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THE DISAGGREGATION OF GROSS OPERATING

SURPLUS FOR THE AGRICULTURAL SECTOR OF ORANI

by

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(a) Includes returns to unpaid family helpers and working partners.

TABLE A1 : ALLOCATION OF GROSS OPERATING SURPLUS IN AGRICULTURAL, FORESTRY AND FISHING INDUSTRIES IN ORANI 77 WITH THE 1977-78 DATA BASE

ORANI 77 Industry	Returns to Primary Factor Inputs (\$m in 1977-78 prices)				Total GOSA
	Owner - Operator's (a) Labour	Land	Fixed Capital	Working Capital	
1.01 Sheep	490.261	114.172	55.069	12.838	672.340
1.02 Cereal Grains	321.333	130.480	68.534	14.101	534.448
1.03 Meat Cattle	166.833	91.279	52.273	15.429	325.814
1.04 Milk Cattle and Pigs	193.704	110.500	37.560	7.588	349.352
1.05 Poultry	36.416	0	50.623	19.492	106.531
1.06 Other Farming	344.396	249.938	172.261	41.814	808.409
2.00 Services to Agriculture	58.181	0	48.821	10.644	117.646
3.00 Forestry and Logging	24.200	0	21.840	6.897	52.937
4.00 Fishing, Trapping, Hunting	38.557	0	45.542	3.114	87.213
All Agriculture	1673.88	696.369	552.523	131.917	3054.689

(a) Includes returns to unpaid family helpers and working partners.

THE DISAGGREGATION OF GROSS OPERATING SURPLUS FOR THE AGRICULTURAL SECTOR OF ORANI*

by
Philip Adams and Peter J. Higgs

1. INTRODUCTION

By the standards of currently operational computable general equilibrium models, ORANI 78 (Dixon, Parmenter, Sutton and Vincent (1982)) has a relatively sophisticated treatment of the agricultural sector (Dixon, Parmenter, Powell and Vincent (1983)). Of eight agricultural industries recognised in the model, four are geographically defined in a way which aggregates enterprises faced with similar climatic/technological conditions. Explicit allowance is made for price responsive variations in the product mix in the three largest industries (namely, the Wheat-Sheep Zone, the Pastoral Zone and the High Rainfall Zone). This represents a considerable advance over the standard use of input-output conventions for the treatment of the agricultural industries adopted in the first version of ORANI (ORANI 77 -- Dixon, Parmenter, Ryland and Sutton (1977)). Nevertheless, for problems in which agricultural detail is unimportant, the earlier version of ORANI is still sometimes used (e.g., Warr (1983)).

* The authors are indebted to Tony Lawson and Alan Powell for their assistance with the preparation of this paper.

Until very recently, the data bases supporting these two versions of the ORANI model were limited to 1968-69 and 1974-75, for both of which official input-output accounts are available (Australian Bureau of Statistics (hereafter ABS) (1977) and (1981)). The Industries Assistance Commission (hereafter IAC) has now released an agricultural data base for ORANI based on the 1977-78 input-output accounts (ABS, 1983). Thus at the present time there are available six separate model entities which can be used for simulation: two versions (ORANI 77 and ORANI 78) times three choices of data base (1968-69, 1974-75, and 1977-78).

The behaviour of ORANI in short-run (say, 2 year) simulations is dependent on cost shares in the different agricultural industries. One exceptionally important component of the cost structure is the share of costs which are represented by factors (such as land) whose aggregate usage does not respond, in the short run, to a policy or other shock under analysis. If this share is high relative to the share of variable costs, an industry will respond with less flexibility than it otherwise would. Since in neo-classical closures of ORANI the only potentially fixed inputs are certain primary factors, the split of gross operating surplus (hereafter GOS) between land, fixed capital, owner-operator's labour, and working capital, is an important issue. In particular, the allocation of GOS over these primary factors could be critical for the performance of the model in closures in which one or more of them is treated as variable, and the others as fixed. For example, in some simulations of longer run issues, owner-operator's labour and capital might be treated as variable (i.e., endogenous), but the usage of agricultural land as fixed (i.e., exogenous).

APPENDIX : PRELIMINARY IAC ESTIMATES OF GOSA SPLITS FOR
ORANI 77 AND ORANI 78 WITH THE 1977-78 DATA BASE

This appendix consists of two tables. The first table contains data on GOS splits for the agricultural industries identified in ORANI 77 with the preliminary 1977-78 data base. The second tabulates identical information, but for the agricultural industries identified in ORANI 78. Researchers at the IAC and the IMPACT Project would welcome any comments on these new estimates.

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This paper has limited objectives. It is written to strengthen the documentation of the ORANI data base, specifically in respect to the issues raised above. In it we outline the various methods used by researchers associated with the IMPACT Project and/or the IAC to allocate the GOSA of each agricultural industry (hereafter, GOSA) into returns to the following four factors:

- (i) land;
- (ii) fixed capital;
- (iii) working capital; and
- (iv) owner-operator's labour.

