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KERANG LAKES IRRIGATION AREA

AGRICULTURAL SECTOR ACTIVITIES AND GROSS MARGINS

BY WATER SOURCE

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Areas of farm enterprise activities within the Kerang Lakes Management Area were aggregated by irrigation water source. Relevant activity gross margins were utilised to determine the net agricultural income derived from each source.

The study found that grazing and field crop activities occupy 97% of total area but contribute only 33% of total gross margin; horticultural activities occur on 3% of the total area but generate 67% of total gross margin. Horticultural Enterprises utilise 9% of total agricultural irrigation water but produce 76% of total irrigated gross margin.

The authors wish to acknowledge (without implication):

(i) The Kerang Lakes Area Working Group, who are responsible for directing the development of the Kerang Lakes Area Management Plan; and

(ii) The Victorian Government, who are funding the project as part of Salt Action : Joint Action which is part of the overall strategy for salinity management in Victoria.

TABLE OF CONTENTS

KERANG LAKES AREA MANAGEMENT PROJECT

AGRICULTURAL SECTOR ACTIVITIES AND GROSS MARGINS BY WATER SOURCE

1. OBJECTIVES

To assess the impact of a significant environmental factor, such as salinity, on a rural based regional economy, it is essential to quantify the relative importance of the agricultural sector within that economy.

This is the second of three papers relating to the agricultural sector within the Kerang Lakes area utilising a data base specifically developed for the study. The first paper "Agricultural Sector Structure" (Keyworth, 1990) reported upon one aspect of this data base. This paper reports upon another: agricultural activity areas and associated gross margins.

The objectives of the current work are two-fold: first, to provide the necessary income and cost data for a regional economic model; and second, to establish a framework within which the economic impact of various regional management strategies may be quantified.

2. SOURCES OF DATA

Selection of a criterion by which to geographically disaggregate activity and gross margin data within the study area (Figure 1) was not straight- forward. With due recognition of the second objective of this research, facility had to be provided to subsequently assess alternative management plans. Given that the only (agriculturally) pertinent variable specified within such plans is the quality (EC_w) of irrigation water within the Torrumbarry System (Figure 2), water source (river, channel or lake) was selected as the basis for disaggregation.

Within the context of a regional economy, an agricultural enterprise must be commercial in scale for production costs and income to be deemed significant. Therefore, utilising the classification system specified within "Agricultural Sector Structure" (Keyworth, 1990) (Figure 3), only Farm Enterprise data was used in this study.

2.1 AGRICULTURAL ACTIVITY AREA DATA

Rural Water Commission Water Bailiffs, located at Swan Hill, Kerang and Cohuna, were informed of the research objectives and then questioned to provide information on the nature and relative importance of agricultural activities for a given Register Number. Assistance was also sought from local officers of the Victorian Department of Agriculture and Rural Affairs to provide similar data for dryland landholders. For analytic convenience the

