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NEWS LETTER

OIL TECHNOLOGISTS' ASSOCIATION OF INDIA WESTERN ZONE

Inside This Issue

What has the New Year in Store for us ? "VIKRUTHI"? Means turn around a symbol. With different meanings. Like the many facets of BOSON particle.

This news letter is for free circulation only to the members of OTAI-WZ

C/o. Department of Oils, Oleochemicals & Surfactants
Institute of Chemical Technology
(Formerly UDCT)
Nathalal Parekh Marg
Matunga (East), Mumbai-400 019
INDIA.

Tel.: 91-22-32972206/91-22-24146526
Fax: +91-22-24124017
Email: info@otai-westernzone.org
Website: www.otai-westernzone.org

OIL TECHNOLOGISTS' ASSOCIATION OF INDIA WESTERN ZONE

From the Editors's Desk

Strangely, the first issue of the Newsletter is emerging now! No holds barred. Even the L C Haldron has made news. Most of the countries worked tirelessly and made it a world co-operation movement. Lesson for us? United we win. And so, it is going to enthuze all os us to score a Bull's Eye for the RSDC already on the anvil. There could be paradigm shift in Conception and make the Event bristle with new thinking and newer ideas. Let us participate in the thought process and come out with wild ideas. Break the routine, and, beat the Pedestrian track. Something Original, may be? Spread the good word. Challenge the basics. Finally leave it to seasoned and mature Leaders to formulate the event. What is the goal? Sharing expertise and Knowledge.

Trade & Commerce

MORE THAN THE EYE MEETS?

Fee just 3% of farmers' extra income, says Monsanto

On every rupee farmers pay for Bt cotton incorporating Monsanto's proprietary Bollgard (BG) knowhow, some 20 paise goes to the $11.7 billion St. Louis-headquartered agri-biotech major. But according to the company, what it earns is a fraction of the incremental income accruing to farmers, courtesy its technology.

Since Bt cotton's introduction in 2002, average lint yields have gone up from 300 kg to 550 kg a hectare - or from 8.6 quintals to 16 quintals in terms of kapas (seed-cotton).

Taking a constant price of Rs 2,000 a quintal, an increase of seven quintals translates into an extra Rs 14,000 a hectare. In 2009, about 10 million hectares (mh) were planted to cotton in the country, of which 9 mh were under Bt cotton and 8 mh under BGBt.

"Even if you assume just Rs 10,000 a hectare on 8 mh, the additional revenue to farmers from BG would be Rs 8,000 crore," noted Mr Jagresh Rana, Director, Mahyco Monsanto Biotech India Ltd.

To this, one must also add savings arising from reduced insecticide sprays. Prior to Bt cotton's advent, farmers used to spray about 10 times against the American bollworm insect pest, with each round costing Rs 500 or more. That would be down to 1-2 now, which means savings of Rs. 4,000 a hectare or Rs 3,200 crore on 8 mh.

"Even the most conservative estimates of the total annual gain from BG to Indian farmers would give a figure of well over Rs 10,000 crore. Our share in this cake (trait fee of Rs 340 crore) is hardly 3 per cent, which is the lowest for any country," claimed Mr Rana.

BG's contribution would be even more if the indirect benefits of a doubling of the country's cotton output since 2002-03 - to ginners, textile mills, cottonseed oil and cake makers, exporters and farm workers - are also factored in.

Monsanto's critics, however, credit Bt cotton's success in India equally to proactive State Governments. When it was first commercialised, a packet of Bt cotton seeds, incorporating the first-generation BG-I gene construct, was retailing at Rs 1,600, of which the technology fee component came to Rs 725.

But today even BG-II Bt cotton seeds are selling at Rs 750 to Rs 925 a packet, with Monsanto being literally forced to slash its trait fees to a maximum of Rs 225.

(The Hindu Business Line, 19th January, 2010)

GOOD RATIONALE

Govt. must allow edible oil imports duty free

Now that the Government has allowed both raw and refined sugar imports duty-free, it is time the same logic is extended to edible oil also.

