GLOBAL UPDATE ON SLOW-RELEASE FERTILIZERS

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Introduction

Slow-release fertilizers include manufactured CRFs and processed natural organic materials, both of which provide the slow release of nitrogen (N).

- ♦ Manufactured CRFs and processed natural organic materials compete with lower cost, conventional fertilizer products.
- ♦ Manufactured CRFs accounted for only 1% of the volume of commercial fertilizers applied in the United States in 2001 and for 1.6% of total contained N.
- ♦ Processed natural organics amounted to 1.3% of the volume of commercial fertilizers and for 0.3% of contained N.

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Introduction (Continued)

The two major types of manufactured CRFs are slowly soluble urea-aldehyde reaction products and coated fertilizers.

- Urea-aldehyde reaction products marketed as slow-release fertilizers include urea-formaldehyde (UF), isobutylidene diurea (IBDU), and crotonylidene diurea (CDU).
- Coated fertilizers mainly consist of sulfur-coated urea (SCU), now mainly polymer- and sulfur-coated urea (P/SCU), and polymer-coated (including resin-coated) fertilizers (PCFs).

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Global Market

SUPPLY

- In the United States, the annual supply (production plus imports) of manufactured CRFs grew at an average annual rate of 4.7% in the 1990-2001 period, for a total increase of about 66%.
- The annual supply of manufactured CRFs in Western Europe increased by about 15% between 1996 and 2001.
- In Japan, the supply of manufactured CRFs increased by just 4% between 1996 and 2001.

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Global Market (Continued)

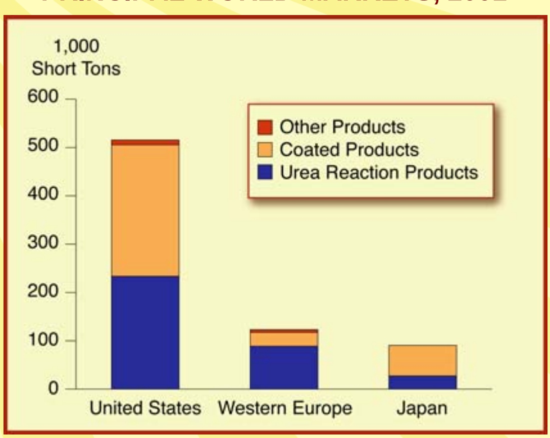
MANUFACTURED CRF SUPPLY/DEMAND BY MAJOR REGION, 2001 (1,000 Short Tons)

	United States	Western Europe	Japan
Production	496	95	110
Imports	51	40	2
Exports	4	2	18
Apparent Consumption	543	133	94

Source: AgIndustries estimates.

Global Market (Continued)

CONSUMPTION OF MANUFACTURED CRFs IN PRINCIPAL WORLD MARKETS, 2001



Global Market (Continued)

CONSUMPTION OF MANUFACTURED CRFs
BY MARKET AND WORLD REGION, 2001
(1,000 Short Tons)

	United States	Western Europe	Japan
Agricultural Crops	30	8	82
Consumers	135	37	NEG
Professional Markets	351	78	9
Total	516	123	91
Projected Average Annual Growth Rate, 2001-2006	2.5–3.5%	2.5–4.0%	0.0–2.0%

Source: AgIndustries estimates.

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Global Market (Continued)

For the Western European CRFs market in the 2001-2006 period, we project overall growth at an average annual rate of 2.5-4.0%.

- Availability of more cost-effective coated products will be one of the main requirements for future growth of the Western European market.
- Research aimed at developing more economic production techniques for PCFs is currently underway.

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Global Market (Continued)

CRFs consumption in the Japanese market is expected to remain at or near the 2001 level or to increase at up to 2% per year between 2001 and 2006.

- ♦ Consumption of urea-aldehyde reaction products and other synthetic organic compounds will continue to decline and consumption of coated fertilizers will continue to increase.
- ♦ As the overall fertilizer market has steadily declined, producers have shifted their production and marketing efforts from conventional to coated fertilizers.
- ♦ Use of coated fertilizers is supported by Zen-Noh and JMAFF.