FIGURE 1

KERANG LAKES AREA MANAGEMENT PROJECT

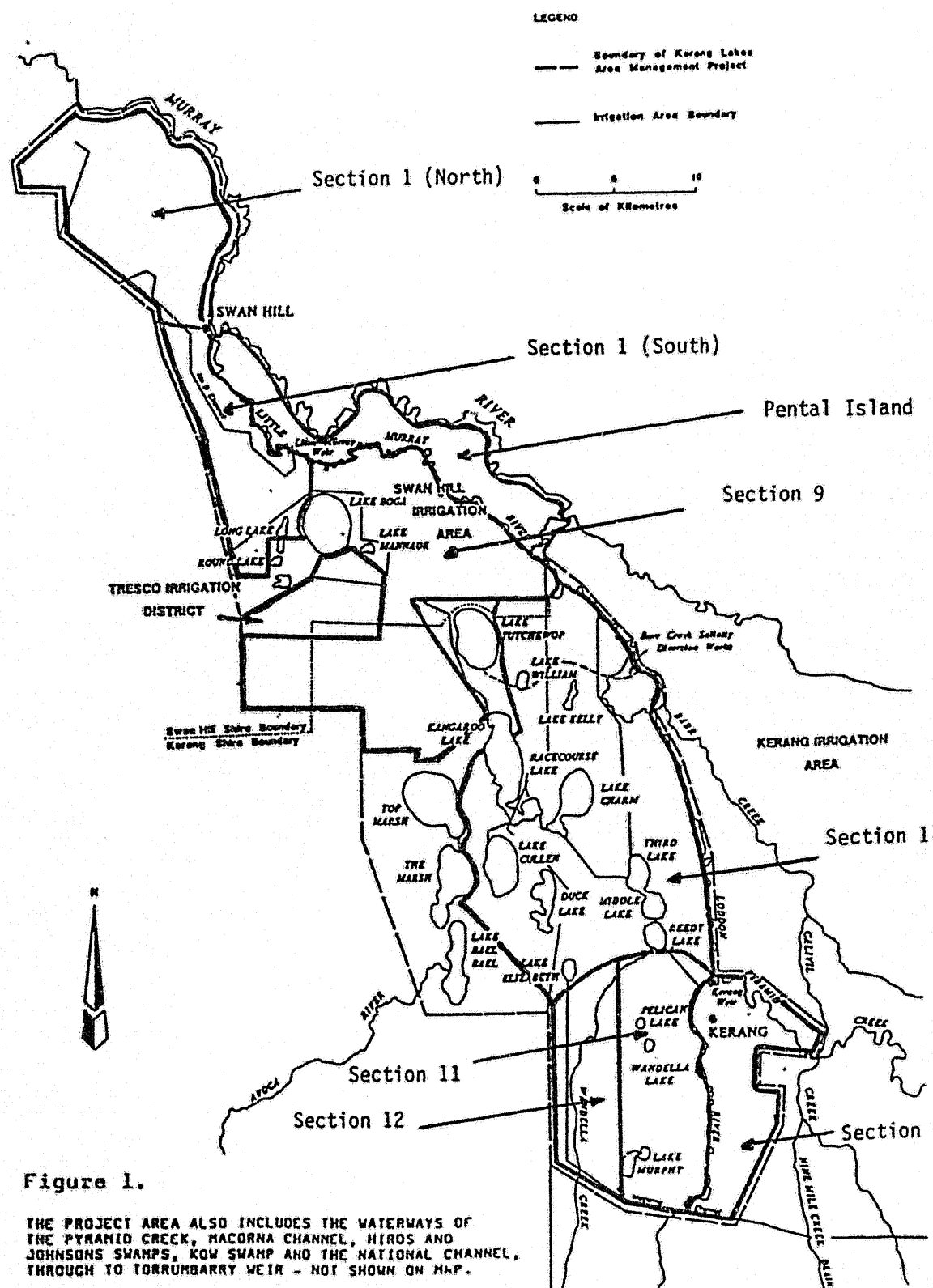


Figure 1.

THE PROJECT AREA ALSO INCLUDES THE WATERWAYS OF THE PYRAMID CREEK, MACORNA CHANNEL, HIROS AND JOHNSONS SWAMPS, KOW SWAMP AND THE NATIONAL CHANNEL, THROUGH TO TORRUMBARRY WEIR - NOT SHOWN ON MAP.

