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Canberra, Australia

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# Anti-Dumping Investigation

## Formulated Glyphosate

### Industry presentation to Customs and Border Protection

# Anti Dumping Application

## Australian Industry

- Nufarm and Accensi represent approximately 85% of Australian production of formulated glyphosate products.
- Other Australian manufacturers include:
  - Autopak
  - Cheminova/Ospray
  - Intec
- Since the closure of Monsanto's glyphosate acid (Technical) plant in 2002, local manufacture has involved the amination and formulation of imported glyphosate acid.

# Anti Dumping Application

## Chinese Exports

- In mid 2010 Chinese govt. Made changes to VAT export rebate arrangements for glyphosate products.
  - Revoked 9% VAT export rebate on Glyphosate acid; and
  - Maintained the 5% VAT export rebate on formulated glyphosate products and “manufacturing concentrates” (i.e. Salts of glyphosate)
- From September 2010 there has been a major shift to the exportation of formulated glyphosate products from China.
- In 2010/2011 Chinese imports of formulated glyphosate products grew by almost 400%.
- Market share of Chinese formulated glyphosate products also grew significantly, resulting in a 25% reduction in the market share of Australian producers.

# China

## knowledge of China

- Nufarm formulated glyphosate products are sold into Chinese distribution
- has provided to Chinese glyphosate manufacturers and has a good understanding of the cost of production.

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# Glyphosate – Global Snapshot

## Historic Market Overview

Global Data	2005	2006	2007	2008	2009	2010	2011	
Sales	US\$ million	3,410	3,820	5,020	6,600	4,950	4,080	4,610
RELS (R66)/L	Litre million	897	1,085	1,385	1,412	1,441	1,583	1,750
95% Tech	Mt	322,830	390,774	498,445	508,414	518,582	570,000	630,000

-Philips McDougall AgrService Data 2010 & Interim Updates.

EXPORTS	2008 Volume	2008 Ave US\$	2009 Volume	2009 Ave US\$	2010 Volume	2010 Ave US\$	2011 Volume	2011 Ave US\$
41% IPA	78,499,113	\$3.65	126,945,160	\$1.62	114,232,313	\$1.58	187,082,814	\$1.72
51% IPA					21,719,047	\$2.00	28,672,206	\$2.24
62% IPA	75,818,414	\$5.09	46,982,928	\$2.10	37,209,138	\$2.10	42,967,304	\$2.27
75.7% WP	2,192,305	\$8.74	5,291,188	\$3.65	6,577,308	\$3.29	11,413,301	\$3.43
95% Tech	231,962,929	\$9.78	230,708,305	\$3.26	209,467,429	\$3.02	191,036,274	\$3.56
<b>Total 100%</b>	<b>293,353,649</b>		<b>295,304,336</b>		<b>263,405,454</b>		<b>276,644,339</b>	

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Glyphosate – Global Snapshot  
Top 5 Export Markets for China Glyphosate

China Exports 2010	41% IPA Kg	51% IPA Kg	62% IPA Kg	75.7% WP Kg	95% Tech Kg	100% AI Kg
Argentina	1,957,240	-	17,280	7,409,204	55,530,080	58,536,963
United States	4,202,593	-	3,469,248	-	40,712,206	41,543,435
Brazil	2,476,707	-	2,418,299	-	23,793,325	24,464,860
Australia	3,807,352	28,672,206	462,860	2,009,399	7,124,421	20,322,399
Thailand	22,720,856	-	9,844,290	-	1,361,718	12,699,250

China Exports 2010	41% IPA Kg	51% IPA Kg	62% IPA Kg	75.7% WP Kg	95% Tech Kg	100% AI Kg
Argentina	135,053	-	205,184	2,334,960	58,562,115	57,375,855
United States	5,732,254	-	3,518,098	-	38,415,585	39,847,501
Australia	5,118,681	21,719,047	1,521,947	861,860	14,390,361	24,698,831
Brazil	320,888	-	326,464	-	17,699,023	17,061,251
Malaysia	968,403	-	348,203	123,000	17,079,560	16,763,558

