

Business Attraction Folio for Organic Waste Industry Development

Prepared for

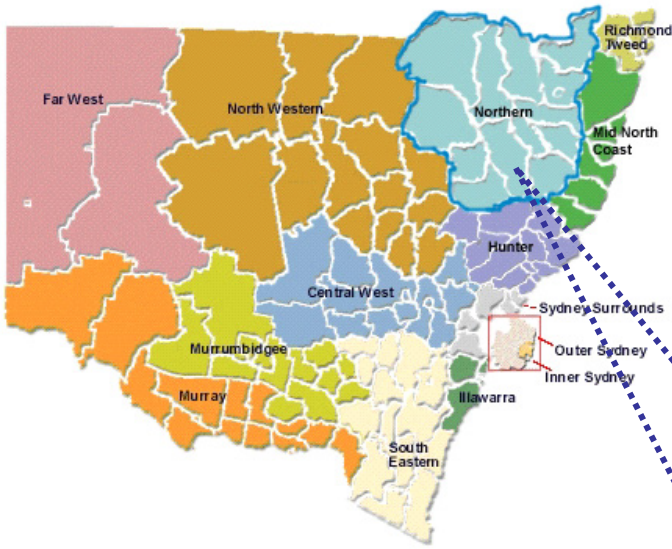
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Introduction to Northern Inland Regional Waste



Northern Inland Regional Waste (NIRW) is a voluntary local government networking group that was established to address waste management issues on a regional level. The group consists of 13 Councils which include Armidale Dumaresq, Glen Innes Severn Shire, Gunnedah Shire, Guyra Shire, Gwydir Shire, Inverell Shire, Liverpool Plains Shire, Moree Plains Shire, Narrabri Shire, Tamworth Regional, Tenterfield Shire, Uralla Shire and Walcha Councils.



The focus of Northern Inland Regional Waste is to facilitate sustainable business development in the New England and North West region of New South Wales that provides solutions to dealing with the waste generated by local industries.

The NIRW committee has made significant investments over the last two years to determine the characteristics of organic wastes produced in the region and the potential for reuse of these materials.

A broad scale mapping project was finalised in 2004 which identified the location, details of waste produced, management and disposal of organics within the region. The information was compiled into a Microsoft Access™ database and linked to ArcView™ to facilitate spatial searches of the recorded organic waste producers.

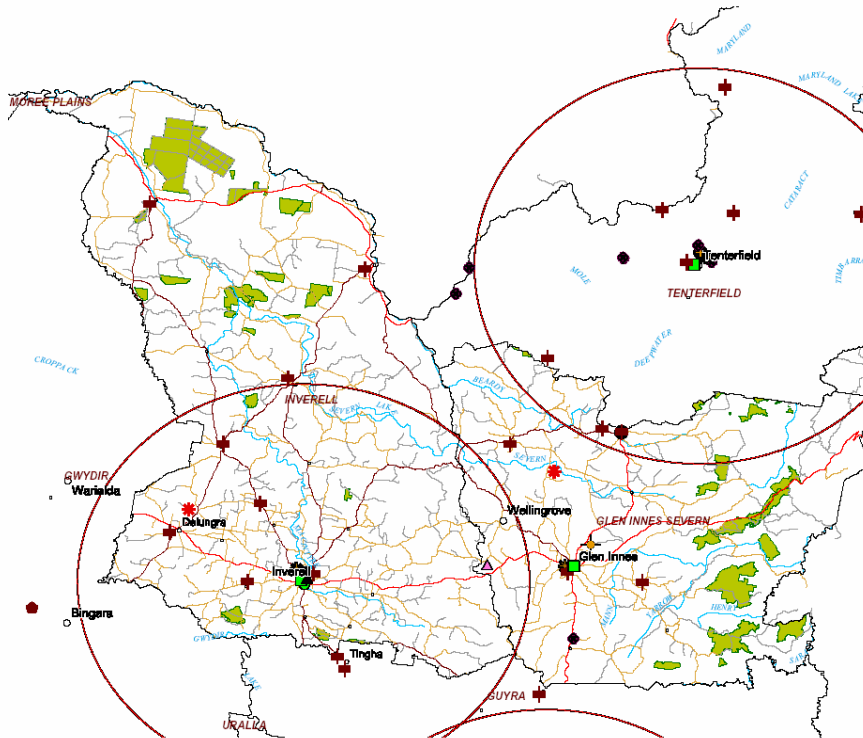
More recently, a feasibility study into partnership building for a regional processing plant was undertaken. The study identified definite interest from small and large scale operators, and a potential for a range of technologies that could be used to capitalise on waste management. Interestingly, the NIRW region covers an expansive area, across which there are clusters of organic waste producers and often a unique composition of waste types.

This business attraction folio outlines the data collated from the 2004 organic waste mapping project. It is designed to publicise the opportunities available for parties with vested interests in developing organic waste industries in the region. The document presents information on waste volumes and industry size/operating scales specific to subregions within NIRW.

The detailed information on organic waste producers that is stored in the Access™ database is subject to Privacy restrictions; however, NIRW is able to work with stakeholders to evaluate resources and opportunities.

Inverell and Glen Innes Severn Local Government Areas

The local government areas of Inverell and Glen Innes Severn contain a range of organic waste producing industries. The distance between the towns of Inverell and Glen Innes is approximately 68km. Most of the industries are located within a distance of 50-60km of either of the towns. The population of Inverell LGA is approximately 15,729 and of Glen Innes Severn is 8,794 (Australian Bureau of Statistics, 2004).



There is one large abattoir in Inverell LGA which processes between 700 to 1,100 head of cattle daily. This facility has a rendering plant as part of the operation. The major wastes from the abattoir are paunch material and sludge.

There are two relatively large cattle feedlots within the two LGA's, with operational scales of 10,000 and 24,000 head of cattle at most times throughout the year. Typical organic wastes include manure, effluent and mortalities. The majority of the manure is composted onsite at the feedlots then applied to surrounding land as fertiliser for crops that are then used to feed the cattle; approximately 20% of manure is sold to local landscaping suppliers.

