African countries, Mao and Schive (1995) on Taiwan, and Bautista and Robinson (1997) on the Philippines.

intensive, locally produced goods and services, weakening therefore the impetus to a rapid and equitable overall growth of the national economy.

In this paper, we make use of SAM (social accounting matrix) multiplier analysis in investigating quantitatively the economy-wide repercussions of exogenous income increases in various agricultural sub-sectors in Zimbabwe, paying particular attention to the effects on overall income growth and equity. Given the recent history of sluggish economic growth and persisting income inequities in Zimbabwe, there is significant policy interest in the assessment of alternative agricultural growth paths in terms of their effects not only on national income but also on its distribution.

Zimbabwean agriculture is characterized by an extremely dualistic structure, consisting of a modern, large-scale commercial (LSC) sector and a traditional, smallholder (mostly, communal) farm sector (see, e.g., Muir 1994). The two farming systems differ widely in production technology, land quality, infrastructure development, level of rainfall, crops planted, and household income. The rural population accounts for about 88 percent of the poor in Zimbabwe, 81 percent coming from the smallholder-farm sector (World Bank 1995:27). The remaining rural poor (about 7 percent) are in LSC farm-worker households. The poverty share of the urban population is 12 percent, much lower than its population share of 28 percent. Five household groups -- smallholder, LSC farm-worker, LSC high-income (farm owners and managers), low-income urban, and high-income urban -- are distinguished

in the present study,[2] relative changes in their incomes providing the basis for assessing distributional effects.

Section 2 of this paper describes the SAM framework and the Zimbabwe SAM used in the study. In Section 3, we identify various agricultural growth paths of policy interest in the Zimbabwean context, and then examine the associated income multipliers with an eye on their implications for overall income growth and equity. The paper ends, in Section 4, with some concluding remarks.

2. The SAM framework

A social accounting matrix describes quantitatively, in a square table, the income flows taking place in an economy during a specified period of time.[3] Each account in the SAM is represented by a row and a column of the table; expenditures are shown in the columns and receipts in the rows. The SAM can be expressed either algebraically as accounting identities (stating that receipts must equal expenditures for each account), or as numbers that represent the data base for a given benchmark period (typically a year). The numerical SAM integrates national income, input-output, flow-of-funds, and foreign trade statistics into a comprehensive and consistent data set. In the present study, we make use of an agriculture-focused Zimbabwe

[2] High-income urban households were the most affluent in 1991 (with an estimated per capita income of Z$13,929), followed by LSC owner/manager (Z$8,694), low-income urban (Z$1,511), smallholder (Z$565), and LSC farm-worker (Z$335).

[3] See Pyatt and Round (1985) for a wide-ranging discussion of the SAM structure, and Robinson and Roland-Horst (1988) for perspectives on SAM-based modeling.

SAM for 1991 recently developed under IFPRI's ongoing project on macroeconomic reforms and regional integration in Southern Africa (MERRISA).[4]

Assuming exogeneity in some accounts (usually the government, rest-of-the-world, and capital accounts), the algebraic SAM can be transformed into a multi-sectoral model of the economy in which the inter-linkages among sectoral production, household incomes and expenditures, and macroeconomic balances are systematically taken into account. There are 78 endogenous accounts in the Zimbabwe SAM, including 27 commodities (see Table 1), 36 activities, eight factors of production (agricultural land, capital, and six labor categories), two enterprise accounts, and five household groups.[5]

Analytically, the total income (row sum) in each endogenous account is equal to the sum of products of the expenditure coefficient and corresponding income plus the total exogenous income from the government, rest-of-the-world, and capital accounts; that is,

$$Y = A_n Y + X \qquad (1)$$

where Y is a column vector (78x1) of total incomes in the 78 endogenous accounts, X is a column vector (78x1) of total exogenous incomes, and A_n is the expenditure coefficient matrix (78x78) pertaining to the endogenous accounts.

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[4] The 83 x 83 SAM is too large to be reproduced here, but can be obtained on request from the authors. A brief description of the construction of the 1991 Zimbabwe SAM is given in the Appendix below.

[5] The number of activities exceed the number of commodities because of the distinction made between smallholder and LSC production of the following "commodities:" maize, other grains, horticulture, groundnuts, cotton, other crops, cattle, other livestock, and forestry.

Solving for Y in equation (1) yields

$$Y = (I - A_n)^{-1}X = M_aX \qquad (2)$$

where M_a is the SAM multiplier matrix. Equation (2) can be used to calculate the endogenous incomes associated with any constellation of total exogenous incomes, given M_a. Also, the effects on Y arising from any given changes in X (e.g., an exogenous income injection in any production sector) can be derived from equation (2).