Our aim in this paper is to consolidate disparate (and in some cases relatively inaccessible) material from several sources. We claim no originality. Nor do we offer a critical assessment of the procedures followed in relation to possible alternatives. We do hope, however, that our paper will provide a convenient document to which readers needing information about the GOSA splits in ORANI 77 and ORANI 78 with the 1968-69 and 1974-75 data bases can turn.

The rest of the paper is organised as follows. In sections 2 and 3 respectively we define GOSA and describe its original split by Vincent (1977) for ORANI 77 with the 1968-69 data base. The conversion to ORANI 78 by Vincent and Parmenter (1978) is discussed in section 4. A description of the new GOSA splits for ORANI 77 with the 1974-75 data base by Stevenson (1981) is given in section 5. The GOSA splits by Bright (1982a) for ORANI 78 with the 1974-75 data base are discussed in section 6. The new IAC GOSA splits based on the 1977-78 preliminary input-output

accounts are published in the Appendix. The methods used to derive these splits in broad terms follow those documented in sections 5 and 6 of this paper. Before issuing final documentation on the 1977-78 data base, the IAC and the IMPACT Project would welcome comments on (a) the accuracy of the splits for 1977-78 and (b) the suitability of 1977-78 as a base year for projections.

2. A DEFINITION OF THE GROSS OPERATING SURPLUS OF AGRICULTURAL INDUSTRIES IN ORANI

GOSA is a measure of the returns to owner-operator's labour, fixed capital and agricultural land plus the cost of working capital. It is estimated by the ABS (1981, p. 20) as a "residual, after subtracting from the value of output all intermediate inputs, indirect taxes and wages, salaries and supplements". This is close to our definition of GOSA; changes in inventories, however, are handled slightly differently in ORANI. In the non-agricultural part of the ORANI data base changes in inventories were excluded from the final demand categories (see Dixon, Parmenter, Sutton and Vincent (1982, p. 173)). In the agricultural sector, however, changes in inventories (e.g., livestock born during the base year but not sold) are treated as an intra-industry flow for the purpose of current production. Therefore our definition of GOSA is the sum of cash receipts from the sale of agricultural outputs plus the market value of changes in inventories less all cash production costs, where the last-mentioned includes wages paid to hired labour but not interest and rent payments.

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- Bureau of Agricultural Economics (1972) Apple and Pear Growing in Tasmania, Victoria and Western Australia: An Economic Survey 1965-66 to 1968-69, Australian Government Publishing Service, Canberra.
- Bureau of Agricultural Economics (1973) The Australian Dairyfarming Industry: Report of an Economic Survey, Australian Government Publishing Service, Canberra.
- Bureau of Agricultural Economics (1974a) The Northern Territory and Kimberley Region Beef Cattle Industry: A Summary of BAE Survey Results 1968-69 to 1970-71, Beef Research Report No. 13, Australian Government Publishing Service, Canberra.

(1) Inventories are not treated in ORANI. In the case of agricultural industries, inventories include livestock, a crucial input into production. In the allocations of gross operating surplus discussed in this paper, the existence of livestock has simply been ignored. Ideally it would have been treated as a specific type of fixed capital. The existing treatment implicitly apportions the return to livestock (considered as an asset -- not livestock sold) over the primary factors which are distinguished; namely, fixed capital, land, working capital and owner-operator's labour.

(2) The present document makes it easier for ORANI users to ascertain how the shares of different primary factors in gross operating surplus (and in value added) in each agricultural industry were derived for the 1968-69 and 1974-75 data bases, and publishes preliminary estimates (by the IAC) of these shares based on 1977-78 data. This increased ease of access would be counterproductive if it discouraged ORANI users and researchers from attempting to strengthen the data base in this area. The temptation to accept existing estimates, just because they have been documented should be resisted. In particular, new primary sources of data are required which would sharpen the precision with which the total returns to primary factors can be allocated. Such endeavours may lead, for instance, to the solution of the problem in (1) above.

3. GOSA SPLITS FOR ORANI 77 WITH THE 1968-69 DATA BASE

Vincent (1977) used the following method to split GOSA for ORANI 77 with the 1968-69 input-output data (for which see ABS (1977)). He first imputed returns to owner-operators and unpaid helpers by multiplying their number (with female operators weighted as 0.75 of an adult male equivalent and unpaid helpers as 0.65 of an adult male equivalent) by the average earnings of adult male employees in agriculture in New South Wales (as calculated by Powell (1974)). This estimate was then allocated among the six ORANI 77 agricultural industries according to their average share in total gross value of agricultural production (over the ten year period 1960-61 to 1969-70). The return to owner-operators (ow/op)_j was then subtracted from GOSA_j for each agricultural industry j, leaving (GOSA - ow/op)_j.

The return to agricultural land was calculated as a two step procedure. First the share in the value of the stock of fixed capital, land and working capital of land (including estimates by qualified valuers of first-stage improvements, such as clearing, pasture development and soil conservation) was computed. This was done using data from Powell (1974) and averaged over all agriculture for the 10 year period from 1960-61 to 1969-70. The average share calculated was 0.537. The second step was to compute the return to agricultural land for each agricultural industry j as 0.537 (GOSA - ow/op)_j.

