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A USER'S GUIDE FOR COMPUTING DETAILED SHORT-RUN AGRICULTURAL SECTOR RESULTS WITH THE MELBOURNE VERSION OF ORANI '78

by

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```
C
      INTEGER B
      WRITE(6,1) B,I,J
    1 FORMAT(//,1X,131(*=*),/1X,*ERROR HAS OCCURED IN SECTION(A=*,I4,
     *    * ). THE VALUE OF IDENTIFIER 1 WAS*,I4,* THE VALUE OF *,
     1    *IDENTIFIER 2 WAS *,I4,//,1X,131(*=*))
      RETURN
      END
*EOS
★EOP
```

```
      RT = R(NR,J)
C
C DETERMINE THE CORRECT VALUE FOR DELTA (1 OR 0). 1 IF BOTH NI AND NTO
C ARE CONTAINED IN THE SAME COMPOSITE COMMODITY PRODUCED BY INDUSTRY J
C 0 OTHERWISE.
C
      IF(NR. EQ. NQ)GO TO 455
      DELTA = 0.0
      GO TO 460
  455 DELTA = 1.0
C
C COMPUTE THE ELASTICITY OF SUPPLY FOR COMMODITY NI WITH RESPECT
C TO THE PRICE OF COMMODITY NTO WHICH RESULTS FROM THE TRANSFORMATION
C EFFECT ALONE
C
  460 TMPO(NI,NTO)=TMPO(NI,NTO)+S(NI,J)*OIJ*HTJ*(DELTA-RTS)
C
C COMPUTE THE SHARE OF COMMODITY NTO IN THE TOTAL VALUE OF
C INTERMEDOATE FLOWS TO INDUSTRY J (SINTER(NTO,J))
C
      SINTER(NTO,J) = (DOMFL(NTO,J) + IMPFL(NTO,J))/(TOTDOM(J)
     1   +TOTIMP(J))
C
C COMPUTE THE ELASTICITY OF SUPPLY FOR COMMODITY NI WITH RESPECT TO THE
C PRICE OF COMMODITY NTO,WHICH RESULTS FROM THE EXPANSION EFFECT
C ALONE
C
      TMPOEX(NI,NTO)=TMPOEX(NI,NTO)+S(NI,J)*0.5*(1-(SK(J)+SV(J)
     1  ))*(RT*HTJ/(SFI(J)*(SK(J)+SV(J))) - SINTER(NTO,J)
     2  *(1/SFI(J) - 1)/(SK(J)+SV(J)))
  480 CONTINUE
C
C COMPUTE THE TOTAL ELASTICITY OF SUPPLY, EQUAL TO THE EXPANSION COMPONENT
C PLUS THE TRANSFORMATION COMPONENT.
C
      TOT(NI,NTO) = TMPO(NI,NTO) + TMPOEX(NI,NTO)
  490 CONTINUE
C
C PRINT RESULTS
C
      WRITE(6,497)NI,(TMPO(NI,NTO),NTO=1,10)
      WRITE(6,498)(TMPOEX(NI,NTO),NTO=1,10)
      WRITE(6,499)(TOT(NI,NTO),NTO=1,10)
  497 FORMAT(/,1X,I2,1X,*TRANS*,5X,10(G11.4))
  498 FORMAT(4X,*EXPAN*,5X,10(G11.4))
  499 FORMAT(4X,*TOTAL*,5X,10(G11.4))
  500 CONTINUE
      WRITE(6,550)
  550 FORMAT(/,1X,131(*=*))
      STOP
      END
      SUBROUTINE EROR(I,J,B)
C
CC
C SUBROUTINE TO PRINT OR78AG SPECIFIC ERROR MESSAGES
CC
```

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1. Introduction

This User's Guide provides documentation for the ORANI 78 post-simulation program named OR78AG, a program written to implement procedures to compute detailed short-run results for the agricultural sector, as set out in Adams (1983). The manual is designed for those familiar with the structure of ORANI 78 (as detailed in Dixon, Parmenter, Sutton and Vincent 1982, hereafter DPSV), and who are sufficiently familiar with the Melbourne version of ORANI computing procedures (as detailed in Higgs and Parmenter 1982a, hereafter HP) to be able to compute a model solution.

OR78AG is structured in two sections. The first contains procedures that append responses of agricultural industries to the basic and back solutions of an ORANI 78 short-run simulation. These are the short-run responses of commodity outputs, commodity prices, and the aggregate real returns accruing to primary factors. The second section computes both the transformation and expansion components of aggregate short-run own and cross price elasticities of agricultural commodity supply as implied by the data base used in computing the model solution. (Note: in ORANI, 'short-run' is defined as being only long enough for domestic suppliers of commodities to hire labour and to expand output with their existing plant and agricultural land (see DPSV, p.68.).) The program is written in FORTRAN and uses basic and back ORANI 78 solution variables as input, together with 'external' share and parameter data.

The author wishes to thank Peter Higgs and Alan Powell for numerous suggestions and comments all of which improved the quality of this document.

The rest of this document is organised as follows. Section 2 contains an illustrative example in which OR78AG is applied to the solution of an ORANI 78 short-run simulation of a 25 per cent across-the-board tariff cut. In section 3 we proceed, line by line, through the construction of the OR78AG deck required for computing results from our illustrative ORANI experiment. The form of the output is explained in section 4 and brief concluding remarks are offered in section 5. An appendix contains a listing of the FORTRAN code for the OR78AG program.

2. Details of an Illustrative Simulation

To illustrate the use and output of OR78AG we have applied it to a solution of a tariff change simulation similar to that described in chapter 7 of DPSV. The only difference between the two experiments is the sign of the across-the-board tariff change, DPSV's being a 25 per cent increase and ours a 25 per cent decrease. In Tables 2.1 and 2.2 details of the ORANI experiment are set out. Table 2.1 contains mnemonics and values of the selected exogenous variables; values for user specified parameters; a listing of commodities and industries, respectively, denoted export and having exogenous investment; and a listing of variables for which projections are to be printed. Table 2.2 presents ad valorem tariff rates for each of the 114 commodities in ORANI based on 1980-81 data presented in Higgs, Parmenter and Powell (1984).

In order to execute OR78AG we require values for the basic and back solution variables, listed in Table 2.3, to be computed and stored on what is called TAPE30. To illustrate how these results are stored on TAPE30 we have reproduced the printout steering line (card 54 of HP), for our illustrative ORANI simulation (note, the symbol '∧' denotes a blank space, and to overcome confusion, we have written zero as 'ϕ' and the alphabetic o as 'o').

```
                                                    Col 72
LINE 54: 114∧∧999∧∧∧999999999999∧∧∧∧∧∧999999999∧∧∧999∧∧∧....    1∧1∧1 ∧∧ 3ϕ
```

In column 72 a '1' has been typed. This means only the row-totals of the solution matrix will be stored on TAPE30. If we wish OR78AG to operate on separate columns of the solution matrix 'ϕ' must be typed in column 72.


```
     2      10(I11),//,1X,131(*=*))
C
C SET NI AND NTO RESPECTIVELY AS COUNTERS FOR COMMODITIES I AND T
C
      DO 500 NI=1,10
C
C COMPUTE THE SHARE OF TOTAL OUTPUT OF COMMODITY NI PRODUCED BY ZONAL
C INDUSTRY J (S(NI,J))
C
      SUM(NI) =0.0
      DO 350 J=1,8
  350 SUM(NI) = SUM(NI) + JOINT(NI,J)
      DO 355 J=1,8
  355 S(NI,J) = JOINT(NI,J)/SUM(NI)
C
C INITIALISE TMPO(NI,NTO) AND TMPOEX(NI,NTO) TO ZERO. TMPO AND
C TMPOEX RESPECTIVELY WILL HOLD VALUES FOR TRANSFORMATION AND EXPANSION
C COMPONENTS OF THE ELASTICITY OF COMMODITY NI WITH RESPECT TO THE
C PRICE OF COMMODITY NTO.
C
      DO 490 NTO=1,10
      TMPO(NI,NTO) = 0.0
      TMPOEX(NI,NTO) = 0.0
C
C BEGIN COMPUTATION OF TMPO BY DETERMINING THE RELEVANT VALUE FOR
C PHI I.E. WHERE NI IS IN THE COMPOSITE NQ PRODUCED BY INDUSTRY J
C
      DO 480 J=1,8
      NCJ = NCOMP(J)
      DO 370 NQ=1,NCJ
      NTM = LCOM(NQ,J)
      DO 360 NT=1,NTM
      IF(NI. EQ. NCQJ(NQ,J,NT))GO TO 400
  360 CONTINUE
  370 CONTINUE
      OIJ = 0.0
      GO TO 410
  400 OIJ = PHI(NQ,J)
C
C CONTINUE COMPUTATION OF TMPO AND TMPOEX BY DETERMINING RELEVANT VALUE
C FOR H(NR,J,NT), RS(NR,J) AND R(NR,J). I.E. WHERE NTO IS IN COMPOSITE
C NR PRODUCED BY INDUSTRY J
C
  410 DO 430 NR = 1,NCJ
      NTM=LCOM(NR,J)
      DO 420 NT = 1,NTM
      IF(NTO. EQ. NCQJ(NR,J,NT))GO TO 450
  420 CONTINUE
  430 CONTINUE
      DELTA = 0.0
      HTJ=0.0
      RTS=0.0
      RT = 0.0
      GO TO 460
  450 HTJ = H(NR,J,NT)
      RTS = RS(NR,J)
```

