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A Social Accounting Matrix for the Agricultural Sector of Pakistan

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1. INTRODUCTION

The purpose of this paper is to analyse the effect of alternative agricultural policies on production, consumption and income distribution within a social accounting framework. This is done by applying the social accounting multiplier analysis on the agricultural SAM for Pakistan for the year 1979-80. The paper focuses attention on the agricultural production sector, the related food producing industrial sectors and food consumption sectors, which are represented in the agriculture SAM by disaggregated accounts, while all the other production sectors in the economy have been aggregated into a single account.

The paper is organized as follows: The SAM for the agricultural sector of Pakistan is presented in Section 2, followed by a discussion of multiplier decomposition in Section 3. Section 4 presents the results of the multiplier analysis and Section 5 gives a summary of the main results.

2. A SAM FOR THE AGRICULTURAL SECTOR OF PAKISTAN FOR 1979-80

The SAM for Pakistan's agricultural sector consists of the following main accounts: Wants account; Factors accounts; Institutions accounts; Activities accounts and an exogenous account which contains the flows of sectoral exports minus competitive imports, investments, net income transfers from the rest of the world and a government account. In addition, there is an exogenous account representing savings, indirect and direct taxes. Schematically, this is shown in Table 1 where the entries in the table denote matrices and vectors.

The flows of the endogenous accounts of the agricultural SAM are presented in Table 2. Rows and columns W_1 to W_8 in Table 2 give the wants accounts, which

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Table 1

Schematic Presentation of the SAM

Receipts		1. Wants Account	2. Factors Account	3. Institutions Account	4. Activities Account	Exogenous Total Account	
						Government, Capital & Rest of the World	
Endogenous	1. Wants			A_{13}		X_1	Y_1
	2. Factors				A_{24}	X_2	Y_2
	3. Institutions		A_{32}	A_{33}		X_3	Y_3
	4. Activities	A_{41}			A_{44}	X_4	Y_4
Exogenous	Others	Residual Balance					
Totals		Y'_1	Y'_2	Y'_3	Y'_4		

	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29
W1 Wheat and Flour	861.	1111.	9851.	103.	131.	20.	225.	831.	974.	2105.
W2 Rice and Flour	303.	290.	1436.	55.	550.	8.	84.	264.	290.	672.
W3 Pulses	190.	365.	915.	58.	421.	5.	58.	210.	244.	532.
W4 Sugar	1075.	3175.	1086.	134.	870.	13.	142.	467.	525.	1186.
W5 Live Stock	2022.	3771.	16819.	38.	692.	61.	651.	1938.	2080.	4923.
W6 Edible Oils	433.	897.	1090.	107.	596.	15.	166.	572.	653.	1451.
W7 Miscellaneous Food	3866.	4257.	4952.	36.	1607.	66.	693.	2057.	2214.	5232.
W8 Other Commodities	14876.	13116.	3266.	372.	3909.	299.	2985.	7494.	7756.	19352.
Total	23625.	26982.	68810.	904.	8777.	487.	5005.	13833.	14737.	35453.

	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45
F9 Large Holdings	920.	198.	138.	34.	1204	625.	101.	1076.	270.	130.	218.	179.	586.	5352.	14460.
F10 Medium Holdings	1759.	761.	265.	66.	2303.	1195.	193.	2058.	232.	112.	187.	154.	504.	4605.	12442.
F11 Small Holdings	7431.	3214	1118.	278.	9727.	5047.	816.	8695.	366.	177.	295.	243.	795.	7257.	19608.
F12 Landless	152.	66.	23	6.	199.	103	17.	178.	0.	0.	0.	0.	0.	0.	15.
F13 Non-farm	1086.	469.	163.	41.	1422.	737.	119.	1270.	41.	18.	30.	25.	81.	741.	1989.
F14 Employer	5.	2.	1.	0.	7.	4	1.	6.	7.	3.	5.	4.	15.	133.	374.
F15 Professional	2.	1.	0.	0.	3.	1.	0.	2.	28.	12.	20.	17.	55.	502.	4665.
F16 Non-manual	3.	1.	0.	0.	4	2.	0.	4.	81.	36.	60.	49.	161.	1468.	12044
F17 Manual	149.	64.	22.	6.	195.	101.	16.	174.	290.	128.	214.	176	576.	5256.	7202.
F18 Self-employed	634.	274.	95.	24.	831.	431	70.	742.	331.	146.	244.	201.	657.	5998.	25280.
F19 Firms	628.	271.	94.	24.	827.	426.	68.	735.	256.	77.	128.	105.	345.	3147.	7670.
Total	12769.	5521.	1919.	479.	16722	8672.	1401.	14940.	1902.	839.	1401.	1153.	3775.	34459.	105749.