The return to working capital was also calculated as a two step procedure. First the share of working capital in land plus working and

fixed capital, W_j , was computed for each industry j . A definition used by the Bureau of Agricultural Economics (hereafter BAE) (1964, p. 4) for working capital (i.e., half the annual cash costs for paid labour, contracts, materials and services employed in operating the business) was adopted. All data used in the calculation of the W_j were taken from BAE documents (see Vincent (1977, pp. 5 and 6)). The second step was to compute the return to working capital for each agricultural industry j as W_j (GOSA - ow/op) $_j$.

The return to fixed capital for each agricultural industry j was simply the residual, i.e., $(1 - 0.537 - w_j)$ (GOSA - ow/op) $_j$. The GOSA splits made by Vincent (1977) for ORANI 77 with the 1968-69 data base are given in Table 3.1.

4. GOSA SPLITS FOR ORANI 78 WITH THE 1968-69 DATA BASE

Vincent and Parmenter (1978) used the following method to split GOSA for ORANI 78 with the 1968-69 data base. They first imputed the return to owner-operators as follows. In the Pastoral, Wheat-Sheep, and High Rainfall Zones, this was computed by multiplying the number of owner-operators obtained from BAE (1976a) in each zone by the Federal Pastoral Award for Station Hands. For the Northern Beef industry the number of owner-operators was taken from BAE (1974a and b). In the Milk Cattle and Pigs industry, the number of owner-operators from BAE (1973) was multiplied by the award wage for the Dairy industry. In the Poultry industry, returns to owner-operators were estimated by multiplying GOSA for Poultry by the share of imputed returns to owner-operators in the GOSA of an 'average' egg

TABLE 6.7 : ALLOCATION OF GROSS OPERATING SURPLUS IN AGRICULTURAL INDUSTRIES IN ORANI 78 WITH THE 1974-75 DATA BASE

Industry	Returns to Primary Factor Inputs (\$m in 1974-75 prices)			
	Owner-Operator's Labour	Land	Fixed Capital	Working Capital
1. Pastoral Zone	102.452	37.098	29.311	2.568
2. Wheat-Sheep Zone	518.417	374.860	249.036	25.982
3. High Rainfall Zone	185.557	44.943	40.007	3.941
4. Northern Beef	30.165	9.626	11.631	0.525
5. Milk Cattle and Pigs	206.146	59.573	31.967	3.037
6. Other Farming (Export)	167.726	96.100	63.882	17.976
7. Other Farming (Import Competing)	160.769	92.11	61.233	17.230
8. Poultry	20.030	0	33.330	12.840
All Agriculture	1391.262	713.314	520.397	84.099
				2709.072

Source: Bright (1982b, Table 5).

TABLE 6.6 : STEVENSON'S (1981) RETURNS TO PRIMARY FACTORS *
AFTER BEING PROCESSED BY BRIGHT'S (1982a) 'COLUMN MANIPULATOR'

ORANI 78 Industry	Returns to Primary Factor Inputs (\$m in 1974-75 Prices)				G.O.S.A.
	Owner- Operator's Labour	Land	Fixed Capital	Working Capital	
1. Pastoral Zone	102.45	37.00	29.30	2.67	171.42
2. Wheat-Sheep Zone	518.41	374.68	249.00	26.20	1168.29
3. High Rainfall Zone	185.54	44.72	39.99	4.16	274.41
4. Northern Beef	30.16	9.36	11.63	0.78	51.93
5. Milk Cattle and Pigs	206.16	59.56	31.96	3.02	300.70
6. Other Farming (Export)	167.72	96.09	63.89	17.97	345.67
7. Other Farming (Import Competing)	160.76	92.11	61.24	17.23	331.34
8. Poultry	20.03	0	33.33	12.84	66.20
All Agriculture	1391.23	713.52	520.34	84.87	2709.96

* Derived by multiplying Bright's column manipulator (a 7x5 matrix, see Table 6.5) by Stevenson's return to primary factors (a 5x4 matrix, see Table 5.6). Note that the Poultry entries are simply transcribed from Table 5.6 as the Poultry industry is the same in ORANI 78 format as it is in ORANI 77 format.

TABLE 3.1 : ALLOCATION OF GROSS OPERATING SURPLUS IN AGRICULTURAL INDUSTRIES
IN ORANI 77 WITH THE 1968-69 DATA BASE

Primary Factor Input	1.01 Sheep \$m	1.02 Cereal Grains \$m	1.03 Meat Cattle \$m	1.04 Milk Cattle Plus Pigs \$m	1.05 Poultry \$m	1.06 Other Crops \$m
Owner-Operator and Unpaid Helper Labour	186.9 (38.81)	120.6 (27.60)	88.6 (44.10)	85.6 (25.99)	30.1 (84.31)	91.0 (28.96)
Land	158.3 (32.87)	169.9 (38.88)	60.3 (30.01)	130.9 (39.74)	0.0 (0.00)	119.9 (38.16)
Fixed Capital	122.3 (25.39)	135.7 (31.05)	48.4 (24.09)	98.5 (29.90)	4.0 (11.20)	72.0 (22.92)
Working Capital	14.1 (2.93)	10.8 (2.47)	3.6 (1.79)	14.4 (4.37)	1.6 (4.48)	31.3 (9.96)
Gross Operating Surplus	481.6 (100.00)	437.0 (100.00)	200.9 (100.00)	329.4 (100.00)	35.7 (100.00)	314.2 (100.00)