Dwyer Leslie

FIGURE 2 : TORRUMBARRY IRRIGATION SYSTEM

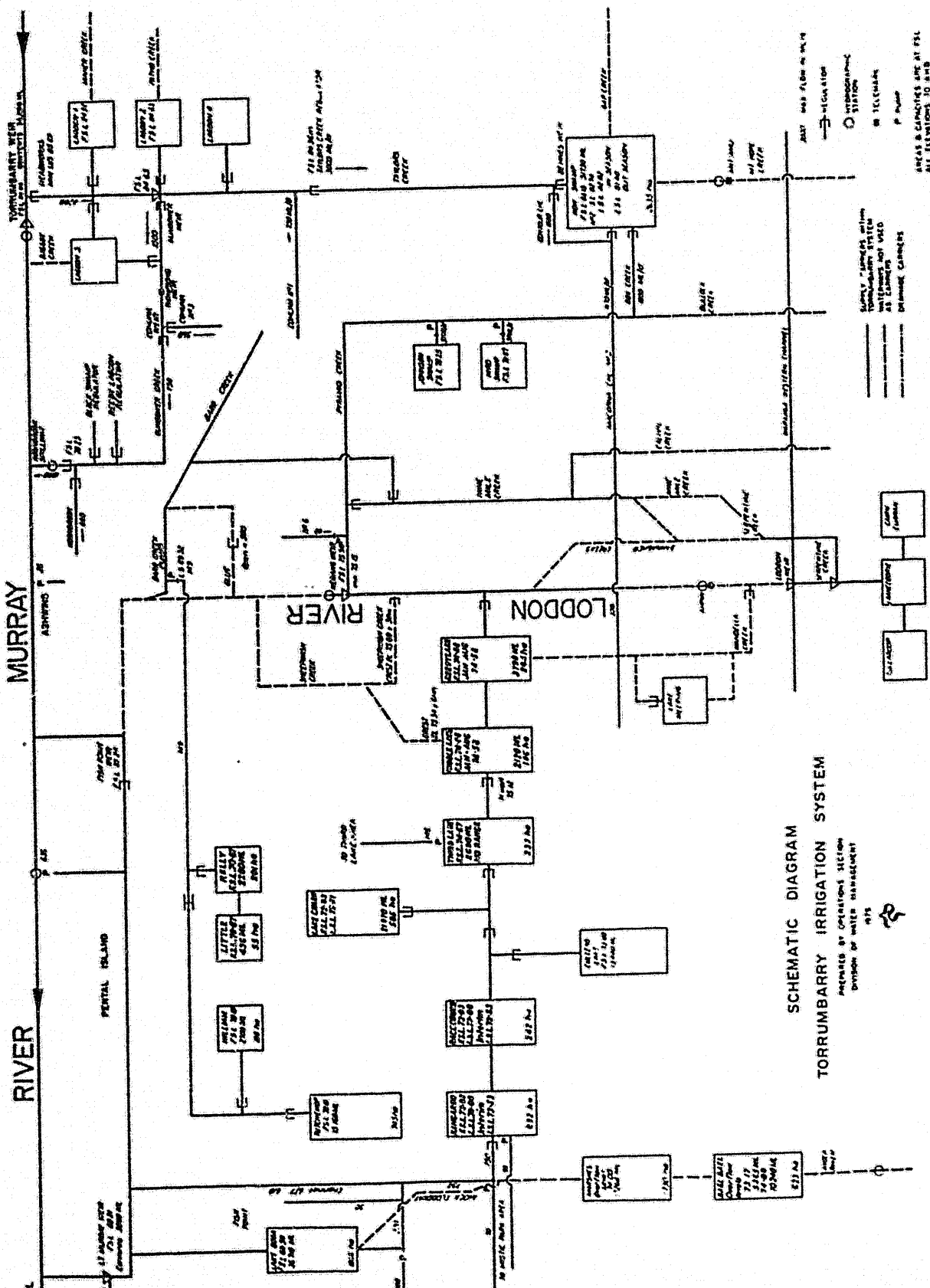
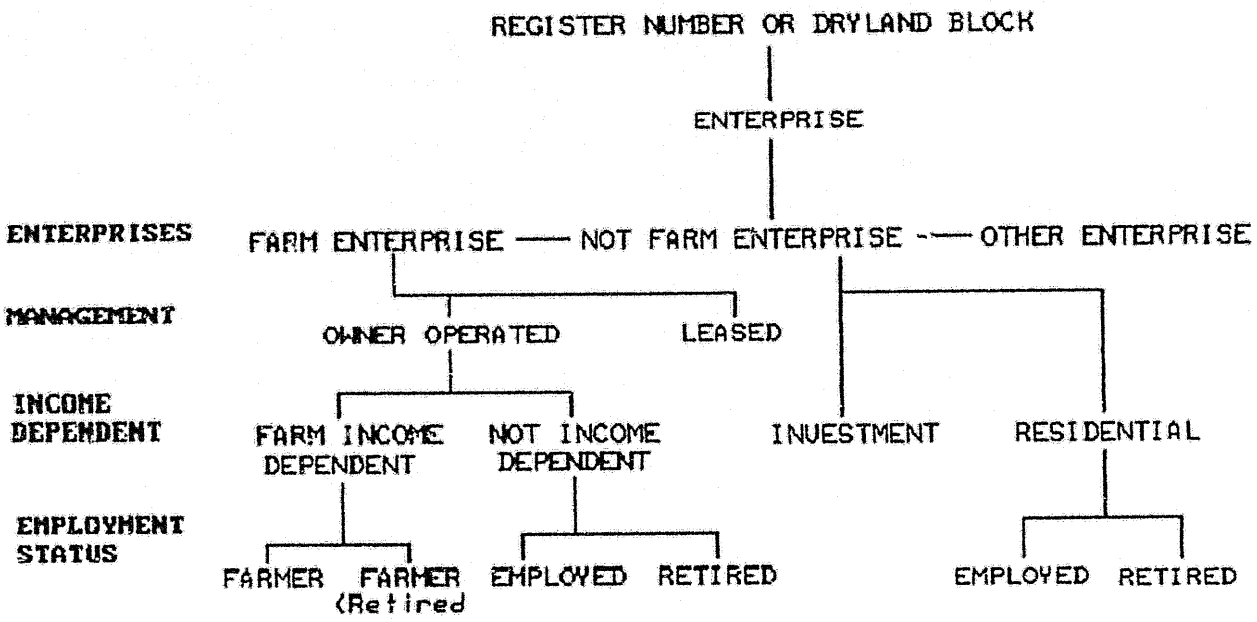


FIGURE 3: AGRICULTURAL SECTOR STRUCTURE



distinction between Dairy and Other, Horticultural and Dryland Enterprises was maintained.

Definitions

Register Number: A Register Number is the Rural Water Commission's entry number associated with a specific block of land, with a particular water right, within a given Bailiff Section.

Dryland Block: A Dryland Block is a specific land area without a current water right. Such blocks may be managed independently or in conjunction with Register Numbers.