	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
I20 Large Holdings	27400.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
I21 Medium Holdings	0.	28620.	0.	0.	0.	0.	0.	0.	0.	0.	0.
I22 Small Holdings	0.	0	69390.	0.	0.	0.	0.	0.	0.	0.	0.
I23 Landless	0.	0.	0	810.	0.	0.	0.	0.	0.	0.	0.
I24 Non-farm	0.	0.	0.	0.	8780.	0.	0.	0.	0.	0.	0.
I25 Employer	0.	0.	0.	0.	0.	640.	0	0.	0.	0.	0.
I26 Professional	0.	0.	0.	0.	0.	0.	5980	0.	0.	0.	0.
I27 Non-manual	0.	0.	0.	0.	0.	0.	0.	15670.	0.	0.	0.
I28 Manual	0.	0.	0.	0.	0.	0.	0.	0.	16410.	0.	0.
I29 Self-employed	0.	0.	0.	0.	0.	0.	0.	0.	0.	40500.	0.
I30 Firms	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	15800.
Total	27400.	28620	69390	810.	8780	640.	5980.	15670.	16410.	40500.	15800.

	W1	W2	W3	W4	W5	W6	W7	W8	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45
S31 Wheat	4477.	0.	0	0	0.	0.	0.	0.	977.	0.	0	0.	2554.	0.	0.	0.	11923.	0.	0.	0.	0	0.	0.
S32 Rice	0.	564.	0.	0.	0.	0.	0.	0.	0.	425.	0.	0.	939	0.	0.	0.	0.	3707.	0.	0.	0.	0.	0.
S33 Sugar	0.	0.	0	2016.	0.	0.	0.	0.	0.	0.	32.	0.	233	0.	0.	0	0.	0.	1147.	0.	0.	0.	0.
S34 Pulses	0.	0.	1215	0.	0.	0	0.	0.	0.	0.	0.	471.	717.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S35 Live Stock	0.	0.	0.	0.	31968.	0.	0.	0.	750.	208.	38.	264	0.	285.	116.	800.	0.	0.	0.	0.	0.	144.	[illegible]
S36 Raw Cotton	0.	0.	0.	0.	0.	0.	0	0.	0.	0.	0.	0	0.	1135.	0.	0.	0.	0	0.	0.	0	12734.	[illegible]
S37 Oil Seeds	0.	0.	0	0.	0.	199.	0.	0.	0.	0.	0.	0.	0.	0.	515.	0.	0.	0.	0.	2071.	0.	0.	[illegible]
S38 Other + Tobacco	0.	0.	0	0.	0.	0.	15149.	0.	0.	0.	0.	0	9129.	0.	0.	1494.	298.	0	117.	0.	2.	[illegible]	[illegible]
S39 Grain Milling	11736.	0.	0	0.	0.	0.	1008.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1332.	[illegible]	[illegible]
S40 Rice Milling	0.	33RR	0.	0.	0.	0.	76.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	724.	[illegible]	[illegible]
S41 Sugar	0.	0.	0.	6320.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	658.	0.	6	[illegible]	[illegible]
S42 Edible Oils	0.	0.	0.	0.	0.	5781.	541.	0.	0.	0.	0.	0.	0	0.	0	0.	0.	0.	0.	3550.	1.	[illegible]	[illegible]
S43 Other Food + Cigarts	0.	0.	1782.	338.	1028	0.	6185.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0	0.	85.	[illegible]	[illegible]	[illegible]
S44 Other Manufactures	0.	0.	0.	0.	0.	0.	2020.	44032.	2565.	891.	320.	491.	485.	2242.	156.	1858.	642.	107.	497.	629.	2.	[illegible]	[illegible]
S45 Services	0.	0.	0.	0.	0.	0.	0.	58790.	4239.	2742.	1120.	693.	3963.	4893	493.	6622	1529.	744.	1539.	235.	[illegible]	[illegible]	[illegible]
Total	16213	3952.	2997.	8674.	32996.	5980.	24980.	102822.	8531.	4268.	1510.	1919	18020	8655.	1280.	10774.	14392.	4558.	3958.	6570.	[illegible]	[illegible]	[illegible]

Note : Table gives non-zero endogenous elements of SAM.

denote the household consumption expenditure on various commodity items. The factors accounts (row and columns F_9 to F_{19}) record the receipts of factor incomes and their disbursement over various spending institutions. The institutions accounts (rows and columns 120-130) highlight the divisions of the household sector into various household groups. The receipts and expenditures of the institutions accounts are recorded in row and column 20 to 30 respectively, while the activities accounts (row and columns S_{31} to S_{45}) record the input-output production flows, which have been obtained by aggregating the PIDE Input-Output Table for 1975-76.

The exogenous accounts consist of the government account, the capital account and the rest of the world account. These accounts include indirect taxes, subsidies, payments of pensions, savings, investment, exports and imports.

3. DECOMPOSITION OF SAM MULTIPLIERS

The SAM-multiplier model is developed along similar lines as the traditional input-output model with the difference that the SAM-multiplier model takes account of the structure of production as well as factor income and its distribution across household groups and other spending institutions.