There are 14 landfills within the two LGA's. Most of the landfills in the Inverell LGA are small rural landfills. Green waste is separated at the Glen Innes landfill but is not composted or mulched at this stage. Green waste is not sorted from other wastes at the other landfills yet.

Table 1. Reported scales of operation

INVERELL				
Industry (No. surveyed in LGA)	Scale of Operation			
Abattoir ★	1	>700	Cattle	Daily
Beef feedlots *	1	10,000	Cattle	Continuously
Food Processing ▲	1	40,000	Tonnes	Annually
Hospitality ●	1	150	Diners	Daily
Landfill +	11	18,000	People	Continuously
Rendering Plant	1			
Supermarket ■	2	21,000	People	Weekly
Sewage Plant ⊕	1	12,000	People	Continuously
Saleyards *★	1	1,500	Cattle	Weekly
GLEN INNES SEVERN				
Industry (No. surveyed in LGA)	Scale of Operation			
Beef feedlots *	1	24,000	Cattle	Continuously
Landfill +	3	8,500	People	Continuously
Supermarket ■	1	9,000	People	Weekly
Sewage Plant ⊕	2	6,300	People	Continuously
Piggeries ▲	1	180	Sows	Continuously
Poultry ●	1	16,000	Birds-Adult	Continuously
Saleyards *★	1	650	Cattle	Weekly

Table 2. Reported annual quantities of organic wastes

INVERELL			
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit
Abattoir	1 Paunch	Not reported	
	Sludge	Not reported	
Beef feedlots	1 Effluent Cattle	25	Megalitres
	Manure Cattle	16,000	Tonnes
	Mortalities	70	Tonnes
Food Processing	1 Grain/Flour	4,000	Tonnes
Landfill	1 Unsorted General Waste	9,200	Tonnes
Supermarket	1 Food Waste	350,400	Litres
Sewage Plant	1 Biosolids [#]	460	Tonnes
	Effluent Human	712	Megalitres

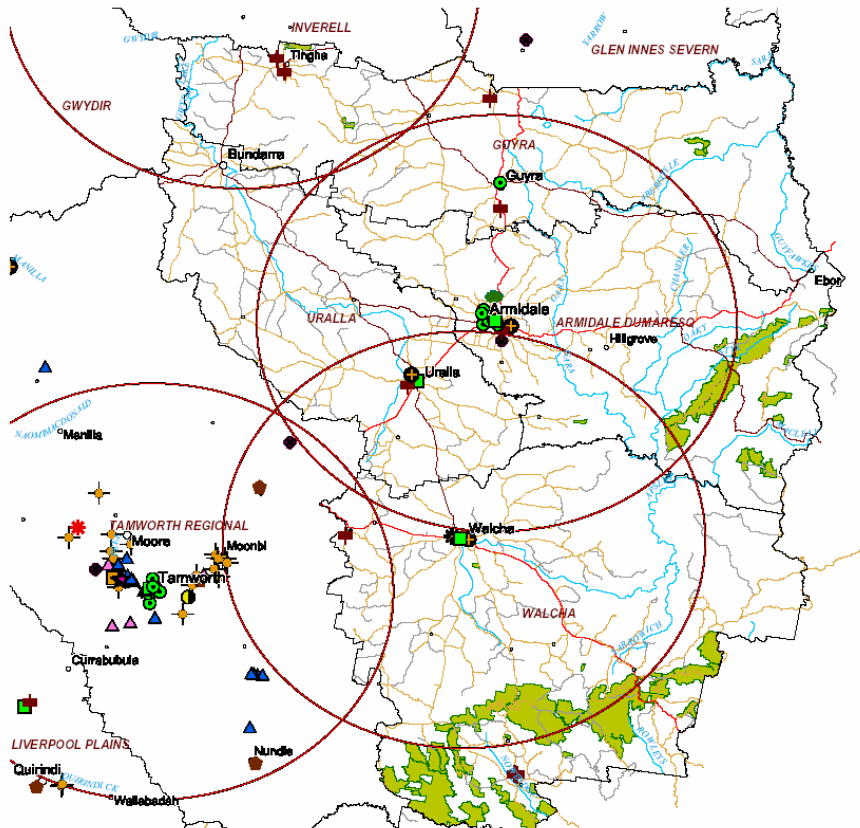
GLEN INNES SEVERN			
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit
Beef feedlots	1 Manure Cattle	45,500	Tonnes
Landfill	2 Green waste	4,000	Cubic Meters
	Oils	6,000	Litres
	Unsorted General Waste	5,100	Tonnes
Supermarket	1 Unsorted General Waste*	312	Cubic Metres
Sewage Plant	2 Biosolids [#]	257	Tonnes
	Effluent Human	740	Megalitres
Piggeries	1 Manure/Effluent	27,9.24	Megalitres
Saleyards	1 Sludge	240	Cubic Meters

*Unsorted General Waste from supermarkets consists of out-of-date produce from all departments including fruit and vegetable, dairy, meat and packaging. Essentially, there is scope for some supermarkets to sort wastes into organic and non-organic waste streams which may then be further utilised.

Volume of biosolids is based on modelled values using the population of the local government area and a conservative value of 0.0802 kilograms of solids per person per day. This calculation does not take into consideration the number of households that are not connected to town sewerage systems.

Armidale, Guyra, Uralla and Walcha Local Government Areas

The majority of organic waste producing industries in the LGA's of Armidale Dumaresq, Guyra, Uralla and Walcha occur within 60km of Armidale city. The image below shows 50km distances between Armidale and surrounding major towns. The population statistics for the four LGA's are: Armidale Dumaresq 24,596; Guyra 4,441; Uralla 6,040 and Walcha 3,261 (Australian Bureau of Statistics 2004).



Livestock industries within the four LGA's consist mainly of saleyards (both sheep and cattle), and one reported piggery at Uralla.

The saleyards for Armidale Dumaresq and Walcha handle relatively consistent numbers of livestock. Manure waste from the saleyards is utilised by Council and private operators.

The Armidale landfill accepts waste from a number of transfer stations including Guyra, Ebor and Wollomombi. Uralla and Walcha LGA's currently manage their own landfills (this may change in the future).