If anything, the case for unifying the rate of duty on both crude and refined oils at zero is more compelling than ever before.

On March 18, 2009, the Government reduced the rate of Customs duty on imported crude vegetable oil to zero and on refined oil to 7.5 per cent. It was, of course, the compulsion of the time. The country was in the election mode and food inflation was raging.

Import of veg oils

Ten months down the line the country has imported unprecedented quantities of crude veg-

etable oils, mainly palm oil, but the consumers have not had a good deal. Indeed, they are short-changed in terms of quality.

April-December 2009 arrivals totalled 62.2 lakh tonnes (up from 49.1 lakh tonnes during the same period previous year), an increase of over 13 lakh tonnes in a nine-month period after duty on vegoils was drastically reduced. Of the 62.2 lakh tonnes of aggregate imports, crude palm oil alone accounted for 38.1 lakh tonnes. During the period, refined palmolein arrivals surged to 9.80 lakh tonnes. In addition, we have had soyabean oil and other oils flowing in.

Despite import of record volumes and burdensome stocks across the country - storage capacities are full and tanks rentals have shot up - the effect of such massive imports and inventory is not markedly felt on edible oil in the open market. Prices have not declined to levels that bring real relief to consumers.

This is primarily because the market is dominated by large refiners who call the shots every day. Prices are dictated by them. Unless this stranglehold of large refiners on the edible oil market is decisively broken, consumers may not obtain any real price relief. The time lag between crude oil import and refining and marketing creates a window of speculative opportunity.

The speculative window needs to be closed and oils must be made available to the market continuously. One sure way to achieve this would be to withdraw the existing 7.5 per cent Customs duty on refined oils which will encourage more traders - big and small - to participate in the import business and ensure that cooking oil is distributed without delay and without anyone being allowed to hold speculative positions.

Duty-free import of refined oils will make for steady flow of ready-to-market refined oil. Nothing, of course, would prevent large refiners from importing crude oil for refining and marketing, but the opportunities to profit from market volatility would be reduced. Consumers will be the ultimate beneficiaries.

Disposal of stearin

A major question that has remained unanswered for long is the disposal of stearin - the solid fraction of palm oil which is not edible per se - that is produced. There are limits to using stearin as industrial oil for soap making and similar purposes. But the quantum of stearin that India produces following the flood of crude palm oil arrivals is simply too big for the country's industrial sector to absorb.

Imports of 50 lakh tonnes of crude palm oil would produce a staggering 10 lakh tonnes of stearin. The possibility of stearin being blended with other oils for manufacture of vanaspati, for instance, cannot be ruled out. Institutional consumers such as restaurants and sweetmeat shops that constantly look for cheapest cooking oil would be ready buyers of such sub-standard oil.

In other words, the by-product of palm oil import that is stearine is palm off to unwary consumers as cooking oil, something that is sure hurt the health of people over time. It is surprising why the Government never bothered to examine this pernicious aspect of crude palm oil import.

Edible oil prices have not attracted the kind of mass attention that sugar and pulses have. Duty-free import of vegetable oil will curb speculation in the marketplace and ensure sustained flow of the commodity to the benefit of consumers.

Failure to strictly monitor the quantity of imports, quality of oil being sold in the market and disposal of residue makes the Government culpable.

(The Hindu Business Line, 20th January, 2010)

FACE IT

Tough time ahead for soyabean processor

Solvent extracting units face a tough period ahead with soyameal exports dropping over 50 per cent in the first nine months of this fiscal.

According to the Solvent Extractors Associa-

tion of India, 14.90 lakh tonnes (lt) of soyameal were exported in April-December against 30.56 lt during the same period, a year ago.

Lack of demand

"Soyameal exports have dropped due to a variety of reasons, including lack of demand and the rise of the rupee against the dollar," Mr Rajesh Agrawal, spokesperson of the Soyabean Processors Association of India, said.