Mathematically, the SAM-multiplier model can be represented by the following matrix equation:

$$y = Ay + X \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where

A is the matrix of endogenous accounts consisting of elements shown by the A_{ij} matrices in Table 1,
X is the vector of exogenous outgoings, and
y is the vector of row totals.

Equation (1) can be rewritten as:

$$y = M_a X \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where

M_a is the matrix of aggregate multipliers.

Following Pyatt, G. and A. Roe (1977) we can rewrite Equation (1) as

$$y = A^* y + (I - \hat{A})^{-1} X \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

where

A = matrix of diagonal elements of the exogenous accounts in Table 1,

$(I-\hat{A})$= the transfer multiplier, denoted by M_1', which represents the total production effects arising from changes in final demand, and

$$A^* = (I-A)^{-1}(A-\hat{A}).$$

Substituting for $(I-\hat{A})$ and solving Equation (3) we get

$$y = (I-A^*)^{-1} M_1 X \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

We have shown elsewhere [I. Havinga, K. Sarmad *et al.*, (1987)] that the matrix $(I-A^*)^{-1}$ can be split into two commutative submatrices denoted by M_2 and M_3 such that if

$$(I-A^*)^{-1} = (I+A^* + A^{*2} + A^{*3})(I-A^*4)^{-1} \text{ then}$$

$$(I-A^*)^{-1} = (I+A^* + A^{*2} + A^{*3})(I+A^{*4} + A^{*8} + \ldots + A^{*n}) = M_2 \quad M_3$$

where

M_2 measures the open loop effect, and M_3 measures the closed loop effect. We have also shown that the commutative nature of M_2 and M_3 does not affect the aggregate multiplier matrix M_a, and that the actual path of the impact of exogenous changes in X on y remains the same.

4. RESULTS

Aggregate Multipliers

Table 3 reports the aggregate SAM multipliers (the matrix M_a) Rows 1 to 8 show the total impact of an exogenous change in the demand in each of the eight agricultural sectors on consumption. The wheat sector has slightly higher impact multipliers as compared to the other agricultural sectors. In general, the impact multipliers show that the food sectors have greater potential for generating higher growth rates as compared to non-food sectors.

Rows 10 to 11 reflect the total impact of an exogenous change in demand in each of the eight agricultural sectors on the pattern of income distribution. Income changes have been normalized by the total change and reported in Table 4. The results reported in Table 4 show that an exogenous increase in demand in the agricultural sector causes a redistribution of income in favour of the medium and small-farm households, the landless and non-farm households, at the cost of the large farm and urban households and firms. The redistribution effects of an increase in demand