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# Glyphosate – China Snapshot

## Historic Production Development

- 1973: Shenyang Chemical Research Institute begin research on synthesis of glyphosate through chloromethyl phosphonic acid route (CPA)
- 1977: Shenyang abandon CPA method due to high pressure and risks of explosions and carry out research on new routes. IDA pathway is adopted with a yield of 81.6% glyphosate technical (also known as glyphosate acid).
- 1980: Shenyang work with Zhenjiang Jiangnan on IDA pathway and develop pilot production line to produce 10% glyphosate ammonium formulations.
- 1986: Shenyang research and adopt AEA or Glycine route with yield of 95% glyphosate technical.
- 1986: Shenyang also work with Guangxi Chemical Research Institute independently on oxidation of PMIDA to produce 95%+ glyphosate technical.
- 1987: Shenyang finish pilot plant on AEA route and transfer technology to Jiande Pesticide Factory and Zhenjian Jiangnan
- 1995: Shenyang cooperate with Zhejiang Xinan (also known as Wynca) on 5,000 Mt per annum IDA pathway glyphosate technical plant.
- 2005: Xinan acquires Zhenjiang Jiangnan and becomes largest China producer.

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## Glyphosate – China Snapshot

### Historic Formulation Development

- 1980's: Chinese companies start production 10% SL glyphosate ammonium formulations.
- 1990's: Chinese companies continue with sales of 10% SL glyphosate formulations. The waste stream or mother liquor from the glyphosate technical manufacturers is disposed of in the 10% glyphosate formulations. The waste items in mother liquor create crusting or agglomeration of the soil where it is applied and retard subsequent plant growth of the crops grown.
- Mid 1990's: Foreign companies begin to register 360 g/L formulations in China and promote. These formulations are more effective and are more cost efficient. Domestic companies follow with their own 360 g/L formulations.
- 2007: There are 190 registered formulations of 10% SL in China. (CCM data)
- 2010: Glyphosate Manufacturers and Formulators are no longer permitted to sell 10% SL formulations in China. The authorities increase policing of waste water treatment of the glyphosate technical manufacturers.
- 2011: There are 367 registered formulations of 360 g/L in China. (CCM data)
- 2012: Retailers are no longer permitted to sell 10% SL as 2 year sell out ends.



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# Glyphosate – Common Formulations

## Formulation Specifications

IPA Formulation or Manufacturing Concentrate (MC)	g/L as Glyphosate Acid (w/v)	g/L as Glyphosate IPA salt (w/v)	Specific Gravity (SG)	% w/w as Glyphosate Acid	% w/w as Glyphosate IPA salt
Glyphosate 360 (41%)	360	486	1.174	31.0	41.4
Glyphosate 450 (51%)	450	607	1.204	37.3	50.4
Glyphosate 62% MC	570	766	1.240	47.5	62.0

Potassium (K) Formulation	g/L as Glyphosate Acid (w/v)	g/L as Glyphosate K salt (w/v)	Specific Gravity (SG)	% w/w as Glyphosate Acid	% w/w as Glyphosate K salt
Glyphosate 510	510	567	1.335	38.2	42.5
Glyphosate 540	540	600	1.355	39.9	44.3

Ammonium Formulation	g/Kg as Glyphosate Acid (w/v)	g/Kg as Glyphosate NH <sub>4</sub> salt (w/v)	Specific Gravity (SG)	% w/w as Glyphosate Acid	% w/w as Glyphosate NH <sub>4</sub> salt
Glyphosate 690	690	759	n/a	69	75.9
Glyphosate 875	875	962	n/a	87.5	96.2

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## Glyphosate – Formulations