"At the beginning of the season, 10 L. tons were contracted for delivery between October and December. After that, only a few quantities have been traded. These have been in small quantities to be shipped in containers," Mr Davish Jain, President, Central Organisation for Oil Industry and Trade, said.

Higher quotes

Though 10 lt of soyameal were contracted for exports at the beginning of the oil year in November, the shipments have been hit by higher quotes.

Exporters had to quote higher prices as soyabean ruled higher, making it tough for them to find parity. On Friday, soyabean quoted at Rs 21,000 a tonne. This is lower than Rs 23,000 quoted since the start of the season.

"While bean prices have dropped, there has been a corresponding decline in meal and oil prices," Mr Jain said.

Soyameal prices are currently quoting at Rs 18,200 a tonne against Rs 18,800 during the October-December period.

"There has been a $40 a tonne drop in prices from the peak we witnessed earlier," Mr Jain said.

Last fiscal, soyameal exports were at a record 41.77 lt. "Last year, we reaped the benefits of lower crop in the United States and the farmers strike in Argentina. We are unlikely to witness the same situation this year," an exporter said. "Reports of higher crop in Brazil and Argentina are putting pressure on bean and meal prices," Mr Agrawal said.

Global supplies

"Global soyabean supplies are expected to be 30-40 million tonnes higher this year. When production is likely to be 15 per cent higher, it is difficult to absorb it without price cut," Mr Jain said. The rupee has also increased to 46.14 against the dollar now from 47.80 at the beginning of November. A higher rupee value means the prices will go up, making exports uncompetitive.

"This season has not been a good one for us. Only 50 per cent of the normal bean crushing has been completed," Mr Jain said.

A factor that has helped the solvent units to some extent is domestic consumption. At least 3 lt has been consumed by the domestic poultry and feed sector.

"Some of this has found its way to the neighbouring countries through the land route," Mr Jain said. Salvation lies in contracting at least 5 lt of soyameal for exports in the next two months. "It will really help the industry to stabilise," Mr Jain said. Things are expected to get tough from March onwards when Brazil's harvest will hit the market. Argentina's crop will arrive in April to add to the pressure on the market.

This year, soyabean production in Brazil is projected at 65 million tonnes against 63.7 million tonnes last year. Argentina's output is forecast at 51 million tonnes (48 million tonnes).

INSIGNIFICANT BUYER

China, one of the key buyers of late, has been an insignificant buyer this year. "They have not been asking for meal. Their growers themselves are under pressure as China is buying from North and South America," Mr Jain said.

Soyabean production this year is projected at over 97.21 lt against a record 108.21 lt last year, according to Soyabean Processors Association of India's estimates.

(The Hindu Business Line, 23th January, 2010)

THE MIRACLE

Agricultural research for inclusive growth

Indian agriculture has witnessed momentous growth during the last 60 years. The food grain production increased by 4 times, horticultural crops and milk by 6 times, fish by 9 times and eggs by 27 times since 1950-51. The country harvested a record 230 million tonnes of food grains, produced 6.87 million tonnes offish and more than 100 million tonnes of milk during 2008-09. It could not have been possible but for the pioneering role of Indian Council of Agricultural Research (ICAR) in ushering green revolution and other major developments in agriculture and allied sectors through its research and technological excellence.

With a strong base for planning, promotion, execution and coordination of agricultural research and education to meet emerging challenges in the country and wide network of Institutes spread across the country the ICAR has significantly contributed to overall development of farm and related sectors. 45 Research Institutes, 4 Deemed Universities, 6 National Bureaux , 17 National Research Centres, 25 Directorates/Project Directorates, 61 All India Coordinated Research Projects and 17 Network Projects, 45 State Agricultural Universities (including one with Deemed University status), one Central Agricultural University and 570 Krishi Vigyan Kendras (KVKs) are the part of nationwide network of ICAR.