Each cell in the multiplier matrix can be interpreted to indicate the total (direct and indirect) income change in the row-account induced by an exogenous unit-income injection in the column-account. This interpretation is subject to the familiar limitations of conventional SAM-based analysis, including the assumption of purely demand-driven adjustments, absence of relative price and monetary effects, externally determined exports, and exogenous government and capital accounts. Because supplies of goods and services are assumed perfectly elastic, they expand readily in response to increases in demand at given (fixed) prices. The SAM model thus leads to larger quantity (and income) responses to exogenous shocks in economies operating at or near full employment in comparison to the corresponding results from a price-endogenous CGE (computable general equilibrium) model.[6]

[6]Adelman and Taylor (1991:162) have argued that general-equilibrium constraints often lead to excessive price changes and an understatement of quantity adjustments. Corresponding simulation results from SAM and CGE models might then provide the upper and lower bounds on the induced changes in real incomes.

3. Income multipliers for different agricultural growth paths

Various pathways of agricultural growth in Zimbabwe can be identified that are likely to have differing influences on overall income growth and equity. Since Independence in 1980, especially during the immediate half-decade, the government has aimed to support smallholder farm production in large part as a pro-equity measure. Moreover, "a smallholder road to (agricultural) development holds promise as a profitable and feasible pathway for the twenty-first century," according to Eicher and Rukuni (1994:406). They also argue for promoting several elements of a "new agricultural revolution" in Zimbabwe that include the expansion of food production (especially, maize), traditional exports (tobacco and cotton), and non-traditional exports (cut flowers and other horticultural products).

We examine, in the present study, the comparative effects on GDP and household incomes arising from an exogenous income injection to the following groups of agricultural accounts:

1. Agriculture, consisting of all crop and livestock commodity accounts
2. Smallholder agriculture, consisting of all smallholder activity accounts
3. Food crops, consisting of the *maize* and *other grains* commodity accounts
4. Traditional export crops, consisting of the *tobacco* and *cotton* commodity accounts
5. Nontraditional export crops, consisting of the *horticulture* commodity account

Based on the 1991 Zimbabwe SAM, the calculated "value-added multipliers," representing the induced effects on GDP (at factor cost), associated with the five agricultural growth paths indicated above, are shown in Figure 1. Each multiplier is a weighted average of the different multipliers for the various accounts comprising each group. The weights used

are the account shares in the total final demand for *commodities* in the group or (for Group 2) in the total value of production for *activities* in the group. Smallholder agriculture is found to have the largest GDP multiplier — 1.92; on this basis, each Zimbabwe dollar of additional value added (at 1991 prices) generated in smallholder farms leads to an increase of Z$0.92 in income elsewhere in the economy. Foodcrop production, in which the contribution of smallholders is significantly higher than that of LSC farms, has the next largest multiplier (1.68) which exceeds the "average" agricultural multiplier (1.62). Relatively lower GDP multipliers characterize both traditional and nontraditional export crop production, in which LSC farms predominate.

It is of some policy interest to compare these multipliers with that associated with an exogenous unit-income injection to the activity account of *other light manufacturing*, which is notably a labor-intensive production sector and represents a potentially significant source of much needed employment generation in Zimbabwe. The GDP multiplier for the latter sector is calculated to be 1.49, remarkably lower than any of the agricultural multipliers shown in Figure 1. Evidently, the demand stimulus generated from each of the five agricultural growth paths exceeds that from the expansion of labor-intensive manufacturing. This finding lends support to the hypothesis of strong macro-linkages of rising agricultural incomes, especially from small-farm production, favored by advocates of agriculture-based development.

The calculated multiplier matrix also provides information on the relative strength of sectoral growth linkages to household incomes. Table 2 indicates the additional incomes generated for the five household groups from an exogenous income injection of one billion

Zimbabwe dollars to each of the five groups of agricultural accounts. A general agricultural income expansion is seen to benefit LSC owner/manager households more than smallholder households in terms of both absolute and proportionate income gains; LSC farm-worker households, whose base total income is much lower compared to the two other rural household groups, receive the least absolute -- albeit the largest proportionate -- income increment. Among urban households, larger income gains accrue to the high-income group, perhaps reflecting a heavy orientation of LSC household expenditures toward the more capital- and skilled labor-intensive products of urban industry.

The smallholder road to agricultural development understandably benefits smallholder households the most, but leads to smaller income gains for the four other household groups. It would appear that the outcome for LSC farms significantly affects the fortunes not only of the two LSC household groups but also of urban households generally. Agricultural growth emphasizing foodcrop production likewise favors smallholder households and also low-income urban households, the latter presumably benefitting from the more labor-intensive structure of smallholder household expenditures. The patterns of income gains for the five household groups arising from the expansion of traditional and nontraditional export crops do not differ significantly. Relative to the results of general agricultural growth, an emphasis on export crop production expectably leads to larger income benefits for the two LSC household groups.

The SAM model can also be applied to the analysis -- again, focusing on the demand side -- of the direct and indirect effects of exogenous income injections to different household groups. The calculated income multipliers for the five household groups distinguished in the

Zimbabwe SAM are shown in Figure 2. We observe that the two lowest-income rural household groups -- smallholder and LSC farm-worker households -- have significantly larger multipliers in comparison to LSC owner/manager households. This finding suggests that the distribution of income benefits from agricultural growth is a potentially significant factor in the latter's influence on overall economic growth.