```
  180 FORMAT(/,1X,131(*=*))
C
CC
C ESTIMATION OF TOTAL REAL RETURNS TO OWNERS OF PRIMARY FACTORS
C EMPLOYED IN EACH OF THE EIGHT AGRICULTURAL INDUSTRIES OF ORANI78.
CC
C
      WRITE(6,200)
  200 FORMAT(1H1,15(/),25X,*REAL RETURN TO ALL FACTORS EMPLOYED IN*,
     1      * EACH AGRICULTURAL INDUSTRY*,/,17X,89(*=*),//,30X,
     2      *INDUSTRY*,39X,*REAL RETURN*,//,17X,89(*=*))
C
C CALCULATE TOTAL REAL RETURNS(RRET) AND PRINT RESULTS
C
      DO 300 J=1,8
      RRET(J) = SLH(J)*(LI(J)+WIND*CPI-CPI)+SLO(J)*(
     &       LI(J)+WIND*CPI-CPI)+(SK(J)+SV(J))*(Q2(J)-CPI)
      WRITE(6,270)(LABEL(JJ,J),JJ=1,3),RRET(J)
  270 FORMAT(/,25X,3A10,20X,F10.4)
  300 CONTINUE
      WRITE(6,280)
  280 FORMAT(//,17X,89(*=*))
C
CC
C COMPUTE OWN AND CROSS PRICE ELASTICITIES FOR EACH OF THE TEN
C AGRICULTURAL COMMODITIES IDENTIFIED IN ORANI78.
CC
C
C
C CALCULATE FOR EACH INDUSTRY J THE SHARE OF PRIMARY FACTOR PAYMENTS
C IN TOTAL COSTS (SFI(J))
C
      DO 310 J=1,8
      TOTDOM(J) = 0.0
      TOTIMP(J) = 0.0
      TOTWAG(J) = 0.0
      DO 305 I=1,114
      TOTDOM(J) = TOTDOM(J) + DOMFL(I,J)
      TOTIMP(J) = TOTIMP(J) + IMPFL(I,J)
  305 CONTINUE
      DO 302 I=1,9
  302 TOTWAG(J) = TOTWAG(J) + WAGE(I,J)
      TOTCOS(J) = TOTDOM(J) + TOTIMP(J) + TOTWAG(J) + CAPITL(J) +
     1  LAND(J) + OTHER (J) + MARGIN(J)
      SFI(J) = (TOTWAG(J) + LAND(J) + CAPITL(J))/TOTCOS(J)
  310 CONTINUE
C
C WRITE NEW SECTION OF PRINT OUT
C
      WRITE(6,320)
  320 FORMAT(1H1,1X,8(/),25X,* TRANSFORMATION AND EXPANSION COMPON*,
     1 *ENTS OF OWN AND CROSS PRICE ELACTICITIES OF SUPPLY*,//,1X,
     3   131(*=*))
      WRITE(6,325)(K,K=1,10)
  325 FORMAT(1X,//,1X,*RESPONSE*,36X,*WITH RESPECT TO THE PRICE OF*,
     1    * COMMODITY NO. :*,/,3X,*OF*,7X,120(*=*),/,1X,*COMMODITY*,
```


Table 2.1: SPECIFICATION OF AN ILLUSTRATIVE ORANI EXPERIMENT

The exogenous variables

$p^{m}_{(i2)}$; t(i2,0); v(i2,0); t(is,jk); v(is,jk); t(is,3); v(is,3);

$v(\ell 1,4)^{(a)}$; $x^{(4)}_{(r1)}$; $t(il,4)^{(a)}$; $k_j(0)$; c_R; i_R; n_J; $f^{(1)}_{(g+1,1)}$; $f^{(1)}_{(g+1,1,m)}$;

$f^{(1)}_{(g+1,1)j}$; $f^{(1)}_{(g+1,1,m)j}{}^{(b)}$; $f^{(5)}_{(is)}$; $f^{(2)}_{n}$; $f^{e}_{(il)}$; $f^{(1)}_{(g+2,j)}$; q; ϕ ; and

all a's except a(j); (for i =1, ..., g; s = 1,2; j = 1, ..., h;

k = 1,2; $\ell \in G$; $r \notin G$; m = 1, ..., M and $n \notin J$).

Values for the exogenous variables

All zeros except the t(i2,0) for i = 1, ..., 114. The values for these are -25.0.

Values for user-specified parameters (the h's) [c]

$h^{(5)}_{(is)}$, $h^{(1)}_{(g+2,j)}$, $h^{(1)}_{(g+1,1,m)j}$, $h^{(2)}_{\ell}$, $h_2(i2,0)$, $h_2(il,4)$,

$h_1(is,jk)$, $h_3(is,jk)$, $h_1(is,3)$ and $h_3(is,3)$

equal to 1, and

$h_1(i2,0)$, $h_3(i2,0)$, $h_1(il,4)$, $h_3(il,4)$, $h_2(is,jk)$ and $h_2(is,3)$

equal to 0;

for i = 1, ..., g; s = 1,2; j = 1, ..., h; k = 1,2;

m = 1, ..., M; and $\ell \notin J$).

The export commodities

G = {A1, A3, A4, A5, 12, 13, 14, 18, 25, 30, 64}

Table 2.1 (continued)

The exogenous-investment industries

$\{j \mid j \notin J\} = \{17, 84, 85, 86, 94, 103, 104, 105, 106, 107, 108, 111, 112\}$

Variables for which projections are to be printed

All endogenous variables in the final system (see HP, Table III.2 part A, and DPSV, subsection 32.2).

All available back-solution variables (see HP, Table III.2, part B).

(a) These variables have not been included in the ORANI 78 computer system, and hence they do not appear in HP, Table III.2. In their place appears the variable $(1 + t(\ell i,4))$, i.e., the power of the ad valorem export subsidy on commodity ℓ ($\ell \in G$). In HP, Table III.2 this is variable 6 (mnemonic S). (b) This variable has not been included in the ORANI 78 computer system, hence it does not appear in HP, Table III.2. Ignoring the variable will cause no problems in the computing but you will not be able to impose wage shifts that are occupation and industry specific, nor can you solve for such shifts. (c) Note that in the current version of the program only the values of the $h^{(1)}_{g+2,j}$ and the $h^{(1)}_{(g+1,l,m)j}$ can be varied by users. All the other h's must take their default values, i.e., the values listed in the table.


```
      NCJ = NCOMP(J)
      DO 70 NQ=1,NCJ
      TMP = 0.0
      NTM = LCOM(NQ,J)
      DO 65 NT=1,NTM
      NTJ = NCQJ(NQ,J,NT)
      TMP=TMP+H(NQ,J,NT)*PA(NTJ)
   65 CONTINUE
      PC(NQ,J) = TMP
   70 CONTINUE
   80 CONTINUE
C
C COMPUTE THE MODIFIED SHARE RS(NR,J)
C
      DO 110 J=1,3
      NCJ = NCOMP(J)
      TMPI=0.0
      DO 105 NQ=1,NCJ
      TMPI = TMPI + PHI(NQ,J)*R(NQ,J)
  105 CONTINUE
      DO 108 NQ=1,NCJ
      RS(NQ,J) = PHI(NQ,J)*R(NQ,J)/TMPI
  108 CONTINUE
  110 CONTINUE
      DO 115 J=4,8
  115 RS(1,J) = 0.0
C
C COMPUTE OUTPUT OF COMPOSITE COMMODITY NQ BY J (Y(NQ,J)).
C
      DO 140 J=1,8
      NCJ = NCOMP(J)
      DO 130 NQ=1,NCJ
      TMP = ZA(J)
      PH = PHI(NQ,J)
      TMP = TMP + PH*PC(NQ,J)
      DO 120 NR=1,NCJ
      TMP = TMP - PH*RS(NR,J)*PC(NR,J)
  120 CONTINUE
      Y(NQ,J) = TMP
  130 CONTINUE
  140 CONTINUE
C
C PRINT OUT RESULTS
C
      WRITE(6,150)
  150 FORMAT(1H1,15(/),1X,7X,*THE PERCENTAGE CHANGE IN VALUE OF OUTP*,
     1  ,*UT AND PRICE OF EACH COMPOSITE COMMODITY PRODUCED BY *,
     2 *EACH AGRCULTURAL INDUSTRY*,/,1X,131(*=*),/,18X,*INDUSTRY*,
     3  26X,*COMPOSITE*,14X,*PRICE INDEX*,20X,*OUTPUT*,/,52X,*COMMODITY*
     4  ,/,1X,131(*=*))
      DO 175 J=1,8
      NCJ=NCOMP(J)
      WRITE(6,160)((LABEL(JJ,J),JJ=1,3),(I,PC(I,J),Y(I,J),I=1,NCJ))
  160 FORMAT(/,15X,3A10,10X,15(I2,15X,G14.6,15X,G14.6,/,55X))
  175 CONTINUE
      WRITE(6,180)
```