Source: Vincent (1977, p.7)

(a) Numbers in parentheses refer to the percentage contribution of returns to each primary factor in GOSA_j.

producing firm. Given the unavailability of other suitable information, this share was based on the BAE (1974c) survey which covered only egg producers and excluded poultry meat producers (which, however, are included in ORANI). In the Other Farming (Export) industry, returns to owner-operators were calculated by multiplying the industry's GOSA by the share of imputed returns to owner-operators in the GOSA of an 'average' fruit farm as defined in two BAE surveys (BAE (1971) and (1972)). In the Other Farming (Import competing) industry returns to owner-operators were calculated by multiplying its GOSA by the share of imputed returns to owner-operators in the GOSA of an 'average' tobacco farm according to BAE (1976b).

The imputed return to owner-operators (ow/op_j) was then subtracted from $GOSA_j$ for each agricultural industry j , leaving $(GOSA - ow/op)_j$. The returns to agricultural land, working capital and fixed capital were then obtained by splitting the $(GOSA - ow/op)_j$ using shares of each of these inputs in the value of the total stock of these primary factors for each industry j . The input of land was calculated as the market value of land including 'first stage improvements' (as defined in section 3). Fixed capital was calculated as the replacement costs of buildings, machinery, fences, dams and other farm structures (see, e.g., BAE (1976a, p. 16)). Working capital was calculated using the BAE definition explained above in section 3. The GOSA splits made by Vincent and Parmenter (1978) for ORANI 78 with the 1968-69 data base are given in Table 4.1.

TABLE 6.5 : CONCORDANCE BETWEEN ORANI 77 AND ORANI 78 AGRICULTURAL INDUSTRIES, 1974-75

ORANI 78		ORANI 77				
ORANI 78 Domestic Production	Other Farming	Milk Cattle and Pigs	Meat Cattle	Cereal Grains	Sheep	Other Farming (Import Competing)
349,235	3,056 (.0022)	.274 (.0004)	48,299 (.1303)	105,725 (.0703)	191,881 (.1897)	191,881 (.1897)
2014,841	62,705 (.0452)	56,504 (.0766)	96,861 (.2614)	1339,642 (.8907)	459,129 (.4539)	459,129 (.4539)
605,256	50,880 (.0366)	32,484 (.0440)	102,618 (.2769)	58,749 (.0391)	360,525 (.3564)	360,525 (.3564)
122,822		648,632 (.8790)	122,822 (.3314)			122,822 (.3314)
648,632						648,632 (.8790)
649,633	649,633 (.4677)					649,633 (.4677)
622,689	622,689 (.4483)					622,689 (.4483)
5013,108	1388,963 (1.0000)	737,894 (1.0000)	370,600 (1.0000)	1504,116 (1.0000)	1011,535 (1.0000)	1504,116 (1.0000)

Source : Bright (1982a, Table 6). Numbers in parentheses are proportions.

5, column 3 of Table 6.4) was added to the existing \$595.634m (see row 5, column 4 of Table 6.4) of the ORANI 77 Milk Cattle and Pigs commodity produced by the ORANI 78 Milk Cattle and Pigs industry (see row 5, column 4 of Table 6.5). Finally, the remaining \$33.902m of secondary production of meat cattle was reallocated from two ORANI 78 industries which were assumed to be responsible, namely, the Wheat-Sheep and the High Rainfall Zones.

This was done by taking \$33.902m of the ORANI 77 commodity Meat Cattle from the Wheat-Sheep and High Rainfall Zones in proportion to their production of the ORANI 77 commodity Meat Cattle (see rows 2 and 3 of column 3 of Table 6.4) and adding it to their outputs of the ORANI 77 commodity Milk Cattle and Pigs. The effects of the reallocation can be observed by comparing columns 3 and 4 of Tables 6.4 and 6.5. The resulting matrix produced by these reallocations is Brightt's column manipulator' (see Table 6.5) showing the production mapping between the ORANI 78 and ORANI 77 industries.

The GOSA splits for ORANI 78 with the 1974-75 data base shown in Table 6.6 was derived by multiplying Brightt's 'column manipulator' (a 7 x 5 matrix) by Stevenson's returns to primary factors matrix (a 5 x 4 matrix, see Table 5.6). The actual GOSA splits implemented in ORANI 78 using the 1974-75 data base are given in Table 6.7, which agrees with Table 6.6 apart from some minor differences after the decimal point.

7. CONCLUDING REMARKS

We offer two concluding remarks. Whilst the first is of a technical nature, it is related to the second because both involve the state of the data base. These remarks are:

TABLE 4.1 : ALLOCATION OF GROSS OPERATING SURPLUS IN AGRICULTURAL INDUSTRIES IN ORANI 78 WITH THE 1968-69 DATA BASE

Primary Factor Input	Pastoral Zone	Wheat-Sheep Zone	High Rainfall Zone	Northem Beef	Milk Cattle + Pigs	OFF	OFM	Poult.
Owner-operator	0.107	0.167	0.276	0.136	0.241	0.310	0.193	0.362
Land	0.449	0.517	0.521	0.304	0.511	0.445	0.405	
Fixed capital	0.384	0.276	0.169	0.548	0.218	0.177	0.342	0.439
Working capital	0.060	0.030	0.032	0.012	0.030	0.068	0.060	0.179
Gross Operating Surplus	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Vincent and Parmenter (1978, p. 26).