Table 3

Aggregate Multiplier Matrix M_a

		S 31 Wheat	S 32 Rice	S 33 Sugar	S 34 Pulses	S 35 Live Stock	S 36 Raw Cotton	S 37 Oil Seed	S 38 Other	S 39 Grain	S 40 Rice Milling	S 41 Sugar	S 42 Edible Oil	S 43 Other	S 44 Other	S 45 Service
W 1	Wheat and Flour	0.3373	0.2961	0.2933	0.2685	0.3049	0.2820	0.2937	0.2806	0.3133	0.2830	0.2044	0.1904	0.1421	0.2118	0.2522
W 2	Rice and Flour	0.0796	0.0700	0.0694	0.0640	0.0719	0.0668	0.0693	0.0663	0.0743	0.0674	0.0691	0.0454	0.0341	0.0509	0.0612
W 3	Pulses	0.0599	0.0527	0.0523	0.0483	0.0540	0.0503	0.0521	0.0499	0.0560	0.0508	0.0372	0.0343	0.0259	0.0386	0.0465
W 4	Sugar	0.1690	0.1492	0.1482	0.1386	0.1520	0.1427	0.1469	0.1409	0 1594	0 1456	0.1084	0.0987	0.0755	0.1127	0.1362
W 5	Live Stock	0.6695	0 5887	0.5839	0 5381	0.6042	0.5615	0.5826	0.5574	0.6248	0.5663	0.4132	0.3818	0.2871	0.4282	0.5141
W 6	Edible Oils	0.1123	0.0993	0.0968	0.0929	0.1008	0.0951	0.0975	0.0937	0.1064	0.0975	0.0731	0.0661	0.0507	0.0759	0.0930
W 7	Miscellaneous Food	0.4671	0.4135	0.4116	0.3884	0.4191	0.3964	0.4057	0.3901	0.4438	0.4074	0.3071	0.2766	0.2134	0.3191	0.3913
W 8	Other Commodities	1.9739	1.7452	1.7352	1.6241	1 7766	1 6701	1.7174	1.6484	1.6857	1.7055	1.2715	1.1548	0.8829	1.3195	1.6086
Total		3.8706	3.4147	3.3928	3.1630	3.4836	3.2648	3.3653	3.2272	3.6437	3.3237	2.4640	2.2480	1.7117	2.5566	3.1032
I 20	Large Holdings	0.4982	0 4432	0 4426	0.4273	0.4440	0.4271	0.4315	0.4167	0.4821	0 4485	0.3499	0.3090	0.2463	0.3678	0.4465
I 21	Medium Holdings	0.5761	0.5078	0.5045	0.4704	0.5183	0.4856	0.5006	0.4799	0.5426	0.4954	0.3681	0.3367	0.2580	0.3844	0.4575
I 22	Small Holdings	1.6180	1.4088	1.3891	1.2343	1.4724	1.3336	1.4120	1.3407	1.4702	1.3076	0.9032	0.8718	0.6286	0.9332	1.0739
I 23	Landless	0.0234	0.0201	0.0196	0.0165	0.0216	0.0187	0.0207	0.0193	0.0203	0.0174	0.0107	0.0113	0.0073	0.0108	0.0118
I 24	Non-farm	0.2149	0.1864	0.1833	0.1607	0 1963	0.1759	0.1877	0.1778	0.1934	0.1703	0.1148	0.1129	0.0797	0.1182	0.1343
I 25	Employer	0.0099	0.0089	0.0090	0.0089	0.0087	0.0087	0.0087	0.0083	0.0099	0.0093	0.0076	0.0065	0.0034	0.0080	0.0100
I 26	Professional	0.0809	0.0736	0.0745	0.0746	0.0717	0.0716	0.0702	0.0689	0.0797	0.0758	0.0608	0.0499	0.0385	0.0597	0.0917
I 27	Non-manual	0 2134	0 1946	0.1965	0.1970	0.1891	0.1890	0.1852	0 1816	0.2107	0 2007	0.1616	0.1326	0.1032	0.1594	0.2408
I 28	Manual	0.2755	0.2458	0.2463	0.2487	0.2418	0 2393	0.2364	0.2297	0.2799	0 2641	0.2199	0.1912	0.1653	0.2428	0.2631
I 29	Self-employed	0.6272	0.5640	0.5661	0.5570	0.5573	0.5455	0.5438	0.5284	0.6147	0.5771	0.4579	0.3919	0.3108	0.4700	0.6249
I 30	Firms	0.2965	0.2629	0.2621	0.2517	0.2649	0 2530	0.2564	0.2476	0.2915	0.2645	0.2045	0.1823	0.1457	0.2161	0.2567
Total		4.4341	3.9162	3.8938	3.6471	3.9861	3.7481	3 8531	3.6988	4.1949	3.8307	2.8589	2.5959	1.9889	2.9704	3.6111
S 31	Wheat	1.4732	0 3669	0.3611	0.3494	0.4517	0.3512	0.3646	0.3476	1.1606	0.3522	0.2571	02404	0.2651	0.2880	0.3200
S 32	Rice	0.1136	1.1448	0.0985	0.0975	0.1289	0.0957	0.0986	0.0941	0.1064	0.8110	0.0710	0.0663	0.0928	0.0845	0.0893
S 33	Sugar	0.0685	0.0603	1.0693	0.0368	0.0682	0.0577	0.0596	0.0571	0.0645	0.0588	0.2345	0.0399	0.0305	0.0455	0.0548
S 34	Pulses	0.0493	0.0430	0.0424	1.2866	0.0695	0.0411	0.0433	0.0409	0.0459	0.0413	0.0300	0.0281	0.0209	0.0312	0.0373
S 35	Live Stock	0.7444	0.6401	0.6239	0.7054	1.6479	0.6129	0.6632	0.6158	0.6873	0.6101	0.4373	0.4197	0.3057	0.4568	0.5416
S 36	Raw Cotton	0.3127	0.2744	0.2744	0.2927	0.2668	1.3394	0.2629	0.2550	0.2991	0.2688	0.2104	0.1901	0.1285	0.3672	0.2726
S 37	Oil Seeds	0.0744	0.0657	0 0654	0.0636	0.0660	0.0634	1.2941	0 0617	0.0707	0 0644	0.0489	0.4757	0.0329	0.0595	0.0625
S 38	Other + Tobacco	0.5413	0.4745	0.4691	0.4765	0.7574	0.4550	0.4747	1.5085	0.5283	0.4620	0.3630	0.3144	0.2388	0.3583	0.4375
S 39	Grain Milling	0.3417	0.3002	0.2980	0.2813	0.3057	0.2879	0.2937	0.2834	1.3197	0.2890	0.2127	0.1980	0.2598	0.2481	0.2658
S 40	Rice Milling	0.1128	0.0992	0.0987	0.0952	0.1002	0.0957	0.0973	0.0934	0.1026	1.0962	0.0718	0.0667	0.1107	0.0896	0.0907
S 41	Sugar	0.1383	0.1720	0.1213	0.1135	0.1243	0.1168	0.1201	0.1153	0.1304	0.1191	1.1972	0.0808	0.0623	0.0930	0.1115
S 42	Edible Oils	0.2589	0.2285	0.2277	0.2218	0.2294	0.2208	0.2230	0.2148	0 2460	0.2742	0.1702	1.7552	0.1144	0.2094	0.2177
S 43	Other Food + Cigarts	0.3010	0.2655	0.2643	0.2559	0.2673	0.2561	0.2595	0.2498	0.2853	0.2598	0.1962	0.1961	1.4000	0.2381	0.2497
S 44	Other Manufactures	2.5438	2.2328	2.2325	2.3813	2.1706	2.2073	2.1388	2.0750	2.4335	2.1871	1.7120	1.5467	1.0458	2.9875	2.2182
S 45	Services	2.4685	2.2721	2.3020	2.2850	2.2028	2.1998	2.1577	2.1205	2.3859	2.2756	1.7827	1.4225	1.0200	1.6350	2.9514
Total		9.5424	8.5901	8.5505	8.9627	8.8566	8.4008	8.5532	8.1328	9.8697	9.1195	6.9950	7.0405	5.1281	7.1917	7.9206