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U.S. Market

LEADING NORTH AMERICAN SUPPLIERS OF MANUFACTURED CRFs

	Estimated Rank as Supplier to the U.S. Market Based on Product Volume, 2001				
Company	**UF Products**	**IBDU**	**P/SCU**	**PCFs**	**Overall**
Scotts	1	--	2	1 (tie)	1
Nu-Gro	3	1	3	--	2
LESCO	--	--	1	--	3
Pursell Technologies	--	--	4	1 (tie)	4
Lebanon Seaboard	2	--	--	--	5

Source: AgIndustries estimates.

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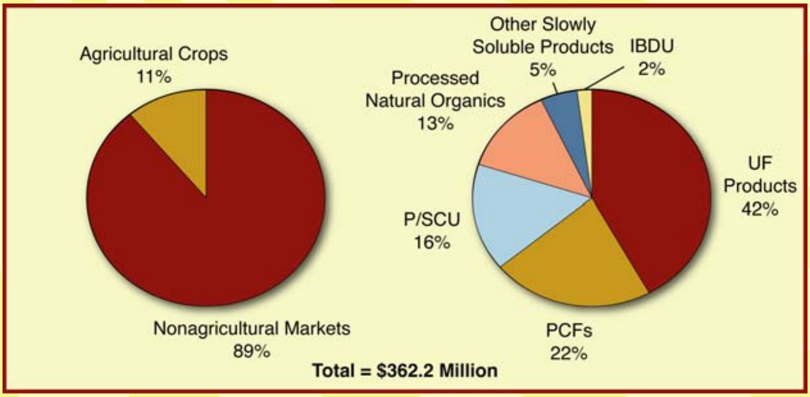
U.S. Market (Continued)

ESTIMATED WHOLESALE VALUE OF THE U.S. CRF MARKET BY MARKET SECTOR AND PRODUCT TYPE, 2001



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U.S. Market (Continued)

U.S. CONSUMPTION OF MANUFACTURED CRFs BY MARKET SECTOR, 2001-2006 (1,000 Short Tons, Product)

Sector	2001	2006	Average Annual Growth Rate, 2001-2006[a] (Percent)
Agricultural Crop Markets	30	35–38	3.5–5.0%
Nonagricultural Markets	486	550–582	2.5–3.5%
Total	516	585–620	2.5–3.5%

[a] Growth rates are rounded to the nearest 0.5%.

Source: AgIndustries estimates.

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U.S. Market (Continued)

We estimate that, in addition to manufactured CRFs, 700,000 short tons of processed natural organic fertilizers were consumed for U.S. agricultural crops and in nonagricultural markets in 2001.

- The average N content of the natural organics was 4.2%.
- Nonagricultural markets accounted for 56% of natural organics consumption, with agricultural markets making up the remainder.
- Dried sewage sludge accounted for 42% of the total natural organic material consumption and dried manure for 23%.

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U.S. Market (Continued)

- U.S. annual consumption of processed natural organics more than doubled between 1990 and 2001.
- We expect overall U.S. consumption of processed natural organics to increase at an average annual rate of 2–4% between 2001 and 2006, as a result of:
  - Continuing emphasis on recycling organic wastes because of restrictions on landfill
  - Increasing production of heat-dried sewage sludge products via new processes designed to produce less dusty pelletized sludge products
  - Availability of new technologies for the conversion of poultry and animal manures to commercially acceptable pelletized or granular organic fertilizers, and development of distribution and marketing systems for these products.

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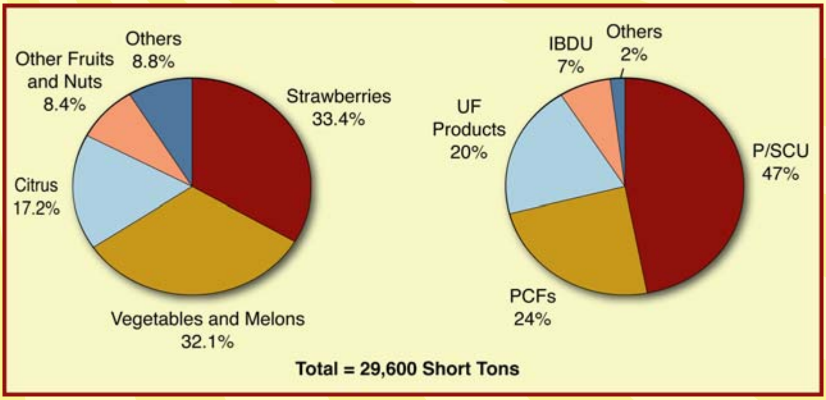
U.S. Market (Continued)