```
      DO 52 NT=1,NTH
      NTJ = NCQJ(NQ,J,NT)
      H(NQ,J,NT) = JOINT(NTJ,J)/PROD(NQ,J)
   52 CONTINUE
   55 CONTINUE
   58 CONTINUE
C
C COMPUTE THE SHARES OF EACH PRIMARY FACTOR IN THE TOTAL VALUE
C OF PRIMARY FACTORS(RESPECTIVELY SLH,SLO,SK AND SV)
C
      DO 64 J=1,8
      TOTPRI(J) = 0.0
      TOTPRI(J) = CAPITL(J) + LAND(J)
      DO 60 I=1,9
      TOTPRI(J) = TOTPRI(J) + WAGE(I,J)
   60 CONTINUE
      SK(J) = CAPITL(J)/TOTPRI(J)
      SV(J) = LAND(J)/TOTPRI(J)
      SLH(J) = 0.0
      SLO(J) = 0.0
      DO 62 I=1,9
      SLH(J) = SLH(J) + WAGE(I,J)*PROPHO(J)/TOTPRI(J)
      SLO(J) = SLO(J) + WAGE(I,J)*(1-PROPHO(J))/TOTPRI(J)
   62 CONTINUE
   64 CONTINUE
C
C WRITE THE SIMPLE COMPOSITION OF EACH COMPOSITE COMMODITY
C
      WRITE(6,9998)
 9998 FORMAT(//,5X,*THE COMPOSITION OF EACH COMPOSITE COMMODITY IS:*,/
     1  ,10X,*PASTORAL ZONE*,22X,*COMPOSITE COMMODITY 1*,5X,*WOOL *
     2  ,*AND SHEEP*,/,65X,*2*,5X,*WHEAT,BARLEY,OTHER GRAINS,MILK*,
     3  * CATTLE AND PIGS,OFE,OFM*,/,65X,*3*,5X,*MEAT CATTLE*,//,10X,
     4  *WHEAT-SHEEP ZONE*,19X,*COMPOSITE COMMODITY 1*,5X,
     1 *OTHER GRAINS,MILK CATTLE AND PIGS,OFE,OFM,*,/,65X,*2*,
     5  5X,*WOOL*,/,65X,*3*,5X,*SHEEP*,/,65X,*4*,5X,*WHEAT*,/,65X,*5*,
     6  5X,*BARLEY*,/,65X,*6*,5X,*MEAT CATTLE*,//,10X,*HIGH RAINFALL*,
     7  * ZONE*,17X,*COMPOSITE COMMODITY 1*,5X,*WHEAT,BARLEY,OTHER GRA*,
     8  *INS,MILK CATTLE AND PIGS,OFE,OFM*,/,65X,*2*,5X,*WOOL*,/,65X,
     9  *3*,5X,*SHEEP*,/,65X,*4*,5X,*MEAT CATTLE*,//,10X,*NORTHERN*,
     @  * BEEF*,22X,*COMPOSITE COMMODITY 1*,5X,*MEAT CATTLE*,//,10X,
     &  *MILK CATTLE AND PIGS*,15X,*COMPOSITE COMMODITY 1*,5X,*MILK*,
     $  * CATTLE AND PIGS,MEAT CATTLE*,//,10X,*OTHER FARMING (EXPORT)*,
     %  13X,*COMPOSITE COMMODITY 1*,5X,*OFE*,//,10X,*OTHER FARMING (IM*,
     P  *PORT COMPETING)*,3X,*COMPOSITE COMMODITY 1*,5X,*OFM*,//,10X,
     &  *POULTRY*,28X,*COMPOSITE COMMODITY 1*,5X,*POULTRY*)
C
CC
C COMPUTE COMPOSITE COMMODITY OUTPUT AND PRICE RESPONSES FOR EACH
C AGRICULTURAL INDUSTRY
CC
C
C
C COMPUTE PRICE RESPONSES
C
      DO 80 J=1,8
```


Table 2.2: VALUES FOR AD VALOREM TARIFF RATES

Commodity identification number	Ad valorem tariff rate, expressed as a proportion	Commodity identification number	Ad valorem tariff rate, expressed as a proportion
1 to 19 (inclusive)	0	52	0.1163
20	0.0035	53	0.1299
21	0.0176	54	0.0518
22	0.1021	55	0.1067
23	0.1005	56	0.1683
24	0.0199	57	0.1375
25	0.0260	58	0.0593
26	0.1460	59	0.0575
27	0.0379	60	0.0448
28	0.0519	61	0.0245
29	0.1361	62	0.0000
30	0.1113	63	0.0665
31	0.1757	64	0.1105
32	0.0035	65	0.0918
33	0.4667	66	0.0545
34	0.3320	67	0.1902
35	0.3554	68	0.2556
36	0.5693	69	0.1877
37	0.2623	70	0.4876
38	0.1374	71	0.0864
39	0.5381	72	0.2577
40	0.6865	73	0.0122
41	0.5663	74	0.1064
42	0.0516	75	0.2220
43	0.2016	76	0.2183
44	0.1214	77	0.1123
45	0.1402	78	0.1400
46	0.0701	79	0.2464
47	0.1928	80	0.1646
48	0.1288	81	0.0929
49	0.0211	82	0.2858
50	0.2154	83	0.2254
51	0.0110	84	0.1693
		85	0.1796
		86 to 114	0

Source: Higgs, Parmenter and Powell (1984, Table A.1).

Table 2.3: BASIC AND BACK SOLUTION VARIABLES REQUIRED BY THE OR78AG PROGRAM(a)

ORANI code no.	ORANI computer mnemonic	Description	Typical element	Standard no. of components
1	Z∧(b)	Industry outputs	z_j	112
19	CP	Consumer price index	$\xi(3)$	1
79	LI	Employment by industry	$x^{(1)}_{(g+1,1)_j}$	112
80	P1	Domestic prices (basic values)	$p^{(0)}_{(il)}$	114
83	Q2	Rental prices of capital by industry	$p^{(1)}_{(g+1,2)_j}$	12

(a) Variables 1 and 19 are in the ORANI final system (see DPSV, subsection 32.3). Variables 79, 80 and 83 are obtained by back solution.
(b) The symbol '∧' denotes a blank space.


```
      DO 1 I=1,NR
    1 JOINT(10,8) = JOINT(10,8) + DOMFL(I,8) + IMPFL(I,8)
      DO 2 I=1,9
    2 JOINT(10,8) = JOINT(10,8) + WAGE(I,8)
      JOINT(10,8) = JOINT(10,8) + CAPITL(8) + LAND(8) + OTHER(8) +
     1      MARGIN(8)
C
C READ:  ALPHABETICAL NAMES OF EACH INDUSTRY(LABEL);
C        THE SHARE IN TOTAL RETURNS TO LABOUR DEVOTED TO HIRED WORKERS
C        (PROPHO)
C        THE NUMBER OF COMPOSITE COMMODITIES PRODUCED PER J(NCOMP);
C        THE NUMBER OF SIMPLE COMMODITIES IN EACH COMPOSITE(LCOM);
C        THE CRETH TRANSFORMATION PARAMATER(PHI);
C        THE ID. NUMBER OF EACH SIMPLE COMMODITY(NCQJ);
C
      DO 20 J=1,8
      READ(5,25) (LABEL(JJ,J),JJ=1,3)
   25 FORMAT(3A10)
      READ(5,27) PROPHO(J)
   27 FORMAT(F10.4)
      READ(5,30) NCOMP(J)
   30 FORMAT(I5)
      NCJ = NCOMP(J)
      DO 10 NQ=1,NCJ
      READ(5,30) LCOM(NQ,J)
      READ(5,40) PHI(NQ,J)
   40 FORMAT(6F10.4)
      NTM = LCOM(NQ,J)
      READ(5,35)(NCQJ(NQ,J,NT),NT=1,NTM)
   35 FORMAT(6I5)
   10 CONTINUE
   20 CONTINUE
C
C COMPUTE THE SHARES R(NQ,J) AND H(NQ,J,NT)
C
C BEGIN BY FINDING TOTAL PRODUCTION OF EACH INDUSTRY
C
      DO 50 J=1,8
      TOTPRO(J) = 0.0
      DO 45 I = 1,10
      TOTPRO(J) = TOTPRO(J) + JOINT(I,J)
   45 CONTINUE
   50 CONTINUE
C
C DETERMINE R AND H
C
      DO 58 J=1,8
      NCJ = NCOMP(J)
      DO 55 NQ = 1,NCJ
      NTM = LCOM(NQ,J)
      PROD(NQ,J) = 0.0
      DO 51 NT =1,NTM
      NTJ = NCQJ(NQ,J,NT)
      PROD(NQ,J) = PROD(NQ,J) + JOINT(NTJ,J)
   51 CONTINUE
      R(NQ,J) = PROD(NQ,J)/TOTPRO(J)
```