## China Standard Product:

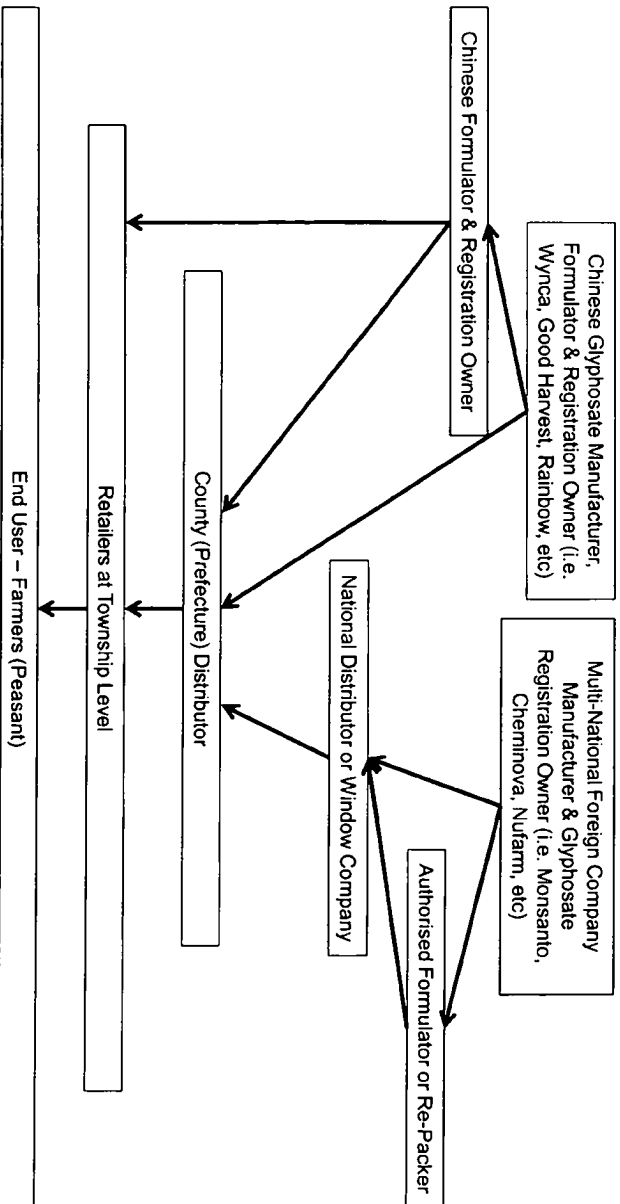
- 360 g/L Glyphosate Acid
- Iso-Propyl Amine (IPA) salt
- Added surfactant to assist with:
  - reduction in surface tension to improve contact on leaf surface for enhanced penetration
  - reduction in chemical loss
- Typically packed in 200 mL & 1 L bottles
- Used as a knockdown herbicide to kill grass and broadleaf weeds
- Applied in orchards and small holder fields
- 2007 consumption was reported as 40 million L (CCM Data 2008)