Armidale Dumaresq Council landfill operates a collection service for green waste and offers a range of composted and mulched materials to the community.

The sewage treatment plant in Armidale services a population of approximately 24,000. The treatment plant has a well managed cropping system which utilises the biosolids and wastewater.

The sewage treatment plants in Walcha, Guyra and Uralla operate at smaller scales and are yet to utilise the wastewater or biosolids for land application.

The Walcha LGA is known for its forestry operations from State Forests and private plantations. Liaison with key managers in the forestry industry during the preliminary organic waste study indicated that green waste was available for use and a market for their sale was desirable.

Table 3. Reported scales of operation

ARMIDALE DUMARESQ					
Industry	(Number surveyed in LGA)	Scale of Operation			
Horticulture	1	Not known			
Hospitality	9	50,235	Diners	Weekly	
Landfill	1	26,000	People	Continuously	
Supermarket	2	24,200	People	Weekly	
Sewage Plant	1	26,000	People	Continuously	
Saleyards	1	1,000	Cattle	Weekly	
		1,000	Sheep	Weekly	
Vineyards	1	Not known			

GUYRA					
Industry	(Number surveyed in LGA)	Scale of Operation			
Hospitality	1	1,000	Diners	Weekly	
Landfill	4	1,320	People	Continuously	
Sewage Plant	1	2,200	People	Continuously	
Vineyards	1	60	Tonnes	Annually	

URALLA					
Industry	(Number surveyed in LGA)	Scale of Operation			
Landfill	2	3,700	People	Continuously	
Supermarket	1	500	People	Weekly	
Sewage Plant	1	2,500	People	Continuously	
Piggeries	1	1,990	Growers	Continuously	
WALCHA					
Industry	(Number surveyed in LGA)	Scale of Operation			
Landfill	3	3,300	People	Continuously	
Supermarket	1	500	People	Weekly	
Sewage Plant	1	2,400	People	Continuously	
Saleyards	1	25,000	Cattle	Annually	
		30,000	Sheep	Annually	
Timber Mill	1	300,000	M ³	Annually	

There is one timber mill in Walcha which processes approximately 300,000 m³ of timber annually. A second timber mill is located in Nundle, approximately 70km south-west of Walcha.

Table 4. Reported annual quantities of organic wastes

ARMIDALE				
Industry (No. reported quantities)		Waste type	Annual Quantity	Unit
Hospitality	3	Oils	5,200	L
		Unsorted General Waste	2,810	Kg
Landfill	1	Green waste	9,682	T
		Unsorted General Waste	8,500	T
Sewage Plant	1	Biosolids	720	T
		Effluent Human	1,700	ML
GUYRA				
Industry(No. reported		Waste type	Annual Quantity	Unit
Landfill	3	Biosolids	147	M ³
		Carcasses	120	M ³
		Green waste	330	M ³
		Unsorted General Waste	463	M ³
Sewage Plant	1	Biosolids [#]	130	T
		Effluent Human	140	ML
URALLA				
Industry(No. reported		Waste type	Annual Quantity	Unit
Landfill	2	Cooking Oil	275	L
		Green waste	600	M ³
		Unsorted General Waste	140	T
Supermarket	1	Food Waste	7,800	L
Sewage Plant	1	Effluent Human	155	ML
		Biosolids [#]	176	T
Piggeries	1	Litter Piggery	1,504.8	T
		Mortalities	84	Growers
WALCHA				
Industry(No. reported		Waste type	Annual Quantity	Unit
Landfill	1	Green waste	383	T
		Unsorted General Waste	986	T
Supermarket	1	Food Waste	2,600	L
Sewage Plant	1	Biosolids [#]	95	T
		Effluent Human	187	ML

Tamworth, Gunnedah and Liverpool Plains Local Government Areas

Tamworth Regional Council includes the agricultural towns of Barraba, Manilla, Tamworth and Nundle. The population of the LGA is approximately 56,828 (the Council was formed by an amalgamation of Nundle, Barraba, Manilla and Parry Shire Councils and Tamworth City Council). To the west of Tamworth Regional Council is Gunnedah Shire Council, with a population of 12,287 and adjacent is Liverpool Plains Shire Council with a population of approximately 7,093 (Australian Bureau of Statistics 2004).

There are a wide range of organic waste producing industries within a 30km radius of Tamworth, including poultry operations, piggeries, abattoirs and dairies.

The poultry industry is predominant in the Tamworth region, with operations including broiler, hatcheries, and layer farms.

Organic waste from the poultry industry is made up mostly of litter - chicken manure mixed with straw or rice hulls, and feathers. Broken eggs and chicken mortalities provide additional waste, the latter feeding a rendering plant in Tamworth.

There is little waste left from the poultry abattoir in Tamworth as this goes to the rendering plant for further processing. However, the cattle and lamb abattoirs again both in Tamworth produce offal, paunch and sludge by-products which do not go to the rendering plant.

Three cattle feedlots occur within the combined area of the three LGA's. The two larger feedlots occur within the Liverpool Plains Shire Council and Gunnedah Shire Council.