```
  800 CONTINUE
      GOTO 1000
  900 DO 600 I=1,NR
      SUMMAT(I) = 0.0
      DO 580 II=1,NC
      SUMMAT(I) = SUMMAT(I) + DOMFL(I,II)
  580 CONTINUE
      VECTOR(I,IVAR) = SUMMAT(I)
  600 CONTINUE
 1000 CONTINUE
      CPI = VECTOR(1,3)
      DO 1100 III=1,10
      ZA(III) = VECTOR(III,1)
      PA(III) = VECTOR(III,2)
      LI(III) = VECTOR(III,4)
      Q2(III) = VECTOR(III,5)
 1100 CONTINUE
C*****************************************************************
      A = 2
C*****************************************************************
C
C READ FROM TAPE 2 : PRODUCTION OF FIRST 9 COMMODITIES BY THE
C                    FIRST 7 INDUSTRIES(JOINT);
C                    DOMESTIC AND IMPORTED COMMODITY FLOWS TO THE
C                    CURRENT PRODUCTION OF EACH INDUSTRY(RESPECTIVELY
C                    DOMFL AND IMPFL)
C                    VALUE OF LABOUR INPUT(WAGE);
C                    VALUE OF CAPITAL INPUT(CAPITL)
C                    VALUE OF LAND INPUT(LAND)
C                    VALUE OF "OTHER COSTS"(OTHER)
C
      LINDEX=0
      CALL OPENRA(2,INDEX,LINDEX)
      NR = 0
      NC = 0
      CALL REDSPS(2,1,NR,NC,1,1,0,DOMFL,115,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,2,NR,NC,1,1,0,IMPFL,115,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,10,9,NC,1,1,2,WAGE,9,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,11,1,NC,1,1,0,CAPITL,1,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,12,1,NC,1,1,0,LAND,1,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,13,1,NC,1,1,0,OTHER,1,113,INDEX,LINDEX,NAME)
      CALL REDSPS(2,14,9,7,1,1,0,JOINT,10,8,INDEX,LINDEX,NAME)
C
C READ FROM TAPE 3 : TOTAL MARGINS ON DOMESTIC AND IMPORTED FLOWS
C                    TO THE CURRENT PRODUCTION OF AGRICULTURAL
C                    INDUSTRIES.
C
      LINDEX=0
      CALL OPENRA(3,INDEX,LINDEX)
      NR = 0
      NC = 0
      CALL REDSPS(3,3,1,NC,1,1,0,MARGIN,1,113,INDEX,LINDEX,NAME)
C
C INCLUDE BOTH THE POULTRY COMMODITY AND THE POULTRY INDUSTRY
C IN (JOINT)
C
```


3. Preparing the Card Deck

There are four sources of data input to OR78AG. The first is formed from a column of the ORANI solution matrix stored on TAPE30. The second and third, respectively, are submatrices of the ORANI 78 Input-Output data file, and the ORANI 78 Margins data file. The fourth source, external in nature, consists of data to be supplied by the user.

Adams (1983, p.9) points out that the reliability of a commodity response projection retrieved from the solution to an ORANI 78 short-run simulation depends crucially on values assigned the base period share parameters of the final form equations of the model. If, for example, the shares were taken from a period of (say) a record wheat harvest or of drought related shortfalls in production, the consequent projections would also pertain to an agricultural sector with that atypical degree of profitability and/or mix of outputs. Accordingly, Adams (1984a) has produced time series from which suitable typical data can be derived. Higgs (1984) has incorporated these data into the latest 1977-78 ORANI 78 Input-Output and Margins data files. Both files are stored on tape in SUPERPASSION format. Access to these tapes and therefore retrieval of the data required by OR78AG from these sources are achieved via use of OPENRA and REDSPS (the SUPERPASSION equivalent of REDRAS), both of which are documented in Sams (1980).

The base year shares of returns to 'other labour' (payments to hired workers, and imputed payments to unpaid helpers, family workers and working-partners other than the single owner-operator) and returns to owner-operator labour in the total factor payments of each agricultural industry cannot be determined from information in the ORANI Input-Output data file. Therefore, the shares of 'other labour' in total payments to labour in each industry J, PROPHO(J), must be supplied for all J. (Note: PROPHO(J), for all J, in 1974-75 can be derived from Table 3.2 in Adams 1983 .)

OR78AG can only operate on a single column of the ORANI solution matrix stored on TAPE30. The value assigned N determines which column is

to be examined. If N=ϕ then OR78AG will examine the row sums of the solution matrix, thereby computing industry and commodity responses that result from the sum effect of all shocks examined in the ORANI simulation.

The user must supply five items of data for each agricultural industry. The first is the industry's alphabetical name (denoted LABEL(J)). The second is the number of composite commodities produced by that industry (NCOMP(J)) (see DPSV, p.192). The third item is values for the CRETH transformation paramater pertaining to each composite commodity (PHI(NQ,J)) (see DPSV, p.192). The fourth is the number of single commodities contained within each composite (LCOM(NQ,J)) (see DPSV, p.192), and the final item is identification numbers for each of the single commodities (NCQJ(NQ,J,NT)) (see Adams 1983, p.14).

The program is unable to read the degree of wage indexation assumed for the ORANI simulation. Therefore, WIND (the degree of wage indexation, expressed as a proportion) must also be supplied by the user.

The complete listing of variables required as data input to OR78AG is contained in Table 3.1. Included in the table for each variable is its mnemonic, source, read format and standard number of components. Table 3.2 contains values for all user-specified variables used in our illustrative example. A schematic summary of the 'card deck image' (viz., sequence of VDU lines of instructions) required to run OR78AG is set out in Table 3.3. The table contains three columns, the first describing the line (or blocks of lines) under consideration. The second cross-references the following subsections of this manual in which the context of the line(s) is (are) explained, and the third indicates the position of the line in our illustrative deck.

3.1 The control statements

Below are listed the 100 lines of control and data statements required for our illustrative example. The only lines which may require changes by the user when conducting his/her experiment are numbers 1, 8, 19 and 20. Below, brief explanatory comments are interspersed among the lines of control statements.


