

FOUR ARROWS ETHANOL PTY LTD : *Herd Methane Calculations*

Notes : The research detail and data accuracy is simply not available to provide reliable and highly defensible outcomes
: Notwithstanding, the following spreadsheet provides a sound measure of the broad quantum of greenhouse gas emissions

<u>Ethanol plant</u>										Credits	Debits
GHG balance from CSIRO model assuming CO ₂ capture & sale										275.19	Kt if all CO ₂ captured
(= production & delivery of grain to eventual usage by fuel users)										98.17	Kt if no CO ₂ captured
say 40% captured										168.98	Kt
<u>Dairy cattle</u>											
Methane - digestive emissions											
		multiplier	21	CO ₂ equivalents							
		emission rate	8	Kg CH ₄ per dse/year (good nutrition)							
		factor for project	1								
cows	7,200	hd @	18.0	dse/hd	21.77						
calves	4,563		2.7		2.07						
heifers	1,889		5.0		1.59						
3 to 9 mths	1,813		9.0		2.74						
9 to 15 mths	1,070		13.0		2.34						
15 to 20 mths	1,990		15.0		5.01						
first calf											
	<u>18,525</u>	hd			<u>35.52</u>	Kt					35.52 Kt
Methane - manure emissions											
		multiplier	21	CO ₂ equivalents							
		emission rate	65	Kg CH ₄ per dse/year (feedlot basis)							
		factor for project	0.25	manure carted off site and spread asap							
				minimal mass under anaerobic conditions							
cows	7,200	hd @	18.0	dse/hd	44.23						
calves	4,563		2.7		4.20						
heifers	1,889		5.0		3.22						
3 to 9 mths	1,813		9.0		5.57						
9 to 15 mths	1,070		13.0		4.75						
15 to 20 mths	1,990		15.0		10.19						
first calf											
	<u>18,525</u>	hd			<u>72.15</u>	Kt					72.15 Kt
<u>Feed supply to cattle</u>											
Irrigation - fixing											
maize silage	1,500	ha	40.0	t/ha/yr CO ₂ fixed	5%	Seq'd =	3.00	Kt			
maize grain	1,000		40.0		5%		2.00				
winter cereals	1,000		18.0		5%		0.90				
Total sequestered							<u>5.90</u>	Kt		5.90	Kt
Irrigation - emissions											
maize silage	1,500	ha	300	kg N	0.5%	N ₂ O emitted	2.25	Kt N ₂ O			
maize grain	1,000		300		0.5%		1.50				
winter cereals	1,000		80		0.5%		0.40				
Total N ₂ O emitted							<u>4.15</u>				
N ₂ O multiplier to CO ₂ equivalents							310				
Total emissions							1,286.50	Kt CO ₂ equiv			
Proportion not already being generated by current crops							5%				
Net increase in emissions							64.33	Kt CO ₂ equiv		64.33	Kt
Totals										<u>174.88</u>	<u>172.00</u>
Net increase in emissions										-2.88	Kt