Activity Area: Activity area is the area on which the production of a particular agricultural activity (e.g. wheat, sheep) takes place. Irrigated activity area is specified, for a given Register Number, on Bailiff's culture records. Potential dryland activity area is found by subtracting total irrigated activity area and area unfit for irrigation from Register Number area.

Farm Enterprise: A Farm Enterprise is a set of owned Register Numbers and/or Dryland Blocks (from 1 to n) that operate as a single legal entity, which undertake a range of commercial agricultural activities (from 1 to n) which produce products for sale.

2.1.1 Dairy and Other Sector Data

To facilitate subsequent analysis, agricultural activities undertaken by Dairy and Other Enterprises were categorised as either field crop (e.g. wheat, lucerne) or grazing (e.g. dairy, sheep).

(a) **Field Crop Activities**

The irrigated area of a particular field crop sown on a given Register Number was determined from Bailiff culture records. Where the Bailiff indicated that only field crops were produced, a proportion of any non- irrigated area was designated as occupied by dryland crop. The proportion of dryland crop area ascribed to wheat and barley (lucerne was readily distinguished) was determined on the basis of discussions with local landholders and Victorian Department of Agricultural and Rural Affairs extension officers.

Assumption

Allocation of available dryland crop area to particular activities:

Proportion available dryland area utilised:	0.80
Proportion dryland crops ascribed to wheat activity:	0.40
Proportion dryland crop area ascribed to barley activity:	0.60

(b) Grazing Activities

The estimation of the area of a particular grazing activity was complicated by the range of possible activities, activity mixes within enterprises and the use of dryland areas for grazing.

Bailiffs were asked to identify the nature of any grazing activity present on a Register Number. If more than one activity occurred (e.g. beef and sheep) then the identity of the primary activity (e.g. sheep) was sought. Total irrigated pasture area (perennial plus annual) specified by Bailiffs culture records was then allocated to each activity present in relation to their perceived importance.

Assumptions:

Allocation of available pasture area to grazing activities:

Primary activity only:		1.00
Primary	)	0.60
Secondary	) activities:	0.40
Primary	)	0.50
Secondary	) activities:	0.30
Tertiary	)	0.20

Allocation of pasture area was further complicated by the potential alternative nature of sheep production: animals kept either for prime lamb or wool production.

The gross margins for a given grazing activity is determined by the stocking rate (D.S.E./ha.) of the associated pasture. Estimates of these rates were made on the basis of discussions with Victorian Department of Agriculture and Rural Affairs research personnel and qualified by annual irrigation rate.

Assumption:
Stocking and irrigation rates for specified pasture types:

	Stocking Rate D.S.E./ha.)	Irrigation Rate (ML/ha.)
Sheep and Beef Activities		
Perennial pasture	15.0	7.0
Annual pasture	7.5	2.0
Dryland pasture	1.5	-
Dairy Activity		
All pasture	30.0	10.0

Allocation of pasture area was subsequently made on the basis of discussions with local landholders, extension officers and examination of Australian Bureau of Statistics census data for the region.

Assumption:

Allocation of sheep pasture area to particular activities:

Proportion available sheep pasture area ascribed to Wool activity:	0.40
Proportion available sheep pasture area ascribed to Lamb activity:	0.60

Where grazing took place but the nature of the activity varied or was of limited occurrence (e.g. goats, horses), a General Grazing activity was deemed to occur. Total pasture areas specified for this activity were then allocated to particular livestock activities on the basis of their relative occurrence within the study area.

Assumption:

Allocation of General Grazing pasture area to particular activities:

Proportion General Grazing pasture area ascribed to Beef activity:	0.44
Proportion General Grazing pasture area ascribed to Wool activity:	0.22
Proportion General Grazing pasture area ascribed to Prime Lamb activity:	0.34

In the absence of field crops, any non-irrigated area on a Register Number was considered to be dryland pasture. A proportion of this area was assumed grazed (at 1.5 D.S.E./ha.) by the livestock activities utilising the irrigated pasture. However, if field crops were present, Bailiffs were asked to provide an estimate of the proportionate allocation of dryland activities.

Assumption:

Proportionate utilisation of dryland pasture area by particular activities:

Proportion dryland pasture area utilised by Sheep activity:	0.80

Proportion dryland pasture area utilised by Beef activity:	0.80
Proportion dryland pasture area utilised by Dairy activity:	1.00

It should be noted that the distinction between perennial and annual irrigated pasture area was maintained in all cases because of their differing production responses to water quality.

2.1.2 Horticultural Sector Data

The irrigated area of a particular horticultural crop on a given Register Number was determined from Bailiff culture records. With the "Stone Fruit" classification (containing peaches, plums, nectarines and apricots), however, additional information was required to determine activity areas. The Swan Hill District Horticultural Census 1987 (Sun Centre Horticultural Development Association, 1987) was examined and appropriate allocations made on the basis of planting data for each Bailiff section. Assumed allocations are presented in Table 1.