5. GOSA SPLITS FOR ORANI 77 WITH THE 1974-75 DATA BASE

Stevenson (1981) used the following method to split GOSA for ORANI 77 with the 1974-75 input-output data (see ABS (1981)). He first imputed returns to owner-operators. This involved a three step procedure.

In the first step, an estimate was obtained from the 1976 Population Census (ABS (1976)) of the number of employees and owner-operators in each agricultural industry (see Table 5.1). This estimate did not include data from industries classified as 0000, 0100 and 0110 in the 1974-75 ASIC code (see ABS (1979)). These industry classifications are not included in the 1968-69 ASIC code (see ABS (1969)) and to maintain consistency with the 1968-69 ASIC code, Stevenson pro-rated the employment in industries 0000, 0100 and 0110 over the agricultural sector (see Table 5.2). He used the pro-rated data to calculate the proportion of hired labour to owner-operators, self-employed and unpaid helpers, by sex, in each of the agricultural industries (see the percentages in parentheses in Table 5.2). Next, data were obtained on employment levels by sex of all workers over 15 years of age in each of the agricultural industries for 1974-75. These were taken from Tulpulé, Mammion and Strzelecki (1981, Table B.8). Female employment levels were then given a weight of 0.75 to convert them to male equivalents (see Table 5.3). The proportions (by sex) of hired workers to the sum of owner-operators, self-employed and unpaid helpers in Table 5.2 were used to split the male and female equivalent employment levels in Table 5.3. The resulting levels of owner-operators and of self-employed plus unpaid helpers are shown separately for males and females in Table 5.4. The hired labour components were then added to give the total number of male equivalent hired labourers in 1974-75.

TABLE 6.4 : PRODUCTION OF ORANI 77 COMMODITIES BY ORANI 78 INDUSTRIES (\$m in 1974-75 prices)

ORANI 78 Industry		ORANI 77 Commodity				
ORANI 78	Output of ORANI 78 Industries	Sheep	Cereals	Meat Cattle	Milk Cattle and Pigs	Other Farming
1	Pastoral Zone	191.681 (a)	105.725 (.0703)	48.299 (.1056)	.265 (.0004)	3.056 (.0022)
2	Wheat-Sheep Zone	459.129 (.4539)	1339.642 (.8907)	113.338 (.2477)	40.027 (.0615)	62.705 (.0452)
3	High Rainfall Zone	360.525 (.3564)	58.749 (.0391)	120.074 (.2624)	15.028 (.0231)	50.880 (.0366)
4	Northern Beef			122.822 (.2684)		122.822
5	Milk Cattle and Pigs			52.998 (.1158)	595.634 (.9150)	648.632
6	Other Farming (Export)					649.633
7	Other Farming (Import Competing)					622.689
	Total	1011.535 (1.0000)	1504.116 (1.0000)	457.531 (1.0000)	650.954 (1.0000)	1388.963 (1.0000)
	Output of ORANI 77 Commodities					5013.108

(a) Numbers in parentheses are proportions.

TABLE 6.3: JOINT PRODUCTION MATRIX AT INPUT-OUTPUT VALUES

ORANI 78 Commodity	ORANI 78 Industries							
	1 Pastoral Zone	2 Wheat Sheep Zone	3 High Rainfall Zone	4 Northern Beef	5 Milk Cattle and Pigs	6 Other Farming (Export)	7 Other Farming (Import Competing)	8 Domestic Production
1 Wool	164.546	357.589	280.429					802.564
2 Sheep	27.335	101.540	80.096					208.971
3 Wheat	92.264	1009.278	12.752					1114.294
4 Barley	4.533	210.290	16.267					231.090
5 Other Grains	8.928	120.074	29.730					158.732
6 Meat Cattle	48.299	113.338	120.074	122.822	52.998			457.531
7 Milk Cattle and Pigs	.265	40.027	15.028		595.634			650.954
8 Other Farming (Export)	2.782	25.227	4.249			649.633		681.891
9 Other Farming (Import Competing)	.274	37.479	46.631				622.689	707.073
Total	349.226	2014.842	605.256	122.822	648.632	649.633	622.689	5013.100

Source : Bright (1982a, Table 5).