Delayed and deficient monsoon coupled with flash floods in parts of Andhra Pradesh and Karnataka in recent months affected the Indian agriculture in kharif 2009. Government's timely response to the exigency and technology-driven contingency plans greatly contributed to protect the standing crops as well as mitigating the drought effects to minimize the adverse impact on kharif production. Sound and scientific location-specific advisories were disseminated across the country to grow short-duration rice varieties, low-water consuming crops and feed and fodder crops. Mobilization of quality seeds was streamlined in coordination with sister organizations at central and state levels.

Steps have been taken to augment production and productivity of rabi crops to at least partially offset the losses in kharif. Acreage under wheat, winter/ boro rice, pulses, maize, sorghum and bajra are being increased to have higher yields/ production.

One hundred thirty one varieties/hybrids of major food crops for different agro-climatic regions of the country were released/identified, besides a few varieties in plantation and horticultural crops. A total of 7,340 tonnes of breeder seed of field crop varieties and over 25 lakh planting material were produced and distributed. Gene sources for resistance to Ug99 rust with new genes have been located. Through efforts of biodiversity conservation, fingerprints of 44 grape accessions of commercial importance were developed. Cost-effective amelioration technologies for waterlogged, salt affected and acid soils have also been developed.

To meet the challenges of climate change in agriculture. National Institute of Abiotic Stress Management has been established by ICAR at Baramati, Maharashtra. Two major institutions, the National Institute on Biotic Stress Management and Indian Institute of Agricultural Biotechnology are in the process of establishment to address the impact of biotic stresses and harness potentials of emerging tools of biotechnology in agriculture.

Two hybrid varieties and 8 high yielding varieties of rice have been developed and released for different agro-eco system. Besides this, a new wheat variety Pusa Baker (HS 490) with a seed potential upto 5 t/ha and durum wheat variety 'Malva Kranti' (HI 8638) for rainfed and limited irrigation conditions of Madhya Pradesh have been developed. A pond-based farming technology has been developed for waterlogged areas that can enhance net water productivity and net returns in rice.

The standardization of a novel hand guided cloning technique in cattle for the first time in the world and the birth of buffalo calf 'Garima', produced through this technique, is a significant achievement. Efforts to provide timely support in diagnosis of Avian Influenza (AI) has led to international recognition of High Security Animal Dis-

ease Laboratory (HSADL) at Bhopal. Fisheries has emerged as a sector with great potential to ensure food, livelihood and nutritional security. Through various technological interventions, marine fish landings exceeded 3.2 million tonnes, recording an increase of about 11 % over the estimates of the previous year. Forensic investigations using DNA bar coding technique helped in identification of whale shark meat, designated as endangered species.

A comprehensive accreditation system is under implementation to ensure quality of education, strengthening of infrastructure and faculty improvement in 45 State Agricultural Universities. Accreditation was granted to five SAUs during the year, taking the number to 33 till date. A national core group revised the course curricula and syllabi of 95 courses in Master's and 80 courses in Doctoral programmes. Introduction of international fellowships during the year was a major milestone in globalizing higher agricultural education. Besides, 368 e-courses for degree programmes have been introduced and created repository of 3,852 e-theses and provided online access to 1,088 research journals in 126 libraries. In an effort to build capacity in high-end research such as molecular breeding, genomics and transgenics, allele mining bioremediation, nanotechnology, diagnostics etc. scientists from ICAR institutes and teachers from State Agricultural Universities were trained in best of the laboratories of the world.

Over 150 agricultural tools/implements and machines have been developed for timely farm operations, drudgery reduction and efficient input use for various field and horticultural crops. A tractormounted cumin planter was developed to save 30% of seed. For pomegranate a motorized aril extractor was developed with 94% separation efficiency and 500 kg/hour capacity. For commercial-scale groundnut milk production, processing technology developed and equipment fabricated having 250 litre per day capacity.