## Australia Standard Product:

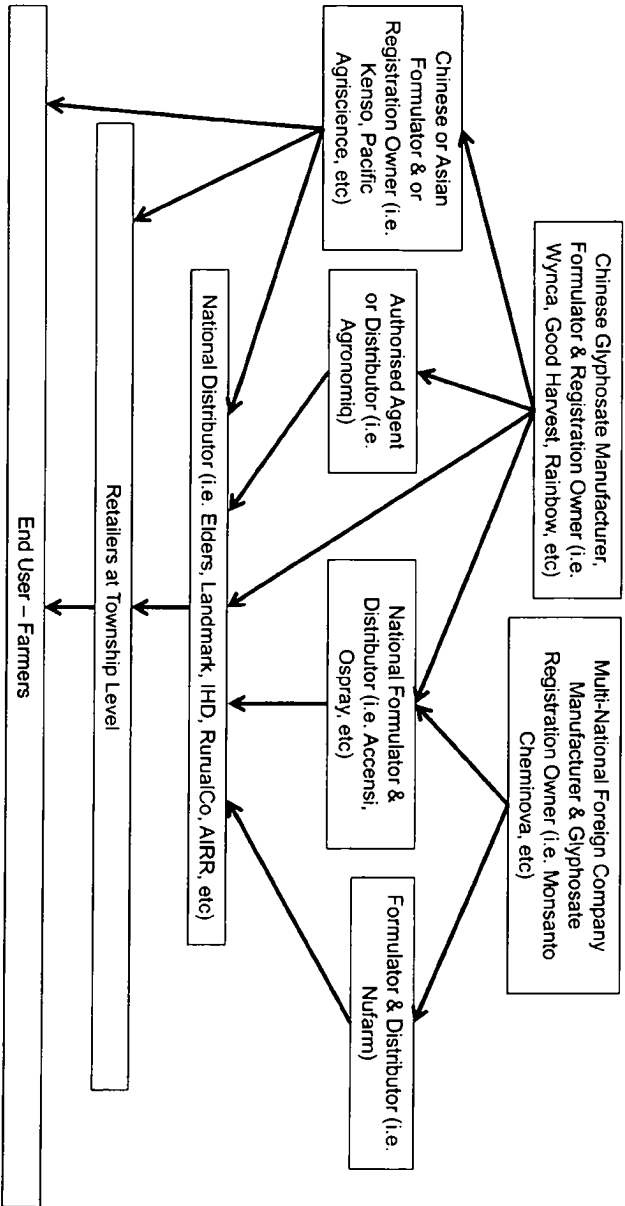
- 450 g/L Glyphosate Acid
- Iso-Propyl Amine (IPA) salt
- Added surfactant to assist with:
  - reduction in surface tension to improve contact on leaf surface for enhanced penetration
  - reduction in chemical loss
- Typically packed in 20L, 110L and 1000L containers
- Used as a knockdown herbicide to kill grass and broadleaf weeds
- Applied in broad-acre fields prior to sowing
- 2011 consumption is estimated at 40 to 50 million L

# Glyphosate – China Market

## Market Structure for Glyphosate



# Glyphosate – Australian Market Market Structure for Glyphosate



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Average 41% IPA Prices – China Domestic Prices

					Distributor (RMB)	Retailer (RMB)	Farmer (RMB)
Welldone	Glyphosate 41% IPA	Tianwang Nongda	2010	200 ml			
				1L			
			2011	200 ml			
				1L			
Wynca	Glyphosate 41% IPA	Nong Wang	2010	200 ml			
			2011	200 ml			
Good Harvest	Glyphosate 41% IPA	Good Harvest	2010	200 ml			
			2011	200 ml			

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Glyphosate – China Domestic Prices  
Average 33% Ammonium Prices

Brand	Chemical	Harvest	Year		Quantity	Country of Distributor (RMB)	Retailer Price (RMB)	Retailer Price (Farmer Price) (RMB)
			2010	2011				
Welldone	Glyphosate 33% Ammonium	No Brand	2010	200 g				
				1Kg				
			2011	200 g				
				1Kg				
Good Harvest	Glyphosate 33% Ammonium	Silver Harvest	2010	1Kg				
				1Kg				
			2011	1Kg				

Source: Nufarm Company Data & Interviews.

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Glyphosate – Chinese Producers

Wynca

Company: Zhejiang Xinan (Wynca) Chemical Industrial Group Co., Ltd

Glyphosate Production Route: AEA Glycine Route

Glyphosate Production Capacity: 70,000 Mt per annum

Exports	41% IPA L	51% IPA L	62% IPA Kg	75.7% WP Kg	Tech 95% Kg	100% AI Kg
2011						
2010						
2009						
2008						
Exports AU	41% IPA L	51% IPA L	62% IPA Kg	75.7% WP Kg	Tech 95% Kg	100% AI Kg
2011						
2010						
2009						
2008						

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Good Harvest  
**Glyphosate – Chinese Producers**

Company: Jiangsu Good Harvest Weien Agrochemical Co., Ltd.