4. Conclusion

This paper has presented some results of SAM-based analysis that indicate relatively strong macro-linkages of agricultural growth in Zimbabwe, notably vis-a-vis labor-intensive industrial growth. Among the five agricultural growth paths considered, the emphasis on smallholder farms yields the largest increase in overall income (GDP). Foodcrop production (in which smallholders have a dominant share) shows a larger GDP multiplier than both the traditional and nontraditional export crop sectors (which are dominated by LSC farms). These findings bear out the expectation of a stronger demand stimulus generated by rising agricultural incomes for the less affluent farm households.

The equity effects are less clear-cut. The smallholder road to agricultural development leads to a dramatic growth of smallholder household income. This in itself represents a significant outcome in equity terms, considering that a large majority of the poor in Zimbabwe come from the smallholder farm sector. However, the income gains to the two other low-income household groups -- especially LSC farm-worker households -- are lower compared to those associated with the four other agricultural growth paths. To achieve equitable growth,

the promotion of smallholder agriculture may need to be accompanied by policies that raise LSC farm-worker income.

APPENDIX: Construction of the 1991 Zimbabwe SAM

An aggregate version (14 x 14) of the Zimbabwe SAM was first constructed, using the latest — and significantly revised — national-income accounts for 1991 (Central Statistical Office 1997) as the basic data source. It provided the control totals for various components of the disaggregate (83 x 83) SAM, including the payments to primary factors of production (value added), intermediate demand by producers, and final demand (household consumption, government current expenditures, and exports). Other publications of the Central Statistical Office were used as major sources of disaggregate data.

The input-output structure of agricultural activities was derived from 1991 data of the *Production Account of Agriculture, Forestry and Fishing,* distinguishing between the two production technologies of large-scale commercial (LSC) and smallholder farms for certain agricultural products.

The *Census of Industrial Production* (1993/94 Report) provided data on 1991 gross output, input purchases, and wages and salaries for the mining, manufacturing, electricity and water, and construction industries. Manufacturing was further disaggregated into grain milling, other food processing, textiles, other light manufacturing, fertilizer, and other manufacturing.

Sectoral estimates of export and import flows came from the *Quarterly Digest of Statistics* (1996 Report), which contains detailed trade data for 1991 classified by principal commodities. They were aggregated according to our SAM classification and the totals reconciled with corresponding national-account figures.

Estimates of the sectoral consumption pattern and the distribution of value added by household group were derived from the *Income, Consumption and Expenditure Survey* (1990/91 Report), and reconciled with the national-account aggregates.

Input coefficients from the 1980 *Input-Output Structure of the Economy of Zimbabwe* were used, in the absence of more recent information, to estimate the values of intermediate inputs for the service sectors and of the marketing margins by commodity.

A recently developed procedure for efficiently estimating a consistent SAM from incomplete and inconsistent data based on "maximum entropy econometrics" (Golan, Judge,

and Robinson 1994; Robinson and El-Said 1997) was employed in making adjustments on the disaggregated estimates to achieve data reconciliation and SAM balance.

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Table 1 Commodity classification in the disaggregated 1991 Zimbabwe SAM

1. Maize	10. Tobacco	19. Textiles
2. Wheat	11. Other crops	20. Other light manufacturing
3. Other grains	12. Cattle	21.Fertilizer and ag. chemicals
4. Horticulture	13. Other livestock	22. Other manufacturing
5. Coffee	14. Fishery	23. Electricity and water
6. Tea	15. Forestry	24. Construction
7. Groundnuts	16. Mining	25. Trade and transport
8. Cotton	17. Grain milling	26. Public services
9. Sugarcane	18. Other food processing	27. Private services

Table 2 Effects of a Z$ one billion increase in sectoral final demand on household incomes (Z$ million at 1991 prices)

Household group	Agriculture	Smallholder farms	Foodcrops	Traditional export crops	Nontraditional export crops
Smallholder	193.2	777.3	302.7	149.0	161.9
	(5.8)	(23.5)	(9.2)	(4.5)	(4.9)
LSC owner/manager	497.7	367.4	447.3	524.8	519.0
	(7.4)	(5.5)	(6.6)	(7.8)	(7.7)
LSC farm-worker	24.7	4.1	19.0	28.6	26.7
	(19.1)	(3.1)	(14.6)	(22.1)	(20.6)
Urban high-income	636.8	557.9	649.0	637.7	590.7
	(4.5)	(3.9)	(4.6)	(4.5)	(4.1)
Urban low-income	123.0	119.1	133.6	122.5	121.3
	(4.0)	(3.8)	(4.3)	(4.0)	(3.9)

Note: Numbers in parentheses are percentages of base household incomes.