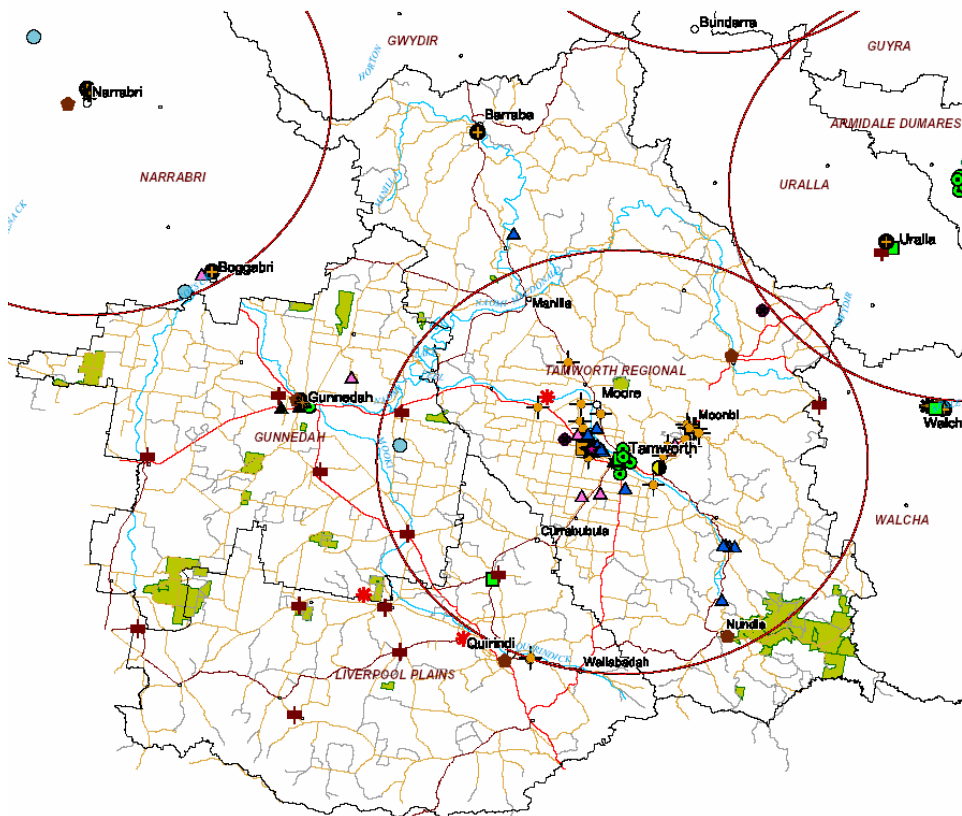


Table 5. Reported scales of operation

TAMWORTH					
Industry (No. surveyed in LGA)	Scale of Operation				
Abattoir ★	3	184,000	Birds-Adult	Daily	
		15,300	Cattle	Monthly	
		3,300	Lambs	Daily	
Beef feedlots *	1	500	Cattle	Continuously	
Dairy ▲	9	1,710	Milkers	Continuously	
Food Processing ▲	4	271,130	Tonnes	Annually	
Hospitality ●	10	11,800	Diners	Weekly	
Landfill +	14	not stated			
Supermarket ■	1	13,000	People	Weekly	
Sewage Plant ⊕	1				
Piggeries ▲	7	3,200	Sows	Continuously	
		5,000	Growers	Continuously	
Poultry ⊕	33	6,593,000	Birds-Adult	Continuously	
		150,000	Growers	Continuously	
Rendering ■	2	210	Tonnes	Daily	
Timber Mill ●	4	497	m ³	Daily	
		20,000	Tonnes	Annually	
Vineyards ⊕	3	450	Tonnes	Annually	

Business Attraction Folio

GUNNEDAH					
Beef feedlots *	1	24,000	Cattle	Continuously	
Food Processing ▲	2	4,600	Tonnes	Annually	
Hospitality ●	1	200	Diners	Weekly	
Landfill +	5	9,001	People	Continuously	
Sewage Plant ⊕	1	9,000	People	Continuously	
Piggeries ▲	2	1,000	Sows	Continuously	
Saleyards ☼	1	2,100	Cattle	Weekly	
Timber Mill ⬮	1	11,000	m ³	Annually	
LIVERPOOL PLAINS					
Beef feedlots *	1	20,000	Cattle	Continuously	
Landfill +	8	8,000	People	Continuously	
Supermarket ■	1	2,000	People	Weekly	
Poultry ●	1	26,000	Birds-Adult	Continuously	
Timber Mill ⬮	1	1,200	m ³	Annually	

Table 6. Reported annual quantities of organic wastes

TAMWORTH				
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit	
Abattoir 2	Blood Dried	312	Tonnes	
	Feathers/Blood/Offal/Bones	32,850	Tonnes	
	Offal	31,200	Tonnes	
	Paunch	2,860	m ³	
	Sludge Abattoir	730	Tonnes	
Beef feedlots 1	Manure Cattle	1,825	Tonnes	
Dairy 4	Effluent Dairy	10,606,900	Litres	
	Manure Cattle	1,825	Tonnes	
	Manure Cattle	73,000	kilograms	
	Manure Cattle	28.8	m ³	
Food Processing 1	Rotten Grain	936	m ³	
	Waste water	129.21	Megalitres	
Hospitality 3	Food Waste	1,560	Kilograms	
	Green waste	27,375	Litres	
	Unsorted General Waste	9,100	Kilograms	
Landfill 12	Green waste	11,270	Tonnes	
	Green waste	2,000	m ³	
	Offal	340	Tonnes	
	Timber Offcuts	700	m ³	
	Timber Offcuts	1,340	Tonnes	
	Unsorted General Waste	15,806	Tonnes	
Piggeries 1	Manure/Effluent	774.8	Megalitres	
Poultry 12	Effluent	6,908,355	Litres	
	Eggs	7,000	Litres	
	Litter Chicken	50,018.9	Tonnes	
	Manure Chicken	2,065.96	Tonnes	
	Mortalities	53,572	Birds	
	Mortalities	224,035	Tonnes	
Rendering 2	Effluent	73,000,000	Litres	
Timber Mill 3	Green waste	3,650	m ³	
	Offcuts	4,460	Tonnes	
	Sawdust	730	m ³	
	Sawdust	3,000	Tonnes	
	Scandling	730	m ³	
	Wood Chips	800	Tonnes	
Vineyards 1	Effluent Winery	5,000	Litres	
	Grape Marc	15	Tonnes	

There are four timber mills in the Tamworth LGA, one in the Liverpool Plains Council and one in Gunnedah Shire Council.

A total of nine piggeries were recorded within the Tamworth and Gunnedah LGA's. The main waste produced from this industry is manure mixed with effluent.

Nine dairy farms were recorded in the Tamworth LGA. Manure from dairies is generally heaped onto a pad and applied over surrounding paddocks.

At the landfills, Tamworth Regional Council sorts and processes green waste into a variety of composted products of different qualities. Gunnedah and Liverpool Plains Councils make green waste available for landscaping in the area.

Of the three vineyards in the Tamworth LGA, one has a winery for grape processing onsite. The by-products from the winery include grape marc (crushed grape skins and seeds) and nutrient rich winery effluent.