TABLE 5.1 : AGRICULTURAL SECTOR EMPLOYMENT BY OCCUPATIONAL STATUS BY SEX BY INPUT-OUTPUT INDUSTRY, 1976 (EXCLUDING "UNDEFINED" INDUSTRY EMPLOYMENT)

Industry Code	Name	Males			Females		
		W & SE ^(a)	E, SE, UH ^(a)	Total	W & SE ^(a)	E, SE, UH ^(a)	Total
1.01	Sheep	13 480	32 597	46 077	2 342	20 316	22 658
1.02	Cereal Grains	9 489	31 249	40 738	1 404	19 569	20 973
1.03	Meat Cattle	14 644	27 922	42 566	3 064	17 342	20 406
1.04	Milk Cattle and Pigs	7 988	30 288	38 276	2 314	21 114	23 428
1.05	Poultry	2 302	2 089	4 391	2 073	1 642	3 715
1.06	Other Farming	16 510	32 723	49 233	5 196	19 101	24 297
2.00	Services to Agriculture	6 058	2 103	8 161	494	624	1 118
3.00	Forest, Logging	8 108	1 594	9 702	533	207	740
4.00	Fishing, Hunting	2 834	4 615	7 449	356	741	1 097
Total	^(b)	81 413	165 180	246 593	17 776	100 656	118 432

Source : Stevenson (1981, p. 3).

(a) Note that hired labour is represented by W&SE, and employers, self employed and unpaid helpers are represented by E, SE, UH.

(b) These totals exclude the employment figures for industries 0000,0100 and 0110 - the "Undefined" primary industries.

TABLE 5.2 : AGRICULTURAL SECTOR EMPLOYMENT BY OCCUPATIONAL STATUS BY SEX BY INPUT-OUTPUT INDUSTRY, 1976 (INCLUDING "UNDEFINED" INDUSTRY EMPLOYMENT)

Industry Code	Name	Males		Females	
		E, SE, UH (a)	Total	E, SE, UH (a)	Total
01.01	Sheep	36 019	51 323	22 287	24 854
01.02	Cereal grains	34 603	45 376	1 539	23 006
01.03	Meat cattle	30 787	47 413	3 358	22 384
01.04	Milk cattle and pigs	33 565	42 634	2 536	25 693
01.05	Poultry	2 277	4 891	2 272	4 075
01.06	Other Farming	36 095	54 839	5 695	26 652
02.00	Services to Agriculture	2 212	9 090	541	1 226
03.00	Forestry and Logging	1 602	10 807	584	812
04.00	Fishing, Hunting, Trapping	5 079	8 297	390	1 203
Total		182 239	274 670	19 483	129 905
		(66.3%)	(100%)	(15%)	(100%)

Source: Stevenson (1981, p.6). Numbers in parentheses are percentages of male and of female work forces in each industry represented by the categories explained in footnote (a).
 (a) Note that hired labour is represented by W&SE and employers, self employed and unpaid helpers by E, SE, UH.

TABLE 6.2 : MAPPING BETWEEN ORANI 77 AND ORANI 78 AGRICULTURAL COMMODITIES

I-0 code	ORANI 77 Commodity	ASIC Commodity Code	ORANI 78 Commodity
01.01	Sheep	01.01.001	Sheep and lambs for slaughter
01.02	Cereal grains	01.02.001	Wheat
		01.02.002	Barley
		01.02.003-.007	Other Grains
01.03	Meat cattle	01.03	Meat Cattle
01.04	Milk cattle and pigs	01.04	Milk Cattle and Pigs
01.06	Other farming	01.06.001-.011	Other Farming Import
		01.06.001-.011	Other Farming Export
01.05	Poultry	01.05	Poultry

Source, Bright (1982a, Table 1).

In the second step, the commodity output levels in Table 6.1 were aggregated into ORANI 77 commodities using the mapping depicted in Table 6.2. These aggregates, based on BAE data, were then compared with the commodity output levels in the ABS 1974-75 input-output tables. To maintain consistency, the entries in Table 6.1 were re-scaled such that when aggregated into ORANI 77 commodities they agreed with the input-output tables (see Table 6.3).

The final step involved taking this matrix (Table 6.3) which shows the production of ORANI 77 commodities by ORANI 78 industries and converting it into a matrix which maps production by the ORANI 78 industries into production by the ORANI 77 industries; i.e., the column manipulator. Table 6.4 depicts the production of ORANI 77 commodities by ORANI 78 industries. The production of ORANI 77 commodities by ORANI 77 industries is not a simple one-to-one relationship due to the secondary production of meat cattle by the Milk Cattle and Pigs industry. In the ORANI 77 conventions, meat cattle produced by the Milk Cattle and Pigs industry is treated as a component of the commodity labelled Milk Cattle and Pigs, whereas in ORANI 78 meat cattle produced in this industry is assigned to the commodity labelled Meat Cattle. In the 1974-75 input-output tables the Meat Cattle industry produces \$370.6m of Meat Cattle and the Milk Cattle and Pigs industry produces \$86.9m of Meat Cattle and \$651.0m of Milk Cattle and Pigs (see ABS (1981, p.29)). This \$86.9m of secondary meat cattle production by the ORANI 78 Milk Cattle and Pigs industry was reallocated such that the output of the ORANI 77 industry Milk Cattle and Pigs increased by \$86.9m. To do this the \$52.998m of the ORANI 77 commodity Meat Cattle produced by the ORANI 78 industry Milk Cattle and Pigs (see row

TABLE 5.3 : TOTAL EMPLOYMENT BY SEX BY INPUT-OUTPUT INDUSTRY, FOR AGRICULTURE, FORESTRY, FISHING AND HUNTING, 1974-75

Industry Code	Name	Males	Females		Total Male Equivalent
			No.	Male Equivalent	
1.01	Sheep	62 250	14 160	10 620	72 870
1.02	Cereal Grains	53 780	12 910	9 680	63 460
1.03	Meat Cattle	57 010	12 960	9 720	66 730
1.04	Milk Cattle and Pigs	51 250	14 920	11 190	62 440
1.05	Poultry	5 880	2 370	1 780	7 660
1.06	Other Farming	66 960	15 680	11 760	78 720
2.00	Services to Agriculture	10 900	710	530	11 430
3.00	Forestry and Logging	10 700	260	200	10 900
4.00	Fishing, Trapping, Hunting	8 200	390	290	8 490
Total		326 930	74 360	55 770	382 700

Source: Stevenson (1981, p.7).