To facilitate assessment, refinement and demonstration of technology/ products, a total number of 570 KVKs have been established so far against the XI plan target of 667 KVKs in all the rural districts of the country. In an effort to enhance farmers' capacity and skills, about 56,000 training programmes were organized benefitting about 15 lakh farmers and farm women, rural youth and extension workers.

To promote production-to-consumption chains for maximizing farmers' profits, 51 models developed for different agricultural commodities. Thirty six models of technological innovation-based sustainable rural livelihood initiatives introduced in 102 of 150 most disadvantaged districts, benefitted 50,000 farm families.

For the first time non-conventional partners were brought into the partnerships in National Agricultural Research through the National Agricultural Innovation Project. They include NTs, IIMs, CSIR laboratories and enterprises of private sector and NGOs. The project, with its approach and expense, has become a model for other countries to emulate.

The Guidelines formulated at ICAR for Intellectual Property Management and Commercialization of Technologies, intense capacity building efforts were undertaken which resulted in filing of 55 patents applications from 13 ICAR institutes during the year.

(Tecoya Trend 19th January, 2010)

THE PRESIDENTIAL CALL

The President Urges India Inc to Partner Govt In Farm, Infrastructure Development

The President, Ms. Pratibha Devisingh Patil, has asked India Inc to partner with the Government in the development of the agriculture sector and basic infrastructure in rural areas."I call on industry leaders to actively participate in a brainstorming meeting to look at synergies between industry and agriculture. The concept is to develop agriculture and industry as two well balanced wheels of the economy," she said addressing the concluding event of the 'India Corporate Week' here.

The President asked the corporate sector to contribute to rural development by voluntarily com-

ing forward to partner with Government in basic infrastructure facilities in rural areas, like schools, health facilities, roads, drinking water and electrification.She urged corporate houses to consider setting up a dedicated fund for entrepreneurship development and capacity building among farmers.

Ms Patil said the private sector could invest in storage, market terminals, cold chains and grading facilities, which in turn can be leased to farmers or other players in agro-commodity retailing, to make farming a win-win situation both for industry and farmers. She asked IT companies to supplement the efforts of the Government to connect every village with IT, by establishing the ICT kiosks in villages.

"The corporate sector should also look at supporting innovative experiments being encouraged by the National Innovation Foundation at the grassroots level - like air conditioning in earthen fridges, scooters running on flow of air, devices that develop agricultural productivity and such others." Ms Patil said.

She said agencies closely linked with agricultural development, like the National Rainfed Area Authority, and other stakeholders should look for innovative solutions to help farmers with new technologies, value addition, marketing and in becoming successful entrepreneurs. In this regard, the President asked the National Rainfed Authority to hold a conference of stakeholders. The Ministries of Corporate Affairs, Agriculture and Rural Development should also work together to explore suitable models that bring better returns to farmers, she said.

(Source : The Hindu Business Line dated 22nd Dec.'09)

TAKE IT EASY

Make Food Labels Simpler For Consumers

Is it possible for a consumer to figure out, at a glance, whether a packaged food product is high on omega-3 fatty acids or contains low levels of salt? In an effort to help consumers make such detailed and consequently more informed choices, the Hyderabad-based National Institute of Nutrition (NIN) and a Delhi consumer organisation, Healthy You Foundation (HUF), have lined up a national conclave on defining packaged food products as healthy, on January 18.

NIN director Dr B Sesikaran says, "We hope to arrive at some kind of consensus after holding discussions with nutrition scientists and the industry. We will put it across to the Food Safety and Standards Authority of India (FSSAI) so that we can have standardised norms." Other than consumer organisations and nutrition scientists from NIN, participants would include FICCI, CIL industry representatives and officials from FSSAI, and ministries of food processing and health.

Sesikaran, who is also part of the scientific panel on food labelling under the FSSAI, says the discussions would focus on how to label healthy food by putting them under standardised categories such as 'low call, 'contains more fibre' , 'contains less energy', etc. Sesikaran hopes this initiative will act as a motivating factor for the industry.