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LIVERPOOL PLAINS

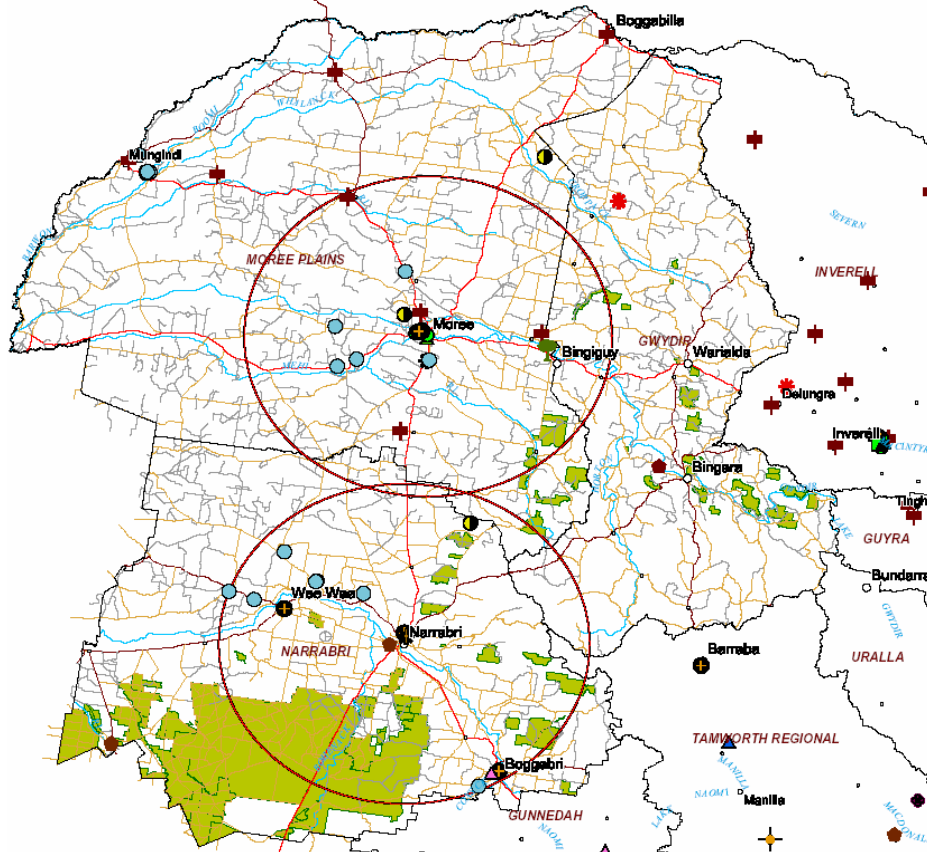
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit
Beef feedlots 1	Effluent Cattle	30	Megalitres
	Manure Cattle	20,000	Tonnes
Poultry 1	Manure Chicken	106,496	Tonnes
Timber Mill 1	Sawdust	912,500	Tonnes

GUNNEDAH

Industry (No. reported quantities)	Waste type	Annual Quantity	Unit
Landfill 5	Green waste	888	Tonnes
	Unsorted General Waste	3,094.4	Tonnes
Sewage Plant 1	Biosolids [#]	140	Tonnes
	Effluent Human	500	Megalitres
Piggeries 1	Manure/Effluent	1,549.6	Megalitres
Saleyards 1	Manure Cattle	125	Tonnes

Moree, Gwydir and Narrabri Local Government Areas

Moree Plains Shire Council is located toward the far north-western section of the NIRW region. Adjacent to the east is Gwydir Shire Council and south is Narrabri Shire Council. The estimated populations of the LGA's are: Moree 16,027; Gwydir 5,166; and Narrabri 14,239 (Australian Bureau of Statistics 2004).



The major organic waste producing industry in this region is cotton gins. There were 13 recorded in the Moree LGA, most of these occur within 40 km of Moree town centre and another two occur on the border of Moree LGA near Mungindi.

Cotton is also a major industry in the Narrabri shire; there are five cotton gins within 50km of Narrabri.

The major waste from the ginning process is cotton trash; this is composed of the stalks and stems of the cotton plant once the lint has been stripped off. It is estimated that cotton trash amounts to approximately 10% of the raw cotton input.

There is one large-scale cattle feedlot in Gwydir Shire, approximately 68km north east of Moree. A second, smaller scale feedlot operates in the Moree LGA; however, the location is not identified on the map.

There are 10 landfills in Moree; green waste is disposed of separately at most.

There are three sewage treatment plants in Narrabri LGA and one in Moree LGA. The treatment plants in Narrabri service approximately 10,800 people and the treatment plant in Moree services a population of approximately 15,000.

Table 7. Reported scales of operation

MOREE PLAINS					
Industry	(No. surveyed in LGA)	Scale of Operation			
Beef feedlots	1	3,500	Cattle	Continuously	
Cotton gins	13	174,955	Tonnes	Annually	
Food Processing	1	90,000	Litres	Annually	
Horticulture	1	2,500	Tonnes	Annually	
Hospitality	2	830	Diners	Weekly	
Landfill	10	12,205	People	Continuously	
Sewage Plant	1	15,000	People	Continuously	
Saleyards	1	1,000	Cattle	Weekly	
Vineyards	1	200	Tonnes	Annually	
Piggeries	1	not known			

GWYDIR					
Industry	(No. surveyed in LGA)	Scale of Operation			
Beef feedlots	2	20,500	Cattle	Continuously	
Piggeries	1	not known			
Timber Mill	1	9,000	Cubic Metres	Annually	

NARRABRI					
Industry (No. surveyed in LGA)	Scale of Operation				
Cotton gins	5	179,800	Tonnes	Annually	
Food Processing	1	1,200	Tonnes	Annually	
Horticulture	1	40,500	kilograms	Annually	
Landfill	1	14,000	People	Continuously	
Sewage Plant	3	10,800	People	Continuously	
Piggeries	3	2,429	Sows	Continuously	
Saleyards	1	700	Cattle	Weekly	
Timber Mill	2	18,500	Cubic Metres	Annually	