TABLE 1: ALLOCATION OF STONE FRUIT AREA TO PARTICULAR ACTIVITIES[1]

BAILIFF SECTION	PEACH	PLUM	NECTARINE	APRICOT
1 (North & South)	0.142	0.233	0.402	0.223
TRESCO	0.116	0.213	0.362	0.309
13	0.390	0.253	0.203	0.154

2.1.3 Dryland Sector Data

Dryland Blocks were identified from Victorian Rural Water Commission maps, discussions with local Department of Agriculture and Rural Affairs staff and Kerang Shire records. Unfortunately, activity data for individual Dryland Blocks are not available. Therefore, areas of particular activities were derived from information obtained during discussions with local landholders and Departmental personnel.

Source: "Swan Hill District Horticultural Census 1987". Sun Centre Horticultural Development Association and Victorian Department of Agriculture and Rural Affairs, 1987.

Assumption:

Proportional utilisation of defined Dryland Sector area:

Proportion total area suitable for agricultural production		0.75
Proportion area utilised by sheep activity		0.50
Proportion suitable area ascribed to Wool Activity	1.00	
Proportion area utilised by field crop activities		0.50
Proportion suitable area ascribed to Wheat Activity	0.40	
Proportion suitable area ascribed to Barley Activity	0.60	

Assumption:

Stocking rate for Dryland Sector pasture areas:

	Stocking Rate (D.S.E./ha)
Wool Activity	
All pasture	2.50

The above assumptions enabled estimation of areas of Dryland Sector activities.

2.2 GROSS MARGIN DATA

To determine the importance of a particular agricultural activity within the Study Area, it is necessary to calculate a gross margin for a unit area of production.

Definition

Gross Margin: A gross margin for any activity is the gross income from the activity over a twelve month period less the variable costs incurred. Variable costs are those that vary in proportion to the size of the activity (e.g. fertiliser, drench).

Gross margins utilised within this analysis for irrigated activities are those which were specifically developed for the Kerang Lakes Area Management Study (Shaw, 1989); gross margins for commercial vegetable production were obtained from the N.S.W. Department of Agriculture (Jones and Salvestrin, 1987); and gross margins for all dryland activities were extracted from a Victorian Department of Agricultural and Rural Affairs Technical Report (Hall, 1988).

It should be noted that, to this point, no adjustment has been made to any gross margin for soil type, soil salinity or irrigation water quality.

In accordance with the first objective of this research, production costs were classified into various categories to facilitate their incorporation into a regional economic model.

3. RESULTS

3.1 WATER SOURCE

The water sources by which agricultural activity areas and associated gross margins are classified within the Study Area are listed in Table 2.

TABLE 2: DEFINED WATER SOURCES

Rivers:	Murray Little Murray Loddon
Creeks:	Pyramid
Lakes:	Boga Charm Kangaroo Middle Racecourse Reedy
Channels:	2 7, 1/7, 3/7, 4/7, 5/7, 6/7, 7/7, 9, 13/9, 21/9, 25/9, 27/9, 28/9, 29/9, 30/9, 31/9, 32/9, 38/9 10, 2/10 Tresco

3.2 AGRICULTURAL ACTIVITY AREAS AND ASSOCIATED GROSS MARGINS

3.2.1 Dairy and Other Sector

Resultant Field Crop activity area and gross margin data are presented in summary by activity type and water source in Tables 3 and 4 respectively. Similarly, results for Grazing activities are presented in Tables 5 and 6 respectively.

TABLE 3: FIELD CROP ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY ACTIVITY TYPE

ACTIVITY	IRRIGATION AREA (HA)	DRYLAND [1] AREA (HA)	TOTAL ACTIVITY AREA (HA)	INCOME ($)	EXPENSES ($)	GROSS MARGIN ($)
LUCERNE	1517.8	-	1517.8	2,377,794	1,051,804	1,325,990
WHEAT	645.5	1211.6	1857.1	769,141	431,829	337,312
BARLEY	1018	1817.3	2835.3	939,915	606,098	333,817
TOTAL	3181.3	3028.9	6210.2	$4,086,850	$2,089,731	$1,997,119

1. Gross Margins are calculated on the basis that the effective area of production is equal to 80.0% of total area.

TABLE 4: FIELD CROP ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY WATER SOURCE