Glyphosate Production Route: DEA IDA Route

Glyphosate Production Capacity: 32,000 Mt per annum

Exports	41% IPA L	51% IPA L	62% IPA Kg	75.7% WP Kg	Tech 95% Kg	100% AI Kg
2011						
2010						
2009						
2008						
Exports AU	41% IPA L	51% IPA L	62% IPA Kg	75.7% WP Kg	Tech 95% Kg	100% AI Kg
2011						
2010						
2009						
2008						



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Glyphosate – Chinese Producers

Rainbow

Company: Shandong Weifeng Rainbow Chemical Co., Ltd

Glyphosate Production Route: Glycine & IDA

Glyphosate Production Capacity: 20,000 Mt & 20,000 Mt per annum

	Exports	41% IPA	51% IPA	62% IPA	75.7% WP	Tech 95%	100% AI
		L	L	kg	kg	kg	kg
2011							
2010							
2009							
2008							
<b>Exports AU</b>	<b>41% IPA</b>	<b>51% IPA</b>	<b>62% IPA</b>	<b>75.7% WP</b>	<b>Tech 95%</b>	<b>100% AI</b>	
	L	L	kg	kg	kg	kg	kg
2011							
2010							
2009							
2008							

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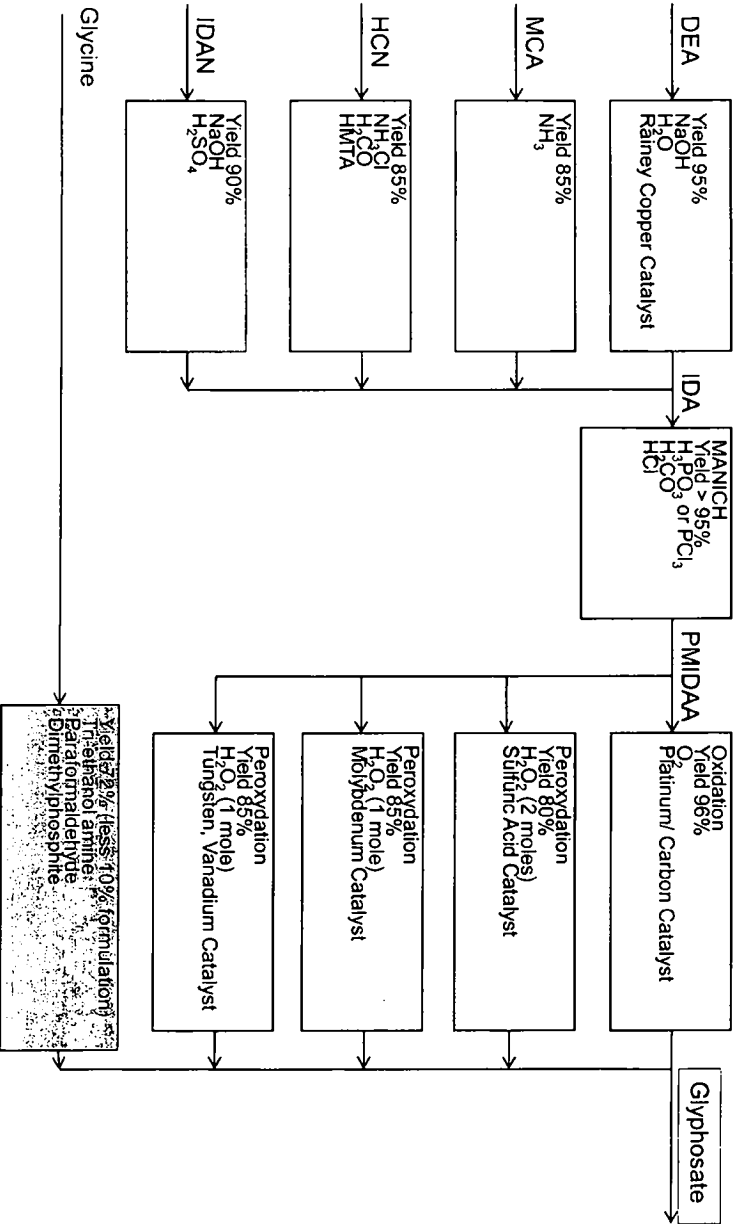
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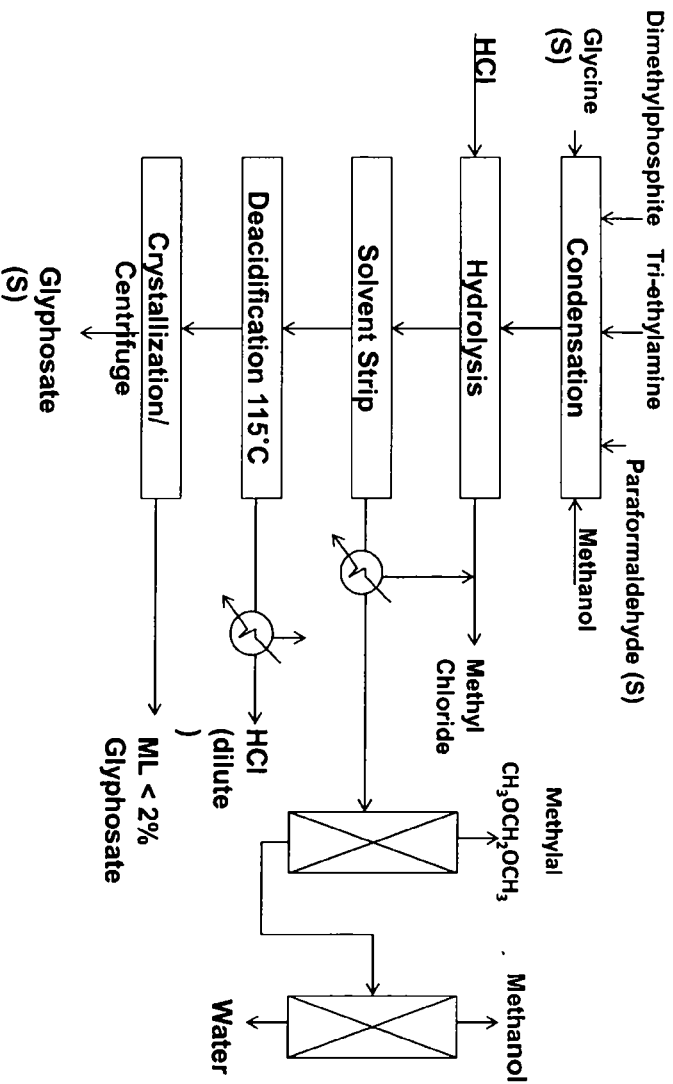
# **Glyphosate Synthesis and Formulation**