```
C
C                THE WAGE INDEXATION PARAMATER(WIND);
C                THE COLUMN OF THE PIEOUT FILE ASSOCIATED WITH THE SHOCK
C                 BEING EXAMINED BY THIS RUN(N). NOTE THAT IF N=0 OR78AG
C                 OPERATES ON THE ROWSUMS OF PIEOUT.
C
      READ(5,15) WIND
   15 FORMAT(F10.4)
      READ(5,16) N
   16 FORMAT(I5)
C
C WRITE HEADINGS FOR PRINT OUT
C
      WRITE(6,9999) N,WIND
 9999 FORMAT(1H1,/////,35X,*OUTPUT OF THE ORANI POST SIMULATION PROGRAM*,
     1    # 'OR78AG'*,/,35X,52(*=*),//,5X,*THE PROGRAM IS DESIGNED*,
     2    # TO IMPLEMENT PROCEDURES WHICH DERIVE, FOR EACH AGRICUL*,
     3    *TURAL INDUSTRY IDENTIFIED IN ORANI78, THE PERCENTAGE*,
     4    /,5X,*CHANGE IN: COMPOSITE COMMODITY OUTPUTS;*,/,
     5    16X,*COMPOSITE COMMODITY PRICES;*,/,16X,*AND THE*
     6    ,* TOTAL REAL RETURNS TO PRIMARY FACTORS.*,/,5X,*ALSO PROVIDE*
     7    ,*ED ARE  VALUES OF TRANSFORMATION AND EXPANSION COMPONENTS O*
     8   ,*F OWN AND AND CROSS PRICE ELASTICITIES OF COMMODITY.SUPPLY*,
     9    //,5X,*COMPUTATION IS BASED ON THE PROJE*
     ]    ,*CTED EFFECTS OF A SHOCK ASSOCIATED WITH COLUMN*,I4,* OF THE*
     [    ,* PIEOUT FILE*,/,5X,*NOTE THAT IF N=0 THEN COMPUTATION*,
     +    * IS BASED ON ROWSUMS OF PIEOUT.*,
     \     //,5X,*THE VALUE OF THE WAGE INDEXATION*,
     9    * PARAMATER IS *,F4.2,/,
     #    //,1X,131(*=*))
C
C READ FROM TAPE 30: CHANGE IN INDUSTRY ACTIVITY LEVELS(ZA);
C  (COLUMN N)         CHANGE IN COMMODITY PRICES(PA);
C                    CHANGE IN CPI;
C                    CHANGE IN INDUSTRY RENTAL PRICES OF CAPITAL(Q2);
C                    CHANGE IN INDUSTRY EMPLOYMENT LEVELS(LI).
C
C
      CALL OPENRA(30,INDEX,LINDEX)
      DO 1000 IVAR=1,5
      NR = 0
      NC = 0
      IPOS = NPOS(IVAR)
      CALL REDRAS(30,IPOS,NR,NC,1,1,0,DOMFL,115,115,INDEX,LINDEX,NAME)
C
C CHECK IF N IS LESS THAN 0 OR EXCEEDS THE NUMBER OF COLUMNS IN THE PIEOUT
C FILE.
C
      IF((N.LT.0).OR.(N.GT.NC)) CALL EROR(N,NC,A)
      IF(N.EQ.0) GOTO 900
C
C RELEASE FROM DOMFL(I,N), THE SOLUTION VALUES OF EACH VARIABLE FROM
C THE RELEVANT COLUMN OF PIEOUT, INTO VECTOR(I,IVAR).
C
      DO 800 I=1,NR
      VECTOR(I,IVAR) = DOMFL(I,N)
```

FIGURE A.1 : LISTING OF THE OR78AG PROGRAM

```
OR78AG,MS140000,ML300,P2000.
GETSET,DTB3006.
GETSET,DTB1070.
TRYLIB,OLD.
COMMON.
ATTACH,OMLIB,OMORANI78LIB,ID=UMDGCO,SN=DTB1070,PW=ORANTK.
LIBRARY,OMLIB,*.
ATTACH,TAPE30,TYPPIEOUT,ID=UMDXPH,SN=COMMON,PW=ORANTK,CY=1.
ATTACH,TAPE2,TYAG778IOTABLES,ID=UMDGCO,SN=DTB1070,PW=ORANTK.
ATTACH,TAPE3,TYAG778MARGINS,ID=UMDGCO,SN=DTB1070,PW=ORANTK.
FTN,I=COMPILE,T,OPT,ER,SL,P.
LGO.
*EOS
*COMPILE OR78AG,EROR
*ID USUAL
*EOS
      PROGRAM OR78AG(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE2,
     1 TAPE3,TAPE30)
C
C
CCCCCCC
C
C POST SIMULATION PROCEDURES TO DERIVE DETAILED AGRICULTURAL RESULTS FROM
C ORANI78 BASIC AND BACK SOLUTIONS. RESULTS ARE DERIVED FOR INDUSTRY OUTPUTS
C BY COMMODITY; COMPOSITE COMMODITY PRICES AND; REAL RETURNS ACCRUING TO
C PRIMARY FACTORS EMPLOYED IN EACH INDUSTRY. SUPPLY ELASTICITIES IMPLIED BY
C THE DATA BASE EMPLOYED ARE ALSO COMPUTED.
C
CCCCCCCC
C
C
      REAL TOTDOM(8),TOTIMP(8),TOTMAG(8),TOTCOS(8),SFI(8),TOT(10,10)
      REAL VECTOR(115,5),SUMMAT(115)
      REAL TOTPRO(8),PROD(6,8), TOTPRI(8),PROPHO(8)
      REAL SINTER(10,8),TMPOEX(10,10)
      REAL SUM(10),JOINT(10,8),DOMFL(115,115),IMPFL(115,113)
      REAL CAPITL(113),LAND(113),OTHER(113),MARGIN(113),WAGE(9,113)
      REAL TMPO(10,10),S(10,8),OIJ,HTJ,RTS
      REAL ZA(10),PA(10),H(6,8,6),PC(6,8),Y(6,8),PHI(6,8),RS(6,8)
      REAL CPI,Q2(10),LI(10),WIND,SLH(10),SLO(10),SK(10)
      REAL SV(10),RRET(10),DELTA,R(6,8)
      INTEGER NAME(12),INDEX(91),NCOMP(8),NCOJ(6,8,6)
      INTEGER  LCOM(6,8),LABEL(3,8),A,NPOS(5)
C
C THE VALUE OF A DESIGNATES SECTIONS OF THE CODE.
C
C**********************************************************************
      A = 1
C**********************************************************************
C
C ASSIGN VALUES TO LINDEX AND THE VECTOR THAT HOLDS THE POSITION OF EACH
C SOLUTION VARIABLE REQUIRED FROM PIEOUT (NPOS)
C
      DATA LINDEX/0/
      DATA NPOS/1,80,19,79,83/
```


Table 3.1: DESCRIPTION OF VARIABLES REQUIRED AS DATA INPUT TO OR78AG

Program	Description	Source	Format	Standard number of components
ZA(J)	Percentage change in the generalised output of industry J	Tape 30	- 8	(Total no. of agricultural industries)
PA(NT)	Percentage change in the basic price of agricultural commodity NT	Tape 30	- 10	(Total no. of agricultural commodities)
CPI	Percentage change in the consumer price index	Tape 30	- 1	
Q2(J)	Percentage change in the rental price of capital employed in industry J	Tape 30	- 8	
LI(J)	Percentage change in the overall employment of labour by industry J	Tape 30	- 8	
JOINT(NT,J)	The production of commodity NT by industry J (excluding both the poultry industry and commodity)	Tape 2	- 63	(7 agricultural industries x 9 agricultural commodities)
DOMFL(K,J)	The intermediate flow of domestically produced commodity K to the current production of industry J	Tape 2	- 920	(8 agricultural industries x 115 commodities)
IMPFL(K,J)	The intermediate flow of imported commodity K to the current production of industry J	Tape 2	- 920	
WAGE(K,J)	The primary input flow of labour (type K) to industry J	Tape 2	- 72	(8 agricultural industry x 9 categories of labour)

(continued)

Table 3.1 (continued)

Program	Description	Source	Format	Standard number of components
CAPITL(J)	The primary input flow of capital to industry J	Tape 2	-	8
LAND(J)	The primary input flow of land to industry J	Tape 2	-	8
OTHER(J)	The flow of 'other cost' tickets to industry J	Tape 2	-	8
MARGIN(J)	Total margins on intermediate flows of both domestically produced and imported commodities to the current production of industry J	Tape 3	-	8
WIND	The degree of wage indexation ($0 \leq WIND \leq 1$)	Cards*	F10.4	1
N	The column of PIE corresponding to the exogenous shock being examined by OR78AG. (If N=0 then OR78AG operates on row sums of PIEOUT)	Cards*	I5	1
LABEL(J,JJ)	The alphabetical title of industry J	Cards*	(3A10)	8
PROPHO(J)	The share of total returns to labour devoted to 'other labour'	Cards*	F10.4	8

(continued)

Appendix: The OR78AG Code

The complete listing of OR78AG is contained in Figure A.1.

References

Adams, P.D. (1983), The Short-Run Behaviour of Agricultural Industries in ORANI 78 – Methodological Overview and Analysis of Base Year Data, IMPACT Preliminary Working Paper No. OP-42, IMPACT Research Centre, University of Melbourne.

—— (1984a), Preparation of the Typical Year Data Base for the Agricultural Sector of ORANI, IMPACT Preliminary Working Paper No. OP-45, IMPACT Research Centre, University of Melbourne.

—— (1984b), Agricultural Supply Response in ORANI, IMPACT Working Paper No. O-44, IMPACT Research Centre, University of Melbourne.

Dixon, P.B., Parmenter, B.R., Sutton, J. and Vincent, D.P. (1982), ORANI: A Multisectoral Model of the Australian Economy, North-Holland Publishing Company, Amsterdam.

Higgs, P.J. (1985), Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-78 Data Base, IMPACT Preliminary Working Paper No. OP-49, IMPACT Research Centre, University of Melbourne.

Higgs, P.J. and Parmenter, B.R. (1982a), How to Compute a Johansen-Style Solution with the Melbourne Version of ORANI 78, IMPACT Computing Document No. C3-02, IMPACT Research Centre, University of Melbourne.

—— (1982b), Computing Johansen Style Solution with ORANI 78: Completing Aborted Simulations or Using Previous Solutions to Generate Additional Results, IMPACT Computing Document C4-01, IMPACT Research Centre, University of Melbourne.

Higgs, P.J., Parmenter, B.R. and Powell, A.A. (1984), 'The Scope for Tariff Reform Created by a Resources Boom: Simulation with the ORANI Model', Australian Economic Papers 23(42), 1-26.

Sams, D. (1980), ORANI 78 General Purpose Routines, ORANI Module Research Memorandum, IMPACT Research Centre, University of Melbourne (Archive No. CA-40).

Table 3.1 (continued)

Program	Description	Source	Format	Standard number of components
NCOMP(J)	the number of composite commodities produced by industry J	Cards*	I5	8
LCOM(NQ,J)	The number of single commodites in each composite NQ produced by industry J	Cards*	I5	18 (3 (J=1) + 6(J=2) + 4(J=3) + 5 for all other non-zonal industries)
PHI(NQ,J)	The value of the CRETH transformation parameter for each composite commodity NQ produced by industry J	Cards*	F10.4	18
NCQJ(NQ,J,NT)	Identification number for each commodity NT contained in composite NQ produced by industry J	Cards*	I5	33 (27 (3 zonal industries x 9 single commodities) + 2 (2 single commodities produced by the Milk Cattle and Pigs industry) + 4 (4 single-product industries))

* 'Card' refers to a line of VDU type corresponding to a card image.

Table 3.2: SPECIFICATION OF AN ILLUSTRATIVE OR78AG EXPERIMENT: VALUES FOR USER-SPECIFIED VARIABLES

J	LABEL	PROPHO	NCOMP	LCOM	PHI	NCQJ
1	Pastoral Zone	0.5662	3	2	0.1041	1 2
				6	4.5455	3 4 5 7 8 9
				1	1.6129	6
2	Wheat-Sheep Zone	0.5689	6	4	1.3158	5 7 8 9
				1	0.2976	1
				1	0.2342	2
				1	1.6129	3
				1	0.5208	4
				1	0.5181	6
3	High Rainfall Zone	0.5728	4	6	3.8462	3 4 5 7 8 9
				1	0.0631	1
				1	0.1153	2
				1	0.3745	6
4	Northern beef	0.5666	1	1	0.0000	6
5	Milk cattle and pigs	0.5122	1	2	0.0000	6 7
6	Other farming (export)	0.6969	1	1	0.0000	8
7	Other farming (import competing)	0.6969	1	1	0.0000	9
8	Poultry	0.5671	1	1	0.0000	10

Source: DPSV, p.192 and Adams (1983, p.14).

5. Concluding Remarks

This manual is designed to complement the work of Higgs and Parmenter (1982a). The computer code described herein provides a good example of how additional results, not incorporated in the basic ORANI software, can be obtained using outputs of that software as a starting point. This document will allow users of ORANI to gain access to OR78AG, a program which computes and appends detailed agricultural sector results to a solution matrix of an ORANI simulation. Included in this appended information are values for short-run agricultural supply elasticities which provide a means of assessing the plausibility of the agricultural part of the database underlying solutions of the model.

(EXPAN) are derived using equation 5.8 of the same paper. Also provided are total (TOTAL) short-run own and cross price elasticities for each agricultural commodity (derived as the sum of the corresponding transformation and expansion components).

To illustrate the correct interpretation of any number contained in sheet four we have chosen the elasticity of commodity 1 (Wool) with respect to the price of commodity 6 (Meat Cattle) as an example. The transformation component is -0.01. This implies that, in the short-run the planned production of Wool would decline by 0.01 per cent if the price of Meat Cattle were expected to increase permanently by 1.0 per cent in a situation in which all other prices were expected to remain constant. This thought experiment is conducted under conditions in which the generalised output of each industry is also assumed to remain constant. The expansion component of 0.1086, on the other hand, implies that the planned production of Wool would increase 0.1086 per cent in the short-run if the price of Meat Cattle permanently increased by 1 per cent when all other prices were held constant and no movement around any industry's transformation frontier were allowed to occur. In this thought experiment, the generalised output levels of industries are allowed to change. The total elasticity is 0.09, implying that planned wool production would increase by 0.09 per cent in the short-run in response to a expected permanent 1 per cent increase in the price of Meat Cattle when all other prices were expected to stay constant.

The printout of short-run supply elasticities as imposed on the model by its data base enables researchers more fully to understand the nature of the particular data used in deriving a model solution. Adams (1984b) has found that short-run supply elasticities are sensitive to changes in the model's Input-Output data file. Furthermore, the size of the elasticities are inversely related to the agricultural sector's gross operating surplus. Consequently, if the data reflects an agricultural sector in a low profit year (such as 1977-78), the output response of agricultural industries to any product price change will be greater than if the data reflected an agricultural sector in a relatively profitable year.