TYPE	WATER SOURCE	TOTAL ACTIVITY AREA (ha)	TOTAL INCOME ($)	TOTAL COST ($)	GROSS MARGIN ($)
RIVERS	MURRAY	704.0	255,412	103,157	152,255
	LITTLE MURRAY	945.0	289,424	157,457	131,967
	LODDON	22.0	34,075	15,524	18,551
CREEKS	PYRAMID	–	–	–	–
LAKES	BOGA	–	–	–	–
	CHARM	621.1	385,891	189,076	196,815
	KANGAROO	167.7	41,429	23,677	17,752
	MIDDLE	26.0	23,842	12,580	11,262
	RACECOURSE	12.0	6,146	4,110	2,036
	REEDY	–	–	–	–
CHANNELS	CHANNEL 2	552.8	554,676	276,520	278,156
	CHANNEL 7	39.4	24,232	11,821	12,411
	CHANNEL 1/7	448.0	422,113	210,214	211,899
	CHANNEL 3/7	252.5	163,481	85,350	78,131
	CHANNEL 4/7	689.0	553,093	307,709	245,384
	CHANNEL 5/7	277.5	243,880	130,224	113,656
	CHANNEL 6/7	481.5	236,866	137,757	99,109
	CHANNEL 7/7	270.5	165,016	102,528	62,488
	CHANNEL 9	347.2	247,597	118,829	128,768
	CHANNEL 13/9	319.0	425,202	195,738	229,464
	CHANNEL 21/9	–	–	–	–
	CHANNEL 25/9	–	–	–	–
	CHANNEL 27/9	–	–	–	–
	CHANNEL 28/9	–	–	–	–
	CHANNEL 29/9	–	–	–	–
	CHANNEL 30/9	–	–	–	–
	CHANNEL 31/9	–	–	–	–
	CHANNEL 32/9	–	–	–	–
	CHANNEL 34/9	–	–	–	–
	CHANNEL 10	35.1	14,475	7,460	7,015
	CHANNEL 2/10	–	–	–	–
	TRESCO	–	–	–	–
TOTAL		6210.3	$4,086,850	$2,089,731	$1,997,119

TABLE 5: GRAZING ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY ACTIVITY TYPE

ACTIVITY	IRRIGATION AREA (HA)	DRYLAND AREA (HA)	TOTAL ACTIVITY AREA (HA)	TOTAL INCOME ($)	TOTAL COST ($)	GROSS MARGIN ($)
BEEF	9336.0	6501.0[1]	15837.0	1,460,142	794,653	665,489
LAMB	8666.0	7764.0[1]	16430.0	2,471,609	1,128,249	1,343,360
WOOL	5723.0	4556.0[1]	10279.0	1,701,595	824,623	876,972
DAIRY	4743.0	1079.0	5833.0	6,517,363	2,994,011	3,523,352
TOTAL	28468	19900	48379	$12,150,709	$5,741,536	$6,409,173

1. Gross Margins are calculated on the basis that the effective area of production is equal to 80.0% of total area.

TABLE 6: GRAZING ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY WATER SOURCE

TYPE	WATER SOURCE	TOTAL ACTIVITY AREA (ha)	TOTAL INCOME ($)	TOTAL COST ($)	GROSS MARGIN ($)
RIVERS	MURRAY	2463.1	782,559	347,367	435,192
	LITTLE MURRAY	2619.0	637,621	282,790	354,831
	LODDON	1128.1	162,084	68,649	93,435
CREEKS	PYRAMID	350.4	151,265	69,235	82,030
LAKES	BOGA	–	–	–	–
	CHARM	860.0	48,260	20,477	27,783
	KANGAROO	1147.0	58,268	21,940	36,328
	MIDDLE	617.0	44,526	18,603	25,923
	RACECOURSE	344.0	9,680	3,220	6,460
	REEDY	1046.0	88,948	35,293	53,655
CHANNELS	CHANNEL 2	15244.3	4,016,030	1,895,479	2,120,551
	CHANNEL 7	45.0	3,767	2,125	1,642
	CHANNEL 1/7	4657.0	1,012,599	471,344	541,255
	CHANNEL 3/7	936.0	62,452	23,121	39,331
	CHANNEL 4/7	2013.0	241,645	113,443	128,202
	CHANNEL 5/7	1701.0	276,956	121,935	155,021
	CHANNEL 6/7	2867.0	676,269	305,203	371,066
	CHANNEL 7/7	3076.0	420,236	186,721	233,515
	CHANNEL 9	2230.0	738,477	378,829	359,648
	CHANNEL 13/9	2068.0	610,765	331,470	279,295
	CHANNEL 21/9	–	–	–	–
	CHANNEL 25/9	–	–	–	–
	CHANNEL 27/9	–	–	–	–
	CHANNEL 28/9	–	–	–	–
	CHANNEL 29/9	–	–	–	–
	CHANNEL 30/9	–	–	–	–
	CHANNEL 31/9	–	–	–	–
	CHANNEL 32/9	–	–	–	–
	CHANNEL 34/9	–	–	–	–
	CHANNEL 10	2576.5	1,932,396	948,914	983,482
	CHANNEL 2/10	390.6	175,906	95,378	80,528
	TRESCO	–	–	–	–
TOTAL		48329	$12,150,709	$5,741,536	$6,409,173

3.2.2 Horticultural Sector

Resultant Horticultural activity area and gross margin data are presented by water source in summary by activity type and water source in Tables 7 and 8 respectively.