TABLE 5.4 : EMPLOYMENT IN AGRICULTURE, FORESTRY, FISHING AND HUNTING BY SEX AND OCCUPATIONAL STATUS, 1974-75

Industry Code	Male		Females (Male Equivalents)		Total W & SE (b)
	W & SE (a) E,SE,UH (a)	Total	W & SE (a) E,SE,UH (a)	Total	
1.01 Sheep	18 551	43 699	1 094	9 526	19 645
1.02 Cereals Grains	12 746	41 034	646	9 034	13 392
1.03 Meat Cattle	19 954	37 056	1 458	8 262	21 412
1.04 MILK Cattle and Pigs	10 916	40 334	1 119	10 071	12 035
1.05 Poultry	3 140	2 740	994	786	4 134
1.06 Other Farming	22 900	44 060	2 517	9 243	25 417
2.00 Services to Agriculture	8 251	2 649	383	147	8 634
3.00 Forestry and Logging	9 116	1 584	63	137	9 179
4.00 Fishing, Hunting, Trapping	3 182	5 018	95	195	3 277
Total	108 756	218 174	8 369	47 401	117 125

Source: Stevenson (1981, p. 8).

(a) Note that hired labour is represented by W & SE and employers, self-employed and unpaid helpers by E, SE, UH.

(b) Total W & SE = Male W & SE + Male equivalent W & SE.

TABLE 6.1: AVERAGE AGRICULTURAL COMMODITY OUTPUTS BY INDUSTRIES, 1973-74 TO 1975-76

Industry	Commodity							INDUSTRY TOTAL Value (Proportion)
	1	2	3	4	5	6	7	
1	Wool Value (Proportion)	184,677 (.2050)	401,338 (.4456)	314,737 (.3494)	900,752 (1.0000)			345,551 (.0743)
2	Sheep Value (Proportion)	45,095 (.1308)	167,509 (.4859)	132,134 (.3833)	344,738 (1.0000)			1576,593 (.3391)
3	Wheat Value (Proportion)	56,610 (.0828)	619,261 (.9058)	7,824 (.0114)	683,695 (1.0000)			665,481 (.1432)
4	Barley Value (Proportion)	2,647 (.0196)	122,800 (.9100)	9,499 (.0704)	134,946 (1.0000)			126,720 (.0273)
5	Other Grains Value (Proportion)	3,363 (.0562)	45,231 (.7565)	11,199 (.1873)	59,793 (1.0000)			662,016 (.1424)
6	Meat Cattle Value (Proportion)	49,832 (.1056)	116,935 (.2477)	123,885 (.2624)	472,052 (1.0000)			649,633 (.1398)
7	Milk Cattle and Pigs Value (Proportion)	.271 (.0004)	40,813 (.0615)	15,323 (.0231)	663,743 (1.0000)			622,689 (.1339)
8	Other Farming (Export) Value (Proportion)	2,782 (.0041)	25,227 (.0370)	4,249 (.0062)	681,891 (1.0000)			622,689 (.1339)
9	Other Farming (Import Competing) Value (Proportion)	.274 (.0003)	37,479 (.0530)	46,631 (.0659)	707,073 (1.0000)			4648,683 (1.0000)

Source: Bright (1982a, Table 4).

Industries

referred to as a column manipulator because it is used to derive the column of inputs for each ORANI 78 agricultural industry from the relevant ORANI 77 columns. He used the column manipulator to transform the ORANI 77 land, fixed capital, labour and 'other cost' tickets matrices as estimated by Stevenson (1981) into ORANI 78 format. (Note that 'other cost' tickets largely consist of returns to owners of working capital. Other components are: production taxes, costs of holding inventories, and other miscellaneous production costs. See Dixon, Parmenter, Sutton and Vincent (1982).) As the Poultry industry is the same in ORANI 78 format as in ORANI 77 format, Bright used the GOSA splits for Poultry as estimated in Table 5.6 by Stevenson (1981). The estimation of the column manipulator involved a three step procedure.

In the first step, a matrix showing the production of ORANI 78 commodities by ORANI 78 industries using BAE survey data was estimated. The averages of yearly production figures from 1973-74 to 1975-76 were used, although the relevant primary data sources are not clearly identified by Bright. It was assumed that (i) the Northern Beef industry only produced Meat Cattle; (ii) the Other Farming Export (OFE) industry produced only an aggregate OFE commodity; (iii) the Other Farming Import Competing (OFM) industry produced only an aggregate OFM commodity; and (iv) the Milk Cattle and Pigs industry produced both Milk Cattle and Pigs, and Meat Cattle. Adjustments were made to account for the secondary production of Meat Cattle by the Milk Cattle and Pigs industry (this is discussed further in the third step below). Some of the output of commodities OFE and OFM was attributed to the Pastoral, Wheat-Sheep and High Rainfall Zones, the residual being allocated to the OFE and OFM industries. The matrix estimated from BAE data in this first step is given in Table 6.1.