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# Routes of Manufacture



# Glyphosate technical – Glycine route



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# Glyphosate technical – Glycine route

**Key Raw Materials Consumed:**

- Dimethylphosphite (DMP) – Reaction step is  $P_4 + Cl$  to  $PCl_3$  + Methanol to DMP
- Glycine – Purchased raw material
- Paraformaldehyde – Purchased raw material

**Key Raw Materials Used and Partially Recovered:**

- Tri-ethylamine (TEA)- catalyst (recovered through the Mother Liquor)
- Methanol – carrier
- HCl - reagent

**Key By-Products Recovered:**

- Methyl Chloride – Income Generating
- Methylal – Income Generating
- Mother Liquor – Income Generating

# Glyphosate technical routes

- Good Harvest use the IDA route
- Rainbow have both IDA and Glycine route plants, but the IDA route plant has been shut down for over a year, because it was deemed uneconomic to run compared to their Glycine route plant
- Relative prices of raw materials continually shift, but it is generally considered that the IDA route is slightly more expensive, with catalyst recovery being critical. This results in a slightly higher sales for the dry technical, typically around USD 0.10-0.20/kg FOB Shanghai, currently.

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## Wynca

- Wynca is currently the largest producer of Glyphosate technical and formulated products in China and a close relationship has been maintained with them, albeit on a more direct commercial basis.