```
LINE 1: EXAMPL,MSl40000,ML300,P2000.
```

★ Enter the program name (any word up to six characters, it must commence with an alphabetic character but the remaining characters may be alphabetic and/or numeric).

★ These entries specify how much computer-memory space is available.

★ This entry determines the priority which your job will receive in the computer (check with the node manager if you need higher or lower priority).

```
LINE 2: GETSET,DTB3006.

LINE 3: GETSET,DTB1070.

LINE 4: TRYLIB,OLD.

LINE 5: COMMON.

LINE 6: ATTACH,OMLIB,OMORANI78LIB,ID=UMDGCO,SN=DTB1070,PW=ORANTK.

LINE 7: LIBRARY,OMLIB,*.
```

This line attaches the ORANI solution matrix stored on TAPE30.

```
LINE 8: ATTACH,TAPE30,TYPPIEOUT,ID=UMDXPH,SN=COMMON,PW=ORANTK,CY=1.
```

★ The name given to the solution matrix of the illustrative ORANI simulation. The prefix (TYP in this case, but can be any word up to nine characters long) is that attached to any file created in the course of a particular ORANI simulation.

★ The user identification code under which TAPE30 is stored.

★ This entry indicates that the computer has stored TAPE30 on generally available (as opposed to user-specific) storage space.

★ The ORANI file password.

★ The cycle number of the TAPE30 file TYPPIEOUT stored in COMMON under ID=UMDXPH and PW=ORANTK. If the printout section of the illustrative ORANI simulation is run again (see Higgs and Parmenter 1982b, pp.11-14), a new TAPE30 file having the same name, ID and PW, will be stored in COMMON with CY=2. (A maximum of 5 cycles of a file can be stored in COMMON).

This line attaches TAPE2 which contains the Input-Output data file derived in Higgs (1985).

```
LINE 9:  ATTACH,TAPE2,TYAG778I0TABLES,ID=UMDGCO,SN=DTB1070,PW=ORANTK.
```

This line attaches TAPE3 which contains the Margins data file derived in Higgs (1985).

```
Line 10: ATTACH,TAPE3,TYAG778MARGINS,ID=UMDGCO,SN=DTB1070,PW=ORANTK.
```

This line attaches the FORTRAN code of OR78AG.

```
LINE 11: ATTACH,OLDPL,OR78AGUPDATE,ID=UMDXPA,SN=DTB1070,PW=ORANTK.

LINE 12: UPDATE,Q.

LINE 13: FTN,I=COMPILE,T,OPT,ER,SL,P,R.

LINE 14: LGO.

LINE 15: *EOS

LINE 16: *COMPILE OR78AG,EROR

LINE 17: *ID USUAL

LINE 18: *EOS
```

3.2 The data statements for our illustrative example.

(Note: the symbol '^' denotes a blank space, and to overcome confusion we have written zero as 'Ø' and the alphabetic o as 'o'.)

The degree of wage indexation, expressed as a proportion (WIND).

```
LINE 19:^^^^1.ØØØØ
```

The value for N. For this experiment we have chosen to examine the row sums of the ORANI solution matrix.

```
LINE 20:^^^^Ø
```

The LABEL of industry 1 (LABEL (1)).

```
LINE 21: PASTORAL  ZONE
```

Value of PROPHO for industry 1 (PROPHO (1))

```
LINE 22:^^^^Ø.5662
```

Number of composite commodities produced by industry 1 (NCOMP(1)).

```
LINE 23:^^^^3
```

Number of single commodities included in composite commodity 1 produced by industry 1 (LCOM (1,1)).

```
LINE 24:^^^^2
```

Value of the CRETH transformation parameter pertaining to composite commodity 1 produced by industry 1 (PHI (1,1))

```
LINE 25:^^^^Ø.1041
```

Identification numbers for each commodity contained in composite commodity 1 produced by industry 1 (NCQJ (1,1,1) NCQJ (1,1,2)).