3.2.3 Dryland Sector

A summary of activity area and gross margin data is presented by activity type in Table 9.

4. DISCUSSION

4.1 OVERVIEW

Agricultural production occurs on some 65,919 ha within the Study Area, which generates $52,340,399 income but incurs $25,706,354 costs, providing an agricultural sector gross margin of $26,634,045.

Dairy and Other sector activities account for 54,589 ha (83% of total) (Field Crops 6,210 ha (9%); Grazing 48,379 ha (74%)). Horticultural sector activities occupy 2236 ha (3% of total area). Dryland Sector activities cover 9,094 ha (14% of total area).

However, the proportionate distribution of associated gross margins differ distinctly: Dairy and Other Sector $8,406,292 (31% of total gross margin) (Field Crops $1,997,119 (7%); Grazing $6,409,173 (24%)), Horticultural sector $17,709,054 (67% of total gross margin), and Dryland sector $518,699 (2% of total gross margin).

Examination of Tables 4, 6 and 8 reveal, as expected that the Dairy and Other and Horticultural sectors draw irrigation water from predominantly different sources. Field Crop and Grazing activities utilise the Rivers, Pyramid Creek, the Lakes and Channels 2, 7, part of 9 and 10; whilst Horticultural activities only utilise Lake Kangaroo, Channel 9 and the Tresco supply. Further, inspection indicates that only five supplies (Channels 4/7, 6/7, 7/7, 9 and 10) provide irrigation water for areas between 2,500 and 5,000 ha; two supplies (channels 2 and 1/7) provide irrigation water for larger areas. Similarly, examination of the gross margin data reveals that the majority of supplies (22 sources) generate returns less than $500,000, with four supplies (channels 2, 9, 21/9 and Tresco) providing returns in excess of $2,000,000.

4.2 DAIRY AND OTHER SECTOR

4.2.1 Field Crop Activities

Examination of Table 3 indicates that Lucerne is the most extensive (1,517.ha) irrigated Field Crop activity. Further, the total gross margin for Lucerne ($1,325,990) significantly exceeds the returns from the alternative

TABLE 7: HORTICULTURAL ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY ACTIVITY TYPE

ACTIVITY	AREA (ha)	INCOME ($)	EXPENSES ($)	GROSS MARGIN ($)
LUCERNE	102.6	160,709	76,635	84,074
CITRUS	62.3	467,667	284,501	183,166
DRY SULTANAS	17.9	81,903	40,858	41,045
WINE SULTANAS	245.5	1,078,355	438,987	639,368
TABLE SULTANAS	785.5	12,575,855	6,034,561	6,541,294
PLUMS	185.3	3,159,821	1,896,311	1,263,510
PEACHES	118.9	2,779,168	1,402,970	1,376,198
APRICOTS	201.2	2,935,949	1,928,046	1,007,903
NECTARINES	318.0	10,170,593	3,875,787	6,294,806
TOMATOES	25.5	631,181	553,097	78,084
PUMPKINS	48.0	120,975	99,543	21,432
ONIONS	34.6	304,738	232,966	71,772
ROCKMELONS	91.1	535,231	428,829	106,402
TOTALS	2236.4	$35,002,145	$17,293,091	$17,709,054

TABLE 8: HORTICULTURAL ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY WATER SOURCE

TYPE	WATER SOURCE	TOTAL ACTIVITY AREA (ha)	TOTAL INCOME ($)	TOTAL COST ($)	GROSS MARGIN ($)
RIVERS	MURRAY	-	-	-	-
	LITTLE MURRAY	12 0	236,306	119,041	117,265
	LODDON	-	-	-	-
CREEKS	PYRAMID	-	-	-	-
LAKES	BOGA	-	-	-	-
	CHARM	-	-	-	-
	KANGAROO	122	950,049	430,718	519,331
	MIDDLE	-	-	-	-
	RACECOURSE	-	-	-	-
	REEDY	-	-	-	-
CHANNELS	CHANNEL 2	-	-	-	-
	CHANNEL 7	-	-	-	-
	CHANNEL 1/7	-	-	-	-
	CHANNEL 3/7	-	-	-	-
	CHANNEL 4/7	-	-	-	-
	CHANNEL 5/7	-	-	-	-
	CHANNEL 6/7	-	-	-	-
	CHANNEL 7/7	-	-	-	-
	CHANNEL 9	743.6	11,255,960	5,519,563	5,736,397
	CHANNEL 13/9	58.1	806,776	379,634	427,142
	CHANNEL 21/9	275.3	4,472,747	2,155,328	2,317,419
	CHANNEL 25/9	18.0	421,014	199,918	221,096
	CHANNEL 27/9	73.0	1,398,634	666,972	731,662
	CHANNEL 28/9	73.4	1,026,597	528,561	498,036
	CHANNEL 29/9	31.1	670,867	320,970	349,897
	CHANNEL 30/9	9.1	156,105	74,039	82,066
	CHANNEL 31/9	9.2	151,727	77,756	73,971
	CHANNEL 32/9	3.0	4,699	2,131	2,568
	CHANNEL 34/9	7.0	107,510	55,479	52,031
	CHANNEL 10	-	-	-	-
	CHANNEL 2/10	-	-	-	-
	TRESCO	801.6	13,343,154	6,762,981	6,580,173
TOTAL		2236.4	$35,002,145	$17,293,091	$17,709,054