U.S. AGRICULTURAL CROP MARKETS FOR MANUFACTURED CRFs, 2001 (Percent of Total)



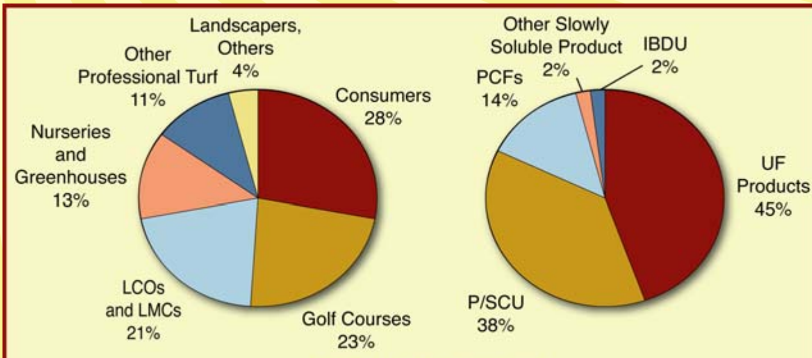
U.S. Market (Continued)

We project average annual growth in CRF agricultural use for the 2001-2006 period at 3.5–5.0%. as a result of:

- Increasing market development and promotion of existing and new manufactured CRF products
- Development of new lower cost CRF manufacturing processes and lower cost coating technologies, and introduction of new CRF products based on these technologies
- Continuing environmental concerns about N pollution of groundwater in many U.S. crop-growing regions
- Possible legislation to require reduced N application rates in some nitrate-sensitive areas.

U.S. Market (Continued)

U.S. NONAGRICULTURAL MARKETS FOR MANUFACTURED CRFs, 2001
(Percent of Total)



Total = 486,000 Short Tons

U.S. Market (Continued)

U.S. CONSUMPTION OF CRFs BY PRODUCT TYPE, 2001-2006
(1,000 Short Tons)

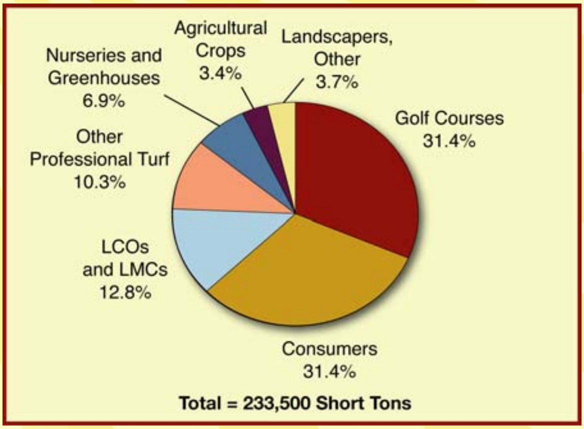
Product Type	2001	2006	Average Annual Growth Rate, 2001-2006[a] (Percent)
Urea Reaction Products	234	257–271	2.0–3.0%
Coated Fertilizers	272	318–337	3.0–4.5%
Other Slowly Soluble Products	10	11–12	1.5-3.0%
Total	516	586–620	2.5–3.5%

[a] Growth rates are rounded to the nearest 0.5%.

Source: AgIndustries estimates.

U.S. Market (Continued)

U.S. MARKETS FOR UREA REACTION PRODUCTS, 2001
(Percent of Total Product Volume)



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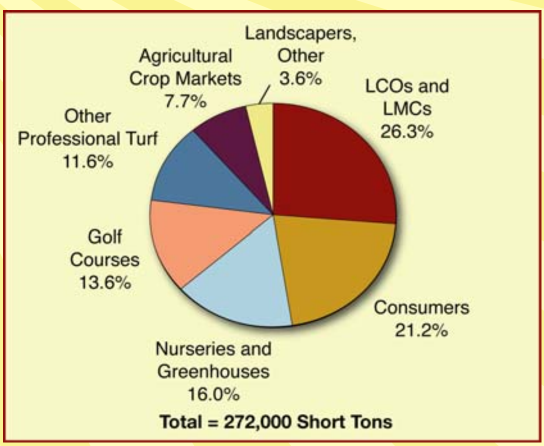
U.S. Market (Continued)