Table 8. Reported annual quantities of organic wastes

MOREE PLAINS SHIRE COUNCIL					
Industry	(No. surveyed in LGA)	Waste type	Annual Quantity	Unit	
Beef feedlots	1	Effluent Cattle	40	Megalitres	
		Manure Cattle	3,000	Tonnes	
Cotton gins	12	Cotton Trash	110,315	Tonnes	
Horticulture	1	Husks	800	Tonnes	
		Shell	1,000	Tonnes	
Landfill	10	Green waste	1,345	Tonnes	
		Timber Offcuts	226	Tonnes	
		Unsorted General Waste	12,430	Tonnes	
Sewage Plant	1	Effluent Human	1,000	Megalitres	
		Biosolids [#]	469	Tonnes	
Saleyards	1	Effluent Saleyard	16	Megalitres	
		Manure Cattle	10	Tonnes	
Vineyards	1	Vine Prunings	200	Tonnes	

GWYDIR SHIRE COUNCIL					
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit		
Beef feedlots	1	Effluent Cattle	120	Megalitres	
		Manure Cattle	16,000	Tonnes	
Timber Mill	1	Wood Chips	20,000	Tonnes	

NARRABRI SHIRE COUNCIL					
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit		
Cotton gins	5	Cotton Trash	271,925	Tonnes	
Landfill	1	Carcasses	15	Tonnes	
		Green waste	580	Tonnes	
		Timber Offcuts	234	Tonnes	
		Unsorted General Waste	1,133	Tonnes	
Sewage Plants	3	Biosolids [#]	416	Tonnes	
		Effluent Human	877	Megalitres	
Piggeries	3	Effluent Piggery	15	Megalitres	
		Manure Pig	2,860	Tonnes	
		Manure/Effluent	200.2	Megalitres	
Saleyards	1	Effluent Saleyard	35	Megalitres	
		Manure Cattle	36	Tonnes	
Timber Mill	1	Offcuts	2,250	m ³	
		Sawdust/Shavings	2,000	m ³	

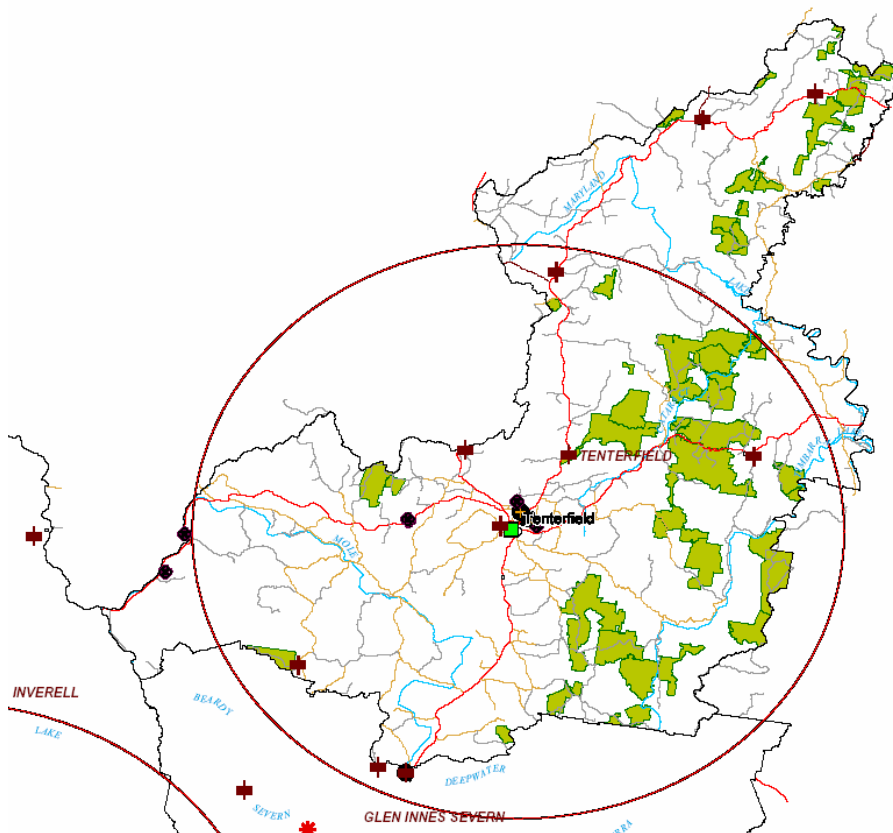
A total of five piggeries were recorded within the Moree, Gwydir and Narrabri LGA's. Scales of operation were not reported by two of the piggeries; however, the three in Narrabri LGA had a combined operational scale of approximately 2429 sows at any one time.

Cattle saleyards were recorded in Narrabri and Moree LGA's. The reported operational scales were 700 and 1,000 head of cattle weekly for Narrabri and Moree respectively.

There was one timber mill in Gwydir LGA, approximately 10km west of Bingara. The reported scale was 9,000m³ of timber processed annually. Of the two timber mills in Narrabri, the combined reported operational scale was 18,500 m³ of timber annually.

Tenterfield Local Government Area

Tenterfield LGA is located at the far northern reaches of the NIRW region, and is approximately three hours drive from Brisbane. The estimated population of the LGA is 6,785 (Australian Bureau of Statistics 2004).



Tenterfield LGA supports 8 landfills, most of which separate green waste from other wastes. It was reported that approximately 100 tonnes of green is available from the combined landfills.

The reported scale of operation for Tenterfield saleyard was 25,000 head of cattle per annum (approximately 470 weekly). The associated volume of manure was estimated to be at least 70 m³ per annum; most of this is stockpiled onsite and collected for use in garden landscaping.

One piggery in the LGA was recorded; however, the scale of operation or volumes of waste were not reported.

There were at least five vineyards which when combined produce 338 tonnes of grapes per year. Two of the vineyards gave an indication of the green waste (vine prunings) which amounted to 81 tonnes of vine prunings per annum.