Table 4

Percentage Distribution of Multiplier over Institutions

	Wheat	Rice	Sugar	Pulses	Live Stock	Raw Cotton	Oil Seeds	Other	Grain	Rice Milling	Sugar cane	Edible Oil	Other	Other	Service	Original Distr.
Large holding	11.24	11.32	11.37	11.72	11.14	11.40	11.20	11.27	11.49	11.71	12.24	13.90	12.38	12.38	12.37	11.91
Medium holding	12.99	12.97	12.96	12.90	13.00	12.95	12.99	12.97	12.93	12.93	12.88	12.97	12.97	19.94	12.67	12.44
Small holding	36.49	35.97	35.68	33.84	36.94	35.58	36.64	36.25	35.05	34.14	31.59	33.58	31.61	31.42	29.74	30.17
Landless	0.53	0.51	0.50	0.45	0.54	0.50	0.54	0.52	0.48	0.45	0.37	0.44	0.37	0.36	0.33	0.35
Non-farm	4.85	4.76	4.71	4.41	4.92	4.69	4.87	4.81	4.61	4.45	4.01	4.35	4.01	3.98	3.72	3.82
Employer	0.22	0.23	0.23	0.24	0.22	0.23	0.23	0.22	0.24	0.24	0.26	0.25	0.27	0.27	0.28	0.28
Professional	1.82	1.89	1.91	2.05	1.80	1 91	1.82	1.86	1.90	1.98	2.13	1.92	1.94	2.01	2.54	2.60
Non-manual	4.81	4.97	5.05	5.40	4.74	5.04	4.81	4.91	5.02	3.24	5.65	5.11	5.17	5.37	6.67	6.81
Manual	6.21	6.28	6.33	6.82	6.07	6.39	6.13	6.21	6.67	6.89	7.69	7.37	8.11	8.17	7.29	7.13
Self-employed	14.15	14.40	14.54	15.27	13.98	14.56	14.11	14.29	14.65	15.06	16.02	15.10	15.63	15.82	17.30	17.61
Firms	6.69	6.71	6.73	6.90	6.64	6.75	6.66	6.69	6.95	6.91	7.15	7.02	7.33	7.27	7.11	6.87

of the agricultural goods processing industries are less progressive in the rural areas, as large-farm households tend to benefit more, but more progressive in the urban areas as the poorest households derive relatively higher benefits.

Disaggregate Multipliers

Transfer Effects: Table 5 presents the matrix M_1, which describes the technical impact multipliers of the Leontief inverse. The matrix shows that with the exception of the pulses sector the backward linkages between the various agricultural sectors are more or less the same, but generally lower than those observed for the agricultural processing sectors, as well as for the other manufacturing and services sectors.

Closed-Loop Effects: Table 6, which reports the matrix M_3 shows that the closed-loop effects are higher than the transfer effects, implying that private household consumption has a greater impact on the production structure as compared with the other components of aggregate demand. Changes in the pattern of household consumption influence the various sectors in different degrees e.g. the largest forward linkages of 12.9 and 12.5 are generated by the other manufacturing sector and the services sector respectively, while the edible oils and other food sectors generate the smallest linkages.

Open-Loop Effects: Table 7, which reports the open-loop effects shows that an exogenous increase in the demand of the agricultural production sectors would redistribute income in favour of rural households. While a similar result is obtained for the agricultural processing sectors, there is in addition, a favourable redistribution of income in favour of poor households in the urban areas. These results are in sharp contrast to the regressive redistribution of income that would be caused by an exogenous increase in demand of the services sector.

Interdependence

A comparison of the impact multipliers in Tables 3 and 5 shows that the backward linkages reported in Table 3 (aggregate SAM Multipliers) are higher as compared to those in Table 5 (Leontief multipliers). This suggests a stronger interdependence between production sectors within the SAM framework as compared to the interdependence of production sectors within a Leontief framework. Table 8 gives a comparison of the degree of interdependence for the two frameworks.