The other goal of the conclave, says Bejon Misra of HUF, is developing effective communication about a healthy food product, including a logo, as well as a code for advertising those.

Consumers must know that nutritional labelling laws that are already in place mandate that labels on packaged food products must list nutritional facts per 100 gm or 100 ml or per serving. As reported earlier in these columns, these rules stipulate that all ingredients in a packed product must be listed in a descending order in terms of weight and volume. The list must also include the nutri¬tional profile of a product such as its energy value in kcal; the amount of protein, carbohydrates - including sugar and fat in grams; and other vitamins and minerals in metric units.

An FSSAI official say: this rule is being implemented at the state level by the respective food health authorities.

(Source : Times of India dated 15th Jan.'10)

GOOD TO BE LEADER

India top in out put of one in eight agri commodities

The global commodity market catches a cold if India sneezes. Not surprisingly, the country tops in the output of one in every eight agricultural commodities produced in the world.

According to a 2007 data of the Food and Agriculture Organisation, an arm of the United Nations, India tops in the production of 25 of 194 agricultural commodities. China tops in the production of one in four agricultural commodities.

Some of the products in which India tops in output are bees wax, goat milk, castorseed, lemons, banana, mangoes, guavas and mangosteens, safflower, chickpea, pigeon pea and buffalo milk.

Though the data are for 2007, it is unlikely that there will be any major change in the position. The country is the number two in 20 commodities - including wheat, rice, sugarcane, onions, garlic, green peas and cauliflower. It holds the third position in the production of tomato, cashewnuts, linseed, rapeseed and sorghum.

FAR Ahead

In most of the commodities, India is far ahead of other countries in production. The rise in output since 2000 in some crops has led to this position.

For example, the country's banana production is 2.3 million tonnes (mt), far ahead of China's 0.8 mt. In lemons, the production is 2.2 mt against 1.9 mt of Mexico. With a production of 3.89 mt in goat milk, India is ahead of Bangladesh (2 mt).

One area where possibly China could catch up is ginger (0.37 mt versus 0.32 mt). In the case of okra (lady's finger or bhindi), the production (3.28 mt) is more than double that of Nigeria (ranked second at 1.28 mt).

In the case of tropical fruits, India's production of 3.5 mt is 0.5 mt higher than the Philippines (ranked second).

In some of the commodities, there has been a sharp rise in production in the last few years. For example, in the case of wheat, the production has increased from 72.15 mt in 2004 to 78.57 mt in 2008 and 80.68 mt last year. This year, the crop has been estimated at 80.28 mt.

In the case of rice, the output has gone up from 83.13 mt in 2004 to 96.19 in 2008 and 99.18 mt last year.

This year, in view of monsoon playing havoc, production expectation is 87.56 mt.

In the case of chickpea (chana), the production this year is estimated at 7.46 mt against 6.54 mt in 2008 and 5.72 mt in 2004. Pigeon pea (arhar) production is seen at 2.5 mt against 3.08 mt in 2008 and 2.5 mt in 2004.

(The Hindu Business Line, 22nd February,

THE PROGNOSIS

Edible oil imports may rise on low seed output

India's vegetable oil imports are likely to increase further this year (November 2009-October 2010) due to lower production of mustard seed in Rajasthan, where 4.5 lakh hectares has been diverted to wheat and other crops.

Edible oil imports are likely to increase by 9,00,000 tonne to 9.5 million tonne, said BV Mehta, executive director of industry body Solvent Extractors' Association (SEA) of India. The country's production of edible oils such as sunflower, soya, groundnut, etc, ranges between 7-7.5 million tonne against an annual consumption of 13-14 million tonne.