Table 9. Reported scales of operation

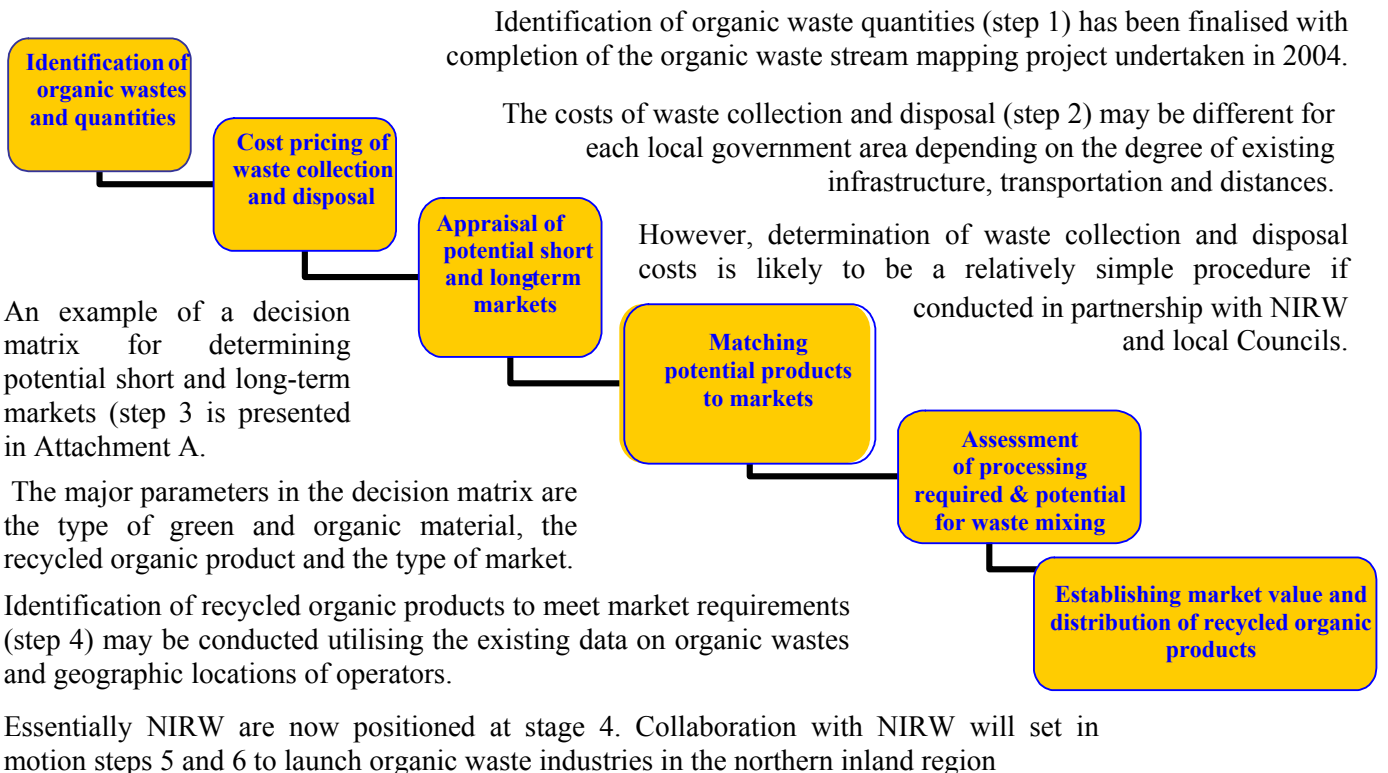
TENTERFIELD					
Industry	(Number surveyed in LGA)	Scale of Operation			
Landfill	8	5,900	People	Continuously	
Supermarket	1	2,000	People	Weekly	
Sewage Plant	1	2,400	People	Continuously	
Piggeries	1	not stated			
Saleyards	1	25,000	Cattle	Annually	
Vineyards	5	338	Tonnes	Annually	

Table 10. Reported annual quantities of organic wastes

TENTERFIELD					
Industry (No. reported quantities)	Waste type	Annual Quantity	Unit		
Landfill	Green waste	100	Tonnes		
	Unsorted General Waste	2,100	Tonnes		
Markets	Food Waste	7,800	Litres		
Sewage Plant	Effluent Human	237	Megalitres		
	Biosolids [#]	198	Tonnes		
Saleyards	Manure Cattle	70	Cubic Metres		
Vineyards	Vine Prunings	81	Tonnes		

Where to from here?

Selection of an organic waste management strategy within a town or region may be assisted using the following decision making process:



Department of State and Regional Development

The New South Wales Department of State and Regional Development (DSRD) is the first point of contact within government for companies wishing to do business in regional New South Wales.

The Department works with businesses to save them time and money when establishing or expanding:

- offering tailored assistance to help them set up and grow in NSW,
- providing a wide range of business and investment information for international and local companies,
- assisting business to find new markets for their products and services,
- attracting and sustaining investment projects,
- organising trade missions for NSW business to help them establish themselves in the international economy,
- delivering enterprise improvement programs that enhance international competitiveness, and
- driving policy change to improve the business climate in NSW.

Contacts

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Data Limitations

A number of limiting factors were encountered during the 2004 organic waste survey that are likely to affect the accuracy of the data. Main factors included the willingness of producers to participate in the survey, willingness to disclose true operational scales of the business and ability to estimate quantities of waste produced. The success of reaching individual producers and organisations from each industry group is presented in Table 11. In general, the major operators were more willing to participate in the survey and provide accurate data compared to smaller scale operators.

Table 11. Survey performance data by industry type.