In the second step, an average wage for each agricultural industry was computed as follows. The total payment of wages, salaries and supplements in each industry is given in the 1974-75 input-output tables. The average wage for each industry was obtained by dividing this total wage bill by the number of hired workers (in male equivalents) from the last column of Table 5.4. The resultant average wage for each industry is given in Table 5.5.

In the final step, the imputed return to owner-operators for each industry was obtained by multiplying the number of male equivalent owner-operators, computed in Table 5.4, by the average wage from column 3 of Table 5.5.

The imputed return to owner-operators (ow/op)_j was subtracted from $GOSA_j$ for each agricultural industry j , leaving $(GOSA - ow/op)$ _j. The returns to agricultural land, working capital and fixed capital were then obtained by splitting $(GOSA - ow/op)$ _j using the shares of each of these factors in the total input of primary factors as estimated by Brooks (1980) who used the same method employed in Vincent (1977) (see Section 3). The results of Stevenson's GOSA splits are reported in Table 5.6, as are estimates for the 'Fishing, Hunting, Trapping' industry which were taken directly from Brooks (1980).

6. GOSA SPLITS FOR ORANI 78 WITH THE 1974-75 DATA BASE

Bright (1982a) explains the method to split GOSA for ORANI 78 with the 1974-75 data base as follows. A concordance was estimated between the ORANI 77 and ORANI 78 agricultural industry classifications; this is

TABLE 5.5: AVERAGE AND IMPUTED WAGES FOR THE AGRICULTURAL, FORESTRY AND FISHING INDUSTRIES, 1974-75

Name	Wages/salaries/ supplements 1974-75 (a)	No. of W & SE 1974-75 (b)	Average Wage per W & SE (c)	Total wages (d)	Imputed wages (e)
Sheep	128.0 (\$m)	19,645 (No.)	\$ 6 515.65 (\$)	474.80 (\$m)	346.80 (\$m)
Cereal Grains	91.0	13,392	\$ 6 795.10	431.22	340.22
Meat Cattle	43.0	21,412	\$ 2 008.22	134.01	91.01
Milk Cattle and Pigs	56.0	12,035	\$ 4 653.10	290.54	234.54
Poultry	23.5	4,134	\$ 5 684.57	43.53	20.03
Other Farm	171.0	25,417	\$ 6 727.78	529.61	358.61
Services to Agriculture	122.9	8,634	\$14 234.42	162.70	39.80
Forestry and Logging	104.8	9,179	\$11 417.37	124.45	19.65
Fishing, Trapping, Hunting	29.2	3,277	\$ 8 910.59	75.65	46.45
Total	769.4	117,125	6 569.05	2 266.51	1 497.11

Source: Stevenson (1981, p.11).

(a) Source: ABS (1981).
 (b) Transcribed from Table 5.4.
 (c) Wages/salaries/supplements ÷ no of employees.
 (d) Total wages = average wage x total no of male equivalent workers (from Table 5.3).
 (e) Imputed wages = total wages - wages/salaries/supplements.

TABLE 5.6: DISAGGREGATION OF GROSS OPERATING SURPLUS FOR AGRICULTURAL FORESTRY AND FISHING INDUSTRIES, 1974-75

Industry Code	Name	Returns (\$m) to							Ratios		
		Fixed Cap. (FC)	Working Cap. (WC)	Land (L)	Imputed Wages (IW)	GOS (a)	FC/GOS	WC/GOS	L/GOS	IW/GOS	
1.01	Sheep	40.26	2.71	32.42	346.80	422.20	.0954	.0064	.0768	.8214	
1.02	Cereal Grains	238.69	25.09	379.59	340.22	983.60	.2427	.0255	.3859	.3459	
1.03	Meat Cattle	35.08	2.36	28.25	91.01	156.70	.2239	.0151	.1803	.5807	
1.04	Milk Cattle and Pigs	36.36	3.44	67.76	234.54	342.10	.1063	.0101	.1981	.6855	
1.05	Poultry	33.33	12.84	20.03	66.20	5035	.1939	.2780	.4852	.3026	
1.06	Other Farming	136.60	38.43	205.46	358.61	739.10	.1848	.0520	.2780	.4852	
2.00	Services to Agriculture	47.68	10.42	39.80	97.90	4870	.4870	.1064	.4066	.4066	
3.00	Forestry and Logging	23.75	7.5	19.65	50.90	4666	.4666	.1473	.3861	.3861	
4.00	Fishing, Hunting, Trapping	22.1	1.5	18.70	42.30	5369	.5369	.0210	.4421	.4421	

Source: Stevenson (1981, p.14).

(a) Source: ABS (1981, Table 1).
 (b) This row is taken directly from Brooks (1980).