```
LINE 26:^^^^1^^^^2
```

LCOM (2,1)

```
LINE 27:^^^^6
```

PHI (2,1)

```
LINE 28:^^^^4.5455
```


indexation paramater WIND. Also provided is the composition of all composite commodities produced by each agricultural industry. Sheet two contains percentage changes in the output and price of each composite commodity computed using equations 2.2 and 2.3 in Adams (1983).

Sheet three of the printout tabulates the return, expressed in terms of percentage changes in purchasing power, accruing to all primary factors employed in each agricultural industry (derived using equation 3.5 in Adams 1983). The ORANI model identifies three classes of primary factors employed in agriculture: labour (includes hired labour, unpaid helpers and owner-operators); fixed capital (buildings, plant and machinery); and agricultural land. To obtain the results printed on sheet three, the percentage change in the Consumer Price Index is deducted from the percentage change in the aggregate return accruing to all three classes of primary factors employed in each agricultural industry.

The aggregate short-run response of agricultural industries in ORANI to a change in product prices is a function solely of the model's data base (the response is therefore invariant to model closure or shock). This response can be separated into two components. The first, reflecting the effect of the change in relative product prices alone, results from the movement around the transformation frontier of each industry (and is denoted the transformation effect). The second, reflecting only the increase or reduction in the profitability of each industry (and consequent change in input application) resulting from the change in price, results from movements of the frontiers themselves (and is denoted the expansion effect). The transformation effect for any one of the ten agricultural comodities identified in ORANI can be measured by the short-run transformation component of the own or cross price elasticity of supply. The corresponding expansion effect, for any commodity, is measured by the short-run expansion component of the elasticity of supply. The transformation and expansion components of short-run own and cross price elasticities of supply for each agricultural commodity are contained in sheet four of the printout. Transformation components (denoted TRANS) are derived using equation 4.10 in Adams (1983), while expansion components

FIGURE 4.1 : (continued)

TRANSFORMATION AND EXPANSION COMPONENTS OF OWN AND CROSS PRICE ELACTICITIES OF SUPPLY

RESPONSE OF COMMODITY	WITH RESPECT TO THE PRICE OF COMMODITY NO. : 1	2	3	4	5	6	7	8	9	10
1 TRANS	.1548	-.1854E-02	-.9474E-01	-.8583E-02	-.1470E-01	-.1490E-01	-.7492E-02	-.1045E-02	-.1153E-01	0.
EXPAN	.3043	.1064	.8788E-01	.2010E-01	.2157E-01	.1006	.1245E-01	-.3355E-03	.9469E-02	-.1068E-08
TOTAL	.4591	.1048	-.6864E-02	.1152E-01	.6877E-02	.9373E-01	.4959E-02	-.1380E-02	-.2055E-02	-.1068E-08
2 TRANS	-.4834E-02	.1607	-.8701E-01	-.9427E-02	-.1633E-01	-.1414E-01	-.9620E-02	-.1680E-02	-.1566E-01	0.
EXPAN	.2775	.1075	.9775E-01	.2200E-01	.2400E-01	.1060	.1401E-01	-.2307E-03	.9210E-02	-.9319E-09
TOTAL	.2727	.2682	.1073E-01	.1257E-01	.5670E-02	.9187E-01	.4391E-02	-.1910E-02	-.6355E-02	-.9319E-09
3 TRANS	-.1552	-.5467E-01	.5660	-.4427E-01	-.9754E-01	-.1435	-.5356E-01	-.1715E-02	-.1561E-01	0.
EXPAN	.1747	.7350E-01	.1748	.3144E-01	.2414E-01	.5771E-01	.1388E-01	-.7544E-03	.2182E-02	-.5303E-09
TOTAL	.1956E-01	.1883E-01	.7407	-.1283E-01	-.7340E-01	-.8580E-01	-.3969E-01	-.2469E-02	-.1332E-01	-.5300E-09
4 TRANS	-.7336E-01	-.3091E-01	-.2310	.4404	-.5675E-02	-.1271	-.4620E-02	.2765E-02	.2955E-01	0.
EXPAN	.1959	.8146E-01	.1579	.2945E-01	.2434E-01	.6861E-01	.1406E-01	-.6233E-03	.3812E-02	-.6090E-09
TOTAL	.1225	.5056E-01	-.7306E-01	.4699	.1867E-01	-.5640E-01	.9377E-02	.2141E-02	.3336E-01	-.6088E-09
5 TRANS	-.1372	-.6560E-01	-.5558	-.6197E-02	.4807	-.1900	.2551	.1920E-01	.2079	0.
EXPAN	.2270	.9577E-01	.1305	.2637E-01	.2527E-01	.6723E-01	.1474E-01	-.3676E-03	.6052E-02	-.7183E-09
TOTAL	.8979E-01	.3017E-01	-.4253	.2017E-01	.5050	-.1108	.2698	.1883E-01	.2145	-.7183E-09
6 TRANS	-.2797E-01	-.1019E-01	-.1645	-.2702E-01	-.3584E-01	.3451	-.1824E-01	-.4457E-02	-.5127E-01	0.
EXPAN	.2039	.7834E-01	.4865E-01	.1214E-01	.1446E-01	.2567	.8365E-01	-.2040E-02	-.1856E-02	-.1491E-08
TOTAL	.1760	.6315E-01	-.1158	-.1570E-01	-.2537E-01	.6018	.6471E-01	-.6497E-02	-.5313E-01	-.1491E-08
7 TRANS	-.1148E-01	-.5651E-02	-.5009E-01	-.8387E-03	.4185E-01	-.1545E-01	.2227E-01	.1666E-02	.1771E-01	0.
EXPAN	.1911E-01	.8247E-02	-.2436E-01	-.4409E-02	-.6706E-02	.6839E-01	.9465	-.1113E-01	-.5800E-01	-.2120E-08
TOTAL	.7632E-02	.2596E-02	-.7446E-01	-.5247E-02	.3507E-01	.5295E-01	.9687	-.9463E-02	-.4037E-01	-.2120E-08
8 TRANS	-.1253E-02	-.7728E-03	-.1256E-02	.3880E-03	.2468E-02	-.2840E-02	.1304E-02	.1894E-03	.1780E-02	0.
EXPAN	.2565E-02	.1040E-02	-.9834E-02	-.2085E-03	-.5346E-02	.1070E-02	.1223E-03	1.596	-.2744E-01	-.5306E-08
TOTAL	.1312E-02	.2671E-03	-.1109E-01	.1796E-03	-.2879E-02	-.1770E-02	.1427E-02	1.596	-.2566E-01	-.5306E-08
9 TRANS	-.1819E-01	-.8476E-02	-.1493E-01	.5452E-02	.3612E-01	-.4307E-01	.1824E-01	.2341E-02	.2451E-01	0.
EXPAN	.3427E-01	.1297E-01	-.1266E-01	.1310E-02	-.8300E-02	.1340E-01	.1511E-02	-.6535E-01	2.611	-.9371E-08
TOTAL	.1608E-01	.3489E-02	-.2758E-01	.6770E-02	.2682E-01	-.2967E-01	.1975E-01	-.6301E-01	2.635	-.9371E-08
10 TRANS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EXPAN	-.2397E-07	-.2182E-07	-.1823	-.3411E-01	-.5874E-01	-.1947E-07	-.2804E-07	-.3509E-07	-.2331E-07	2.954
TOTAL	-.2397E-07	-.2182E-07	-.1823	-.3411E-01	-.5874E-01	-.1947E-07	-.2804E-07	-.3509E-07	-.2331E-07	2.954


```
    NCQJ (2,1,1) NCQJ (2,1,2) NCQJ (2,1,3) NCQJ (2,1,4) NCQJ (2,1,5)
    NCQJ (2,1,6)
LINE 29:^^^^3^^^^4^^^^5^^^^7^^^^8^^^^9