U.S. MARKETS FOR COATED FERTILIZERS, 2001



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U.S. Imports and Exports

IMPORTS

U.S. SHIPBORNE IMPORTS OF MANUFACTURED CRFs BY PRODUCT TYPE, 2002

Product Type	Short Tons
UF Products	1,393
PCFs	
PCU	953
PC-NPK	11,932
Subtotal	12,885
Total	14,278

Source: AgIndustries estimates based on data reported by Port Import Export Reporting Service. (PIERS).

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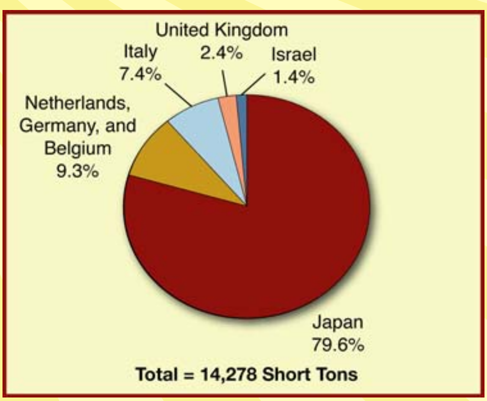
U.S. Imports and Exports (Continued)

IMPORTS (Continued)

U.S. CRF IMPORTS BY COUNTRY OF ORIGIN, 2002



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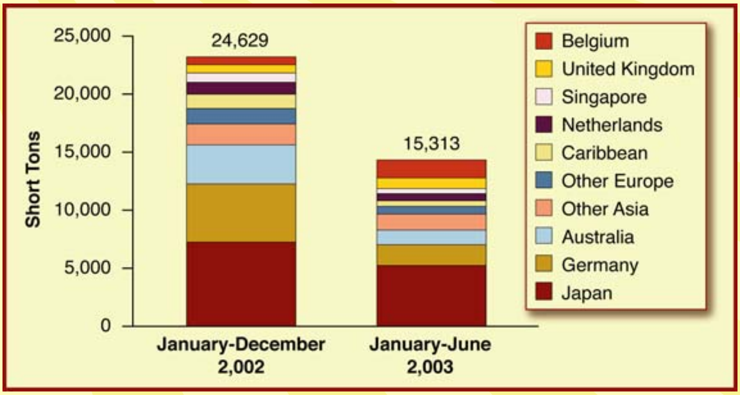
U.S. Imports and Exports (Continued)

EXPORTS

RECENT U.S. EXPORTS OF CRFs AND CRF-BASED FERTILIZERS BY DESTINATION (Short Tons, Product)



Conclusions

We project the following trends for the global CRFs market during the 2001-2006 period:

- The global market for SRFs based on urea-aldehyde reaction products will grow at an average annual rate of 1.5-2.5%.
- Global consumption of coated fertilizers will grow at an average annual rate of 3-4.5% during 2001-2006.
  - Consumption of P/SCU, mainly in the United States, will increase at an average rate of 3-4% per year
  - Demand for PCFs will increase at an average rate of 3-5% per year.

Conclusions (Continued)

- Continuing advances in UF technology are leading to new solid and liquid UF products with N-release characteristics more closely matched to the N uptake requirements of turfgrasses, ornamental crops, and high-value vegetable crops.
- Lower cost coating technologies and lower cost manufacturing processes for PCFs are needed.
- Numerous companies worldwide are developing and patenting new polymer coating technologies and/or are working to improve or enhance their present PCF products.

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Conclusions (Continued)

Results to date of our continuing monitoring and analysis of U.S. CRF imports and exports indicate that:

- Japan is both the principal source of U.S. shipborne imports of CRFs and the largest export market for CRF products manufactured in the United States.
- The volume of PCFs imported from Japan in 2002 was equivalent to about 14% of Japan's total production of coated fertilizers in 2001.
- Imports of UF products, mainly from Italy, are growing.
- Each of the five leading North American CRF manufacturers has export markets for its products.

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