Table 8 shows that only 8 percent of the Leontief multipliers exceed the value of 0.75 as compared with 21 percent of the aggregate SAM multipliers.

Table 5

Transfer Multiplier Matrix M_1

		S 31 Wheat	S 32 Rice	S 33 Sugar	S 34 Pulses	S 35 Live Stock	S 36 Raw Cotton	S 37 Oil Seed	S 38 Other	S 39 Grain	S 40 Rice Milling	S 41 Sugar	S 42 Edible Oils	S 43 Other	S 44 Other	S 45 Service
S 31	Wheat	1.0633	0.0066	0.0059	0.0208	0.0816	0.0077	0.0078	0.0964	0.7785	0.0061	0.0054	0.0072	0.0901	0.0271	0.0075
S 32	Rice	0.0041	1.0484	0.0029	0.0090	0.0302	0.0037	0.0034	0.0029	0.0040	0.7179	0.0027	0.0035	0.0454	0.0137	0.0038
S 33	Sugar	0.0003	0.0002	1.0095	0.0010	0.0069	0.0002	0.0004	0.0002	0.0003	0.0001	0.1909	0.0002	0.0001	0.0002	0.0001
S 34	Pulses	0.0011	0.0006	0.0003	1.2470	0.0261	0.0006	0.0014	0.0008	0.0009	0.0004	0.0001	0.0005	0.0001	0.0002	0.0001
S 35	Live Stock	0.0440	0.0240	0.0129	0.1420	1.0159	0.0253	0.0537	0.0326	0.0377	0.0170	0.0044	0.0199	0.0049	0.0081	0.0025
S 36	Raw Cotton	0.0394	0.0312	0.0346	0.0686	0.0210	1.1086	0.0254	0.0272	0.0414	0.0335	0.0353	0.0308	0.0070	0.1855	0.0516
S 37	Oil Seeds	0.0023	0.0020	0.0021	0.0041	0.0012	0.0024	1.2315	0.0016	0.0029	0.0020	0.0021	0.4334	0.0004	0.0110	0.0001
S 38	Other + Tobacco	0.0158	0.0105	0.0028	0.0453	0.2847	0.0111	0.0379	1.0701	0.0125	0.0090	0.0258	0.0072	0.0045	0.0083	0.0118
S 39	Grain Milling	0.0073	0.0062	0.0064	0.0127	0.0039	0.0075	0.0047	0.0050	1.0011	0.0062	0.0065	0.0074	0.1165	0.0343	0.0095
S 40	Rice Milling	0.0040	0.0034	0.0015	0.0070	0.0021	0.0041	0.0026	0.0028	0.0042	1.0034	0.0036	0.0040	0.0633	0.0189	0.0051
S 41	Sugar	0.0002	0.0002	0.0002	0.0004	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	1.1086	0.0002	0.0006	0.0010	0.0003
S 42	Edible Oils	0.0087	0.0073	0.0076	0.0151	0.0046	0.0089	0.0056	0.0060	0.0091	0.0074	0.0078	1.6083	0.0017	0.0409	0.0114
S 43	Other Food + Cigarts	0.0091	0.0077	0.0080	0.0159	0.0049	0.0094	0.0059	0.0063	0.0096	0.0077	0.0082	0.0254	1.2694	0.0429	0.0119
S 44	Other Manufactures	0.3208	0.2703	0.2818	0.5583	0.1711	0.3300	0.2064	0.2210	0.3370	0.2723	0.2876	0.2508	0.0566	1.5094	0.4195
S 45	Services	0.3317	0.3861	0.4276	0.5348	0.2804	0.3960	0.3000	0.3384	0.3721	0.4369	0.4166	0.1784	0.0712	0.2124	1.2279
	Total	1.8523	1.8068	1.8113	2.6828	1.9347	1.9159	1.8668	1.7215	2.6331	2.5200	2.1057	2.5776	1.7318	2.1189	1.7661