    LCOM (3,1)
LINE 30:^^^^1

    PHI (3,1)
LINE 31:^^^^1.6129

    NCQJ (3,1,1)
LINE 32:^^^^6

    LABEL (2)
LINE 33: WHEAT-SHEEP ZONE

    PROPHO (2)
LINE 34:^^^^0.5689

    NCOMP (2)
LINE 35:^^^^6

    LCOM (1,2)
LINE 36:^^^^4

    PHI (1,2)
LINE 37:^^^^1.3158

    NCQJ (1,2,1) NCQJ (1,2,2) NCQJ (1,2,3) NCQJ (1,2,4)
LINE 38:^^^^5^^^^7^^^^8^^^^9

    LCOM (2,2)
LINE 39:^^^^1

    PHI (2,2)
LINE 40:^^^^0.2976

    NCQJ (2,2,1)
LINE 41:^^^^1

    LCOM (3,2)
LINE 42:^^^^1

    PHI (3,2)
LINE 43:^^^^0.2342

    NCQJ (3,2,1)
LINE 44:^^^^2

    LCOM (4,2)
LINE 45:^^^^1

    PHI (4,2)
LINE 46:^^^^1.6129

    NCQJ (4,2,1)
LINE 47:^^^^3
```

```
    LCOM (5,2)
LINE 48:^^^^1

    PHI (5,2)
LINE 49:^^^^Ø.5208

    NCQJ (5,2,1)
LINE 50:^^^^4

    LCOM (6,2)
LINE 51:^^^^1

    PHI (6,2)
LINE 52:^^^^Ø.5181

    NCQJ (6,2,1)
LINE 53:^^^^6

    LABEL (3)
LINE 54: HIGH^RAINFALL^ZONE

    PROPHO (3)
LINE 55:^^^^Ø.5728

    NCOMP (3)
LINE 56:^^^^4

    LCOM (1,3)
LINE 57:^^^^6

    PHI (1,3)
LINE 58:^^^^3.8462

    NCQJ (1,3,1) NCQJ (1,3,2) NCQJ (1,3,3) NCQJ (1,3,4) NCQJ (1,3,5)
    NCQJ (1,3,6)
LINE 59:^^^^3^^^^4^^^^5^^^^7^^^^8^^^^9

    LCOM (2,3)
LINE 60:^^^^1

    PHI (2,3)
LINE 61:^^^^Ø.Ø631

    NCQJ (2,3,1)
LINE 62:^^^^1

    LCOM (3,3)
LINE 63:^^^^1

    PHI (3,3)
LINE 64:^^^^Ø.1153

    NCQJ (3,3,1)
LINE 65:^^^^2

    LCOM (4,3)
LINE 66:^^^^1
```


FIGURE 4.1 : (continued)

REAL RETURN TO ALL FACTORS EMPLOYED IN EACH AGRICULTURAL INDUSTRY

INDUSTRY	REAL RETURN
PASTORAL ZONE	3.9377
WHEAT-SHEEP ZONE	4.3822
HIGH RAINFALL ZONE	4.7859
NORTHERN BEEF	8.8824
MILK CATTLE AND PIGS	2.2907
OTHER FARMING (EXPORT)	5.4835
OTHER FARM (IMPORT COMPETING)	.8647
POULTRY	3.3437

FIGURE 4.1 : (continued)

THE PERCENTAGE CHANGE IN VALUE OF OUTPUT AND PRICE OF EACH COMPOSITE COMMODITY PRODUCED BY EACH AGRCULTURAL INDUSTRY

INDUSTRY	COMPOSITE COMMODITY	PRICE INDEX	OUTPUT
PASTORAL ZONE	1	-.675740	1.31146
	2	-.561662E-01	-.898353
	3	2.18462	4.21750
WHEAT-SHEEP ZONE	1	-.476741	.280660
	2	-.872358	.897755
	3	.402362	1.26714
	4	.374118	1.43659
	5	.366645	1.29469
	6	2.18462	2.23521
HIGH RAINFALL ZONE	1	-.568943	.464434
	2	-.872358	1.72599
	3	.402382	1.84052
	4	2.18462	2.67726
NORTHERN BEEF	1	2.18462	2.84158
MILK CATTLE AND PIGS	1	-1.04509	.956697
OTHER FARMING (EXPORT)	1	-.338795	2.82902
OTHER FARM (IMPORT COMPETING)	1	-1.83497	.547838
POULTRY	1	-.895107	1.42523


```
    PHI (4,3)
LINE 67:^^^^Ø.3745

    NCQJ (4,3,1)
LINE 68:^^^^6

    LABEL (4)
LINE 69: NORTHERN^BEEF

    PROPHO (4)
LINE 70:^^^^Ø.5666

    NCOMP (4)
LINE 71:^^^^1

    LCOM (1,4)
LINE 72:^^^^1

    PHI (1,4)
LINE 73:^^^^Ø.ØØØØ

    NCQJ (1,4,1)
LINE 74:^^^^6

    LABEL (5)
LINE 75: MILK^CATTLE^AND^PIGS

    PROPHO (5)
LINE 76:^^^^0.5122

    NCOMP (1)
LINE 77:^^^^1

    LCOM (1,5)
LINE 78:^^^^2

    PHI (1,5)
LINE 79:^^^^Ø.ØØØØ

    NCQJ (1,5,1) NCQJ (1,5,2)
LINE 80:^^^^6^^^^7

    LABEL (6)
LINE 81: OTHER^FARMING^(SUGAR^CANE,^FRUITS^AND^NUTS)

    PROPHO (6)
LINE 82:^^^^0.6969

    NCOMP (1)
LINE 83:^^^^1

    LCOM (1,6)
LINE 84:^^^^1

    PHI (1,6)
LINE 85:^^^^Ø.ØØØØ
```

```
    NCQJ (1,6,1)
LINE 86:^^^^8

    LABEL (7)
LINE 87:^OTHER^FARM^(VEGETABLES,^COTTON,^OILSEEDS^AND^TOBACCO)

    PROPHO (7)
LINE 88:^^^^0.6969

    NCOMP (1)
LINE 89:^^^^1

    LCOM (1,7)
LINE 90:^^^^1

    PHI (1,7)
LINE 91:^^^^0.0000

    NCQJ (1,7,1)
LINE 92:^^^^9

    LABEL (8)
LINE 93: POULTRY

    PROPHO (8)
LINE 94:^^^^0.5671

    NCOMP (8)
LINE 95:^^^^1

    LCOM (1,8)
LINE 96:^^^^1

    PHI (1,8)
LINE 97:^^^^0.0000

    NCQJ (1,8,1)
LINE 98:^^^^1

    End of section card
LINE 99: *EOS

    End of information card
LINE 100: *EOI
```

4. Interpreting the Printout

The output of OR78AG, for our illustrative example, is presented in Figure 4.1. The printout consists of four sheets. Sheet one contains miscellaneous explanatory notes including values for N and the wage

FIGURE 4.1 : OUTPUT FROM ILLUSTRATIVE APPLICATION OF OR78AG

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OUTPUT OF THE GRAINS POST SIMULATION PROGRAM 'OR78AG'
=====================================================

THE PROGRAM IS DESIGNED TO IMPLEMENT PROCEDURES WHICH DERIVE, FOR EACH AGRICULTURAL INDUSTRY IDENTIFIED IN GRAINS, THE PERCENTAGE
CHANGE IN: COMPOSITE COMMODITY OUTPUTS;
           COMPOSITE COMMODITY PRICES;
       AND THE TOTAL REAL RETURNS TO PRIMARY FACTORS.
ALSO PROVIDED ARE VALUES OF TRANSFORMATION AND EXPANSION COMPONENTS OF GNI AND CROSS PRICE ELASTICITIES OF COMMODITY SUPPLY

COMPUTATION IS BASED ON THE PROJECTED EFFECTS OF A SHOCK ASSOCIATED WITH COLUMN   0 OF THE PIEOUT FILE
NOTE THAT IF N=0 THEN COMPUTATION IS BASED ON ROWSUMS OF PIEOUT.

THE VALUE OF THE WAGE INDEXATION PARAMETER IS 1.00.

THE COMPOSITION OF EACH COMPOSITE COMMODITY IS:
    PASTORAL ZONE              COMPOSITE COMMODITY 1    WOOL AND SHEEP
                                                   2    WHEAT,BARLEY,OTHER GRAINS,MILK CATTLE AND PIGS,OFE,OFH
                                                   3    MEAT CATTLE

    WHEAT-SHEEP ZONE           COMPOSITE COMMODITY 1    OTHER GRAINS,MILK CATTLE AND PIGS,OFE,OFH,
                                                   2    WOOL
                                                   3    SHEEP
                                                   4    WHEAT
                                                   5    BARLEY
                                                   6    MEAT CATTLE

    HIGH RAINFALL ZONE         COMPOSITE COMMODITY 1    WHEAT,BARLEY,OTHER GRAINS,MILK CATTLE AND PIGS,OFE,OFH
                                                   2    WOOL
                                                   3    SHEEP
                                                   4    MEAT CATTLE

    NORTHERN BEEF              COMPOSITE COMMODITY 1    MEAT CATTLE

    MILK CATTLE AND PIGS       COMPOSITE COMMODITY 1    MILK CATTLE AND PIGS,MEAT CATTLE

    OTHER FARMING (EXPORT)     COMPOSITE COMMODITY 1    OFE

    OTHER FARMING (IMPORT COMPETING)  COMPOSITE COMMODITY 1    OFH

    POULTRY                    COMPOSITE COMMODITY 1    POULTRY
```