Survey Performance by Industry Type	Base Number	Called & Completed	Declined	Closed	Too Small*	Non-contactable	% Successful	% Declined	% Closed	% Too Small	% Non-contactable	% Unsuccessful
Abattoirs	5	3	1			1	60	20			20	40
Beef Feedlots	12	8	1		2	1	67	8		17	8	33
Broad Acre Crops	29	7	8	1		13	24	28	3		45	76
Cotton gins	20	18	2				90	10				10
Dairies	16	9	4	3			56	25	19			44
Food processors	25	9	9	2		7	36	36	8		28	72
Horticulture	25	3	12	1	3	6	12	48	4	12	24	88
Hospitality	33	23	2		1	7	70	6		3	21	30
Logging operations	3	3					100					0
Municipal waste	85	83				2	98				2	2
Sewage treatment plant	19	16				3	84				16	16
Piggeries	25	14	3	3		5	56	12	12		20	44
Poultry broiler	31	23	2		1	5	74	6		3	16	26
Poultry egg	17	12		1	1	3	71		6	6	18	29
Rendering plants	3	2	1				67	33				33
Saleyards	11	8				3	73				27	27
Supermarkets	40	10	19			11	25	48			28	75
Timber mills	16	10	1	3	2		63	6	19	13		38
Wineries/Vineyards	24	11	7			6	46	29			25	54
Total	439	272	72	14	10	73	62%	16%	3%	2%	17%	38%

*Industries labelled as *Too Small* were below the specified operational scale threshold; for example two beef feedlots held <1000 head of cattle. The list of survey thresholds is available in the Organic Waste Stream Mapping document (E.A. Systems Pty Ltd, 2004).

Data on quantities and volumes of organic wastes produced were recorded from telephone surveys with site managers of each organisation. Producers had highly varied abilities to report on the quantities of waste generated. However, various mathematical models are available to predict waste volumes, particularly for livestock industries. E.A. Systems have used some simple models to calculate waste quantities based on the scales of operation (refer to Attachment B); details are available in E.A. Systems Pty Ltd (2004).

Attachment A

Selection matrix for green and organic processes based on sustainable markets.

Process	Raw Material	Product	Solids content (%)	Market	Processing cost (\$/dry solid tonne)
Shredding	Green waste	Tritter Forest mulch	50-70	Home garden Landscape Dune reclamation	\$30
Composting	Green waste	Compost	50-55	Landscape Horticulture Home garden Agriculture	\$100 (plus shredding cost)
Co-composting	Organics Reject paper Biosolids	Compost Soil humus amender	55	Horticulture Home garden Agriculture Forestry Minesite rehabilitation Landfill rehabilitation	\$100 open windrow (plus \$300 dewatering) \$350 in-vessel composting (plus dewatering)
Thickening	Biosolids Liquid organics	Thickened slurry	3-6	Agriculture Forestry	\$50-60
Dewatering	Biosolids Liquid organics	Dewatered cake	11-35	Agriculture Forestry Minesite rehabilitation Landfill rehabilitation	\$60 (plus dewatering)
Vermiculture	Green waste (screened) Organics Reject Paper Biosolids	Vermicast liquid		Horticulture Agriculture Forestry	Unable to verify
Lime stabilisation	Green waste (screened) Organics (domestic and industrial) Reject paper biosolids	Lime amended organic	35-60	Horticulture (acid soils only) Agriculture (acid soils only) forestry	\$400-500 (plus dewatering)
Thermal drying	Green waste (screened) Organics Reject paper biosolids	Dried pellet		Horticulture Agriculture Forestry	\$600-700 (plus dewatering)
Energy recovery	Low-quality green waste Low-value fibrous organic wastes Reject paper and cardboard Industrial biofuels (timber, sawdust, cardboard) Agro-industrial fibrous wastes and by-products	Steam Heat Hot water electricity		Green energy Green power	\$1 million/megawatt of energy

(Source: QLD EPA, 2002, Green & Organic Waste Processing and Marketing in Queensland, Queensland Government Environmental Protection Agency).

Attachment B

The volumes of biosolids were calculated using the population of the local government area and a conservative value of 0.0802 kilograms of solids per person per day. This calculation does not take into consideration the number of households that are not connected to town sewerage systems.

Standard livestock units and predicted nutrient outputs.

Table A: Conversion factors for standard livestock units

Industry	Sub-industry	Livestock Unit		Conversion Factor
		Reported	Standardised	
Beef Feedlots		Head	Standard Cattle Unit	1.0
Dairies		Head	Head	1.0
Piggeries	Breeder and Grower	Sows	Standard Pig Unit	10.0
	Breeder	Sows		3.2
	Grower	Growers		1.3
Poultry	Caged layer	Birds	Birds	1.0
	Free range layer	Birds		1.0
	Broiler	Birds		1.0

Annual nutrient output for standard livestock units may be calculated based on published values of nutrient output 1, 2, 3. (Casey *et al.* 2003, Skerman 2004, McGahan *et al.* 2002 and Western Australia Department of Environment, 2004). These values are outlined in Table B.

Table B: Annual volume & nutrient outputs for standardised livestock units. All values are kg/yr for single livestock units. SCU = standard cattle units, SPU = standard pig units, DSE = dry sheep equivalent.

Industry	Unit	Waste Source	Waste Types	Total Solids	Volatile Solids	N	P	K
						(kg/yr)		
Beef Feedlots	SCU	Cattle Pens	Manure	805.65	562.10	18.00	8.00	24.00
Dairies	Head	Milking shed wastewater	Raw effluent stream	237.25	200.75	9.80	1.30	8.90
			Pond Effluent			4.41	0.65	8.01
			Pond Sludge			1.96	0.65	0.89
Piggeries	SPU	Wet based sheds	Raw effluent stream	110.0	91.0	9.50	3.10	2.60
			Pond Effluent			4.28	0.31	1.56
			Pond Sludge			2.38	2.79	1.04
Poultry	1.0	Caged layer sheds	Manure	15.60	10.92	0.72	0.31	0.33
	1.0	Free range layers	Manure/litter	20.80	14.56	0.85	0.29	0.44
	1.0	Broiler sheds	Manure/litter	23.40	16.38	0.61	0.42	0.23
Saleyards	SCU	Cattle pens	Manure	805.65	562.10	18.00	8.00	24.00
	DSE	Sheep pens	Manure	92.00				

References:

- Casey, K.D., McGahan, E.J., Atzeni, M.A., Gardner, E.A. and Frizzo, R.E. (2003), PIGBAL, version 3.1, Queensland Department of Primary Industries, Toowoomba, QLD.
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- Western Australia Department of Environment, (2004), ENVIRONMENTAL CODE OF PRACTICE FOR POULTRY FARMS (draft), Western Australia Department of Environment, Western Australian Broiler Growers Association, and Poultry Farmers Association of Western Australia, Perth, WA., p. 59.