# DMP intermediate costs

Energy Cost	Unit	Quantity	Price	Value	Unit	Quantity	Price	Value
Electricity								
Water								
Gas								
Oil								
Coal								
Other Fuels								
Other								
Labor Cost								
Direct Wages								
Overhead								
Material								
Supplies								
Transportation								
Maintenance								
Insurance								
Depreciation								
Other								
By-products								
Other								
Cost								

PCIA price DMP Price Oystertown FOB





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# Glyphosate technical costs

Item Name (Overall V.I.)	Cost	Percentage of Total Cost
Production		
Raw Materials		
Manufacturing		
Overhead		
Research & Development		
Marketing		
Administrative		
Other		
Profit		
Total Cost		100%

UNIT 1  
 10/15/2010  
 10/15/2010  
 10/15/2010  
 10/15/2010

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# Technical by-products contributions

By-product	Formula	Volume (t/t Gly)	Unit price (RMB/t)	Contribution (RMB/t Gly)	Main market
Methylal/Formal	(CH <sub>3</sub> O)CH <sub>2</sub>	0.45	3,248	1,462	Solvent, resins
Methyl chloride	CH <sub>3</sub> Cl	0.95	3,418	3,247	Organosilicones
DMP residue	H <sub>3</sub> PO <sub>4</sub>	0.07	3,846	269	Phosphates
Total				4,978	



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# Glyphosate formulation costs

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**Important issues to keep in mind**

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# Surfactants - local and imported

- Imported surfactants are not normally used for Glyphosate formulations in China for domestic sales, because of the significantly higher cost (approximately double, as seen in the earlier slide). While some exported formulations can be made with local (Chinese) surfactants they have unproven efficacies in the receiving country
- In the examples shown, the use of a local surfactant rather than the imported one saved 15 cents/litre.
- Further savings can be made by reducing the addition rates below the 120gpl level shown. Decreasing this, for example, to 100 gpl would save an additional 2 cents/litre, although at risk of reduced efficacy
- Products exported to Australia are made using imported (not Chinese) surfactants.

## Ammonia – replacement of MIPA

- Glyphosate formulations can be made using ammonia in complete or partial replacement for the significantly more expensive MIPA.
- Providing the correct surfactants are selected, the efficacies can be maintained. There would be loading (concentration) issues associated with the use of ammonia.
- These particular products are not registered for sale and application in Australia.

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# Mother liquor from Glycine route

- Mother liquor from centrifuges used in Glycine route Glyphosate technical acid production used to be concentrated (usually by evaporation) and then formulated to produce a low cost 10% Glyphosate product, very popular with Chinese farmers. This recovered an extra 1-2% of Glyphosate acid.
- However, this contained numerous undesirable contaminants, so production has been banned and finally, from 1 January 2012, sale has been banned. Minimum concentration of **Glyphosate acid** in the formulation must now be 30% w/w.
- It is possible that some mother liquor is still being blended into the 30% w/w.
- In 2002, Mother liquor was the main product sold in China. This is no longer the case. We would seriously doubt any claim by exporters that they sell Mother liquor. If they did, its likely to be “run-out” pricing.



# Concentration

- Prices can vary quite significantly due to concentration.
- Important to check concentrations to ensure that appropriate comparison with export products can be made.
- We expect 360 gpl product to be selling from the manufacturer to distribution at the 18 RMB per litre level.
- While there may be unit prices as low as 12 RMB per litre in sales records, these sales will be of ammonia salts. That is a 33% not 41% concentration.

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## Due Allowances

- Difference in export and domestic concentrations
  - 450 g/l export
  - 360 g/l domestic
  - Equates to factor of 1.25
- Difference in surfactants
  - Export quality surfactants add approximately 15 cents/litre
- Trading terms
  - Cash terms on domestic sales
  - 90 to 180 days on export sales

## Due Allowances

- Export sales commissions
  - 5% (Good Harvest)
- Export VAT Rebate
  - Quoted domestic sales prices are exclusive of the 17%
  - Export sales prices include 17% VAT less the 5% export VAT rebate. Hence, export prices include a net 12% VAT.
- Pack size
  - Domestic packaging is smaller
  - Lower cost of 1000 litre export IBCs may be offset by manual packing cost.