Table 6

Closed-Loop Multiplier Matrix M_3

		S 31 Wheat	S 32 Rice	S 33 Sugar	S 34 Pulses	S 35 Live Stock	S 36 Raw Cotton	S 37 Oil Seed	S 38 Other	S 39 Grain	S 40 Rice Milling	S 41 Sugar	S 42 Edible Oil	S 43 Other	S 44 Other	S 45 Service
S 31	Wheat	1.2692	0.2756	0.2216	0.0990	0.1923	0.1949	0.2038	0.2184	0.0369	0.0516	0.0695	0.0407	0.0659	0.1029	0.2037
S 32	Rice	0.0713	1.0000	0.0539	0.0211	0.0509	0.0516	0.0540	0.0578	0.0101	0.0141	0.0189	0.0111	0.0234	0.0283	0.0558
S 33	Sugar	0.0439	0.0307	1.0365	0.0330	0.0314	0.0318	0.0332	0.0356	0.0065	0.0091	0.0123	0.0072	0.0152	0.0183	0.0150
S 34	Pulses	0.0315	0.0264	0.0261	1.0093	0.0225	0.0228	0.0238	0.0255	0.0044	0.0061	0.0083	0.0048	0.0102	0.0124	0.0243
S 35	Live Stock	0.4584	0.3841	0.3808	0.1359	1.3275	0.3319	0.3470	0.3720	0.0638	0.0889	0.1197	0.0701	0.1480	0.1790	0.3516
S 36	Raw Cotton	0.1756	0.1411	0.1458	0.0521	0.1254	1.1271	0.1329	0.1425	0.0261	0.0364	0.0491	0.0287	0.0606	0.0733	0.1449
S 37	Oil Seeds	0.0459	0.0315	0.0382	0.0136	0.0328	0.0333	1.0348	0.0373	0.0070	0.0098	0.0132	0.0077	0.0163	0.0197	0.0390
S 38	Other + Tobacco	0.3375	0.2878	0.2803	0.1001	0.2411	0.2444	0.2554	1.2738	0.0503	0.0703	0.0946	0.0554	0.5269	0.1414	0.2791
S 39	Grain Milling	0.2192	0.1817	0.1821	0.0650	0.1566	0.1587	0.1659	0.1779	1.0303	0.0423	0.0570	0.0334	0.0704	0.0852	0.1671
S 40	Rice Milling	0.0707	0.0393	0.0587	0.0210	0.0505	0.0512	0.0335	0.0574	0.0101	1.0142	0.0189	0.0111	0.0234	0.0283	0.0559
S 41	Sugar	0.0888	0.0744	0.0737	0.0263	0.0634	0.0643	0.0672	0.0720	0.0112	0.0185	1.0249	0.0146	0.0508	0.0373	0.0728
S 42	Edible Oil	0.1596	0.1317	0.1326	0.0474	0.1141	0.1156	0.1208	0.1295	0.0244	0.0139	0.0457	1.0268	0.0365	0.0683	0.1355
S 43	Other Food + Cigarts	0.1870	0.1567	0.1553	0.0555	0.3336	0.1354	0.1416	0.1518	0.0281	0.0192	0.0528	0.0309	1.0653	0.0790	0.1560
S 44	Other Manufactures	1.4283	1.1968	1.1864	0.4235	1.0206	1.0342	1.0811	1.1590	0.2123	0.2965	0.3992	0.2338	0.4934	1.5967	1.1792
S 45	Services	1.3746	1.1518	1.1419	0.4076	0.9822	0.9953	1.0405	1.1154	0.2035	0.2842	0.3826	0.2241	0.4729	0.5719	2.1295
	Total	5.9614	5.1574	5.1214	2.4711	4.3451	4.5924	4.7554	3.0260	1.7268	2.0151	2.3666	1.8005	2.6892	3.0428	5.0306

Table 7

Open-Loop Multiplier Matrix M_2

		S 31 Wheat	S 32 Rice	S 33 Sugar	S 34 Pulses	S 35 Live Stock	S 36 Raw Cotton	S 37 Oil Seed	S 38 Other	S 39 Grain	S 40 Rice Milling	S 41 Sugar	S 42 Edible Oil	S 43 Other	S 44 Other	S 45 Service
I20	Large Holdings	0.0423	0.0406	0.0402	0.0142	0.0346	0.0351	0.0367	0.0393	0.0165	0.0240	0.0324	0.0189	0.0400	0.0484	0.0031
I 21	Medium Holdings	0.0926	0.0777	0.0771	0.0275	0.0662	0.06671	0.0701	0.0732	0.0142	0.0207	0.0278	0.0163	0.0344	0.0416	0.0715
I 22	Small Holdings	0.3914	0.3280	0.3254	0.1158	0.2796	0.2834	0.2963	0.3176	0.0224	0.0327	0.0439	0.0257	0.0542	0.0656	0.1127
I 23	Landless	0.0080	0.0067	0.0067	0.0025	0.0057	0.0058	0.0062	0.0065	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
I 24	Non-farm	0.0572	0.0479	0.0474	0.0171	0.0409	0.0414	0.0432	0.0464	0.0025	0.0033	0.0045	0.0026	0.0055	0.0067	0.0114
I 25	Employer	0.0003	0.0002	0.0003	0.0000	0.0002	0.0002	0.0004	0.0002	0.0004	0.0006	0.0007	0.0004	0.0010	0.0012	0.0021
I 26	Professional	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0001	0.0017	0.0022	0.0030	0.0018	0.0038	0.0045	0.0260
I 27	Non-manual	0.0002	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0001	0.0030	0.0066	0.0089	0.0052	0.0110	0.0133	0.0692
I 28	Manual	0.0078	0.0065	0.0064	0.0025	0.0056	0.0051	0.0058	0.0064	(0.0178	0.0236	0.0318	0.0186	0.0393	0.0475	0.414
I 29	Self-employed	0.0334	0.0200	0.0276	0.0100	0.0239	0.0242	0.0254	0.0271	0.0203	0.0269	0.0363	0.0213	0.0448	0.0542	0.1453
I 30	Firms	0.0331	0.0277	0.0274	0.0100	0.0238	0.0239	0.0247	0.0258	0.0157	0.0142	0.190	0.0111	0.0235	0.0284	0.0441
	Total	0.6725	0.3615	0.5585	0.1996	0.4807	0.4869	0.5087	0.5458	0.1165	0.1548	0.2083	0.1220	0.2575	0.3114	0.6078