TABLE 9: DRYLAND BLOCK ACTIVITY AREAS AND GROSS MARGINS CLASSIFIED BY ACTIVITY TYPE

DRYLAND ACTIVITIES	AREA(1) (ha)	INCOME ($)	EXPENSES ($)	GROSS MARGIN ($)
WHEAT	1818.9	371,055	186,891	184,164
BARLEY	2728.4	470,649	294,667	175,982
WOOL	4547.3	258,991	100,438	158,553
TOTAL	9094.6	$1,100,695	$581,996	$518,699

1. Gross Margins are calculated on the basis that the effective area of production is equal to 75.0% of total area

activities. It is interesting to note that estimated areas of dryland wheat (1,211 ha) and barley (1,817 ha) are significantly greater than associated irrigated crop areas (645 and 1,017 ha respectively); this is primarily attributable to the distribution of activities on Pental Island.

Inspection of Table 4 reveals that, from a Field Crop perspective, Channels 2, 1/7, 4/7 and 13/9 are important water sources, with each generating gross margins in excess of $200,000.

4.2.2 Grazing Activities

Examination of Table 5 indicates that Beef is the most prevalent (9,336 ha) irrigated Grazing activity. However, the total gross margin for Beef ($794,653) is lower than for the alternative activities. The Dairy activity, though occupying least irrigated area (4,743 ha), is most important in terms of total gross margin generated ($3,523,352). Again, it is interesting to note that areas of dryland Beef (6,501 ha), Lamb (7,782 ha) and Wool (4,556 ha) are less than irrigated grazing areas (9,336, 8,666 and 5,723 ha respectively)).

Inspection of Table 6 reveals that Grazing activities draw irrigation water from most sources within the Study Area. However, only the Channels 1/7, 6/7, 7/7, 9, 13/9 and 10) produce gross margins in excess of $200,000, with only Channel 2 generating a return greater than $2,000,000.

4.3 HORTICULTURAL SECTOR

Examination of Table 7 indicates that Table Grapes are the predominant (785 ha) Horticultural activity. Though Table Grapes also provide the highest total gross margin ($6,541,294) returns from Nectarines ($6,294,806) and Peaches ($1,376,198) are also very significant.

Inspection of Table 8 reveals that Horticulture acquires irrigation water from relatively few sources, however, the returns generated by most are large. Lake Kangaroo and Channels 13/9, 25/91, 27/9, 28/9 and 29/9 provide gross margins in excess of $200,000, whilst net returns for Channels 9, 21/9 and Tresco exceed $2,000,000.

4.4 DRYLAND SECTOR

Examination of Table 9 indicates that Wool (by definition) is the most extensive (4,547 ha) Dryland sector activity. The total gross margins for Wool ($58,553) however, is less than for either the Wheat ($184,164) or barley ($175,982) activities. This anomaly may be primarily attributed to the relatively low stocking rates (2.5 D.S.E./ha) for Dryland blocks.

5. CONCLUSIONS

The results of this study are surprising in that they indicate that whilst the Dairy and Other sector occupies 83% of the total agricultural area it only produces 31% of the total gross margin. Further, examination of the data reveals that this sector commands 93% of the irrigated area (i.e. hectares actually watered) but generates 24% of the irrigated gross margin; the Horticultural sector occupies 7% of the area but produces 76% of the irrigated gross margin. Review of data in the preceding paper (Keyworth, 1990) indicates that Dairy and Other Farm Enterprises use 91% of the agricultural irrigation water. Therefore, the 9% of water used by Horticultural Enterprises produces 76% of the total irrigated gross margin within the Kerang Lakes Study Area.

Examination of the gross margins generated by individual water sources indicates that several lakes (Racecourse, Reedy and Middle) and channels (30/9, 31/9, 32/9 and 34/9) each provide less than $100,000 net income.

The above findings have significant implications for the development of a land management plan, particularly in relation to the continued provision of irrigation water to particular activities and geographic areas when associated environmental costs are considered.

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