Table 8

Degree of Interdependence

Multipliers (Value)	M_a (Percent)	M_1 (Percent)
0–0.25	47	82
0.26–0.50	27	9
0.51–0.75	5	1
0.75–1.00	1	1
>1.00	20	7

Source: Tables 3 and 5.

5. CONCLUSIONS

In this paper a SAM for the agricultural sector of Pakistan for the year 1979-80 has been presented. The SAM multiplier analysis yielded an aggregate SAM multiplier matrix, which was decomposed into different matrices representing the transfer, closed-loop and open-loop effects.

The results showed that when there is an exogenous increase in demand the food production sectors cause a much greater impact on household consumption as compared to the non-food production sectors. Within the agricultural sector the wheat producing sector produces the largest linkages. The results show that an exogenous increase in demand in the agricultural sector would also generate progressive income redistributional effects in the rural areas. A comparison of the Leontief multipliers with the aggregate SAM multipliers shows that the latter have stronger sectoral interdependence and a more heterogenous production structure. This suggests that when simulating the effect of various policy measures the SAM-multiplier model yields better results as compared with the input-output model.

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Comments on "A Social Accounting Matrix for the Agricultural Sector of Pakistan"

One appreciates to see in this paper the application of one of the latest modelling techniques, namely, the Social Accounting Matrix (SAM) to the analysis of the agricultural sector in Pakistan. The authors have rightly claimed the superiority of this technique over the input-output model which helps in explaining the production account of the economy only. In the case of Pakistan, where not much is yet known about the macro relationships, treatment of agricultural production consumption, investment and income distribution within an overall economic setting provides a useful framework to understand the problems of this sector.

However, the following comments are offered to sharpen its analytical content.

First, a relatively minor point is that the authors in an attempt to be compact and precise in their writing have become somewhat abstract and unclear. I believe that while introducing a new technique such as SAM and new terminologies such as

M_1 = Transfer effect of X;
M_2 = 'Open-loop' effect;
M_3 = 'Closed-loop' effect of all endogenous account;

and 'Agricultural Satellite SAM', it would have helped the reader if those concepts were elaborated more clearly and systematically. At present the readers feel lost when the authors present something in Table 1, and even in Table 2, but with little explanation of the entries in those tables.

Second, the authors do not disclose the sources of the data used and the quality of those data. Obviously, no matter how sound a particular analytical technique is, the usefulness of empirical results depends on the accuracy of data used in its estimation. The authors do state that identifying data gaps is one of the objectives of their paper. But neither such gaps nor the problems of data actually used have been mentioned anywhere in the paper.

Third, one of the common problems which I have observed in the analytical part of the paper is that the interpretation of the results is very mechanical. The authors do not try to highlight the significance of the results which otherwise are quite interesting. For example, while elaborating the consumption effect of various

exogenous changes it is stated that the 'wheat sector' has a slightly higher effect than the rest of the agricultural sector. It is not clear why so? Similarly, it is not clear why there was a relatively more increase in consumption of pulses and livestock at the same time in response to exogenous changes. How comparable are their findings with consumption behaviour observed in other studies is an important question which has also not been dealt with in the paper.

Fourth, the most intriguing part of the results relates to the effect of growth on income distribution. The authors find this effect in agriculture to be positive, particularly for small farmers and landless labourers. This might be a valid finding but unless the authors explain how actually this happened one cannot accept it as there is a great deal of empirical evidence against it, for example, see K. Griffin, (1972); M. H. Khan (1979); and Faiz Mohammad (1986).

Moreover, it is not clear why the authors left out 'tenants' as one of the 'institutional groups' in the agricultural sector of Pakistan in their analysis.

Fifth, I feel that the authors need to qualify their statement about the intersectoral production relationships and their effect on income distribution. Strong forward or backward linkages of agricultural production with other sectors does not necessarily mean better income distribution in a sector. Expansion in agricultural production must be accompanied by increased demand for labour, better terms of trade, and improved ownership distribution to have a favourable effect on income distribution.

Finally, there was a need to point out somewhere in the paper the weakness of the SAM model as applied to the agricultural sector in Pakistan. Besides being static in nature, its omission of prices, agrarian structure, and particularly interfarm transfers of land and other assets does not allow an unquestioned use of this model. Similarly, from the point of a developing country where the behaviour of production, consumption and investment over time of a sector is of crucial importance, a static model has limited relevance. However, this problem is common to studies based on SAM and should not undermine the worth of the present paper.

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