"Lower mustard seed production in addition to lower prices of oilseeds compared with other crops, zero duty on imports, low global prices of edible oils and a rising rupee is expected to lead the country to import 9 million tonne in 2009-10 (November-October), up from 8.6 million tonne last year. This is because of the divergence of 4.5 lakh hectares of mustard area in Rajasthan to wheat. Despite the area under acreage of the oilseed hav-

GOODS AND SERVICES TAX

The Government of India on 10th November 2009 has published "First Discussion Paper on Goods and Services Tax" proposed to be in effect from 1st April 2010. The Empowered Committee of State Finance Ministers were requested to work with the Central Government of India to prepare a road map for introduction of GST in India. The Empowered Committee has released the 'First Discussion Paper on Goods & Service Tax in India 'and have invited interaction with the representatives of industry, trade, agriculture and common people. The Association has sent representations to Hon'ble Finance Minister, GOI as well as Dr. Asim Dasgupta, Chairman, Empowered Committee of State Finance Ministers and Hon'ble Finance Minister, Govt.of West Bengal, requesting that "a Single CGST rate should be laid down, for simplicity and better compliance. Further, for items of daily necessity and mass consumption viz Food grains, Edible oil etc. should be exempted from CGST, so that the common man is not adversely impacted". We reproduce here below frequently asked questions and answers on GST for better understanding.

Dr. B. V. METHA, Executive Director

ing gone up in UP, it will be a mixed crop (with potato) and so yields will go down," Mr Mehta said.

Mr Mehta said the impact of lower oilseed production would be felt by the domestic industry which would not get raw material in sufficient quantity to crush and this in turn could affect the domestic cattlefeed industry, which would suffer from want of oilmeal that is used as feed.

SEA estimates the mustard crop area in Rajasthan to be down at 23.25 lakh hectares in 2009-10 from 28.03 lakh hectares last year, while the yield will be lower at 1,161 kg/hectare against 1,030 kg/ hectare last year. Total crop in Rajasthan is forecast at 27 lakh tonne from 30 lakh tonne last year. "The overall area has reduced by 2.11 lakh hectares (3%), while the production is down by 2.80 lakh tonne (4.5%)," said SEA in a press release.

While minimum support price of mustard seed was increased marginally by Rs 30 to Rs 1,830 per quintal (100 kg) in 2008-09, wheat MSP was raised by Rs 80 to Rs 1,080. For 2010-11, the government has announced an MSP of Rs 1,100 for wheat.

(The Economic Times 9th February, 2010)

UNRAVELLING THE MYSTERY

What is GST? How does it work ?

GST is a tax on goods and services with comprehensive and continuous chain of set-off benefits from the producer's point and service providers point upto the retailer's level. It is essentially a iax only on value addition at each stage, and a supplier at each stage is permitted to set-off, through a tax credit mechanism, the GST paid on the purchase of goods and services as available for set-off on the GST to be paid on the supply of goods and services. The final consumer will thus bear only the GST charged by the last dealer in the supply chain, with set-off benefits at all the previous stages.

The illustration shown below indicates, in terms of a hypothetical example with a manufacturer, one wholeseller and one retailer, how GST will work. Let us suppose that GST rate is 10%, with the manufacturer making value addition of Rs.30 on his purchases worth Rs.100 of input of goods and services used in the manufacturing process. The manufacturer will then pay net GST of Rs. 3 after setting-off Rs. 10 as GST paid on his inputs (i.e. Input Tax Credit) from gross GST of Rs. 13. The manufacturer sells the goods to the wholeseller. When the wholeseller sells the same goods after making value addition of (say), Rs. 20, he pays net GST of only Rs. 2, after setting-off of Input Tax Credit of Rs. 13 from the gross GST of Rs. 15 to the manufacturer. Similarly, when a retailer sells the same goods after a value addition of (say) Rs. 10, he pays net GST of only Re.1, after setting-off Rs.15 from his gross GST of Rs. 16 paid to wholeseller. Thus, the manufacturer, wholeseller and retailer have to pay only Rs. 6 (= Rs. 3+Rs. 2+Re. 1) as GST on the value addition along the entire value chain from the producer to the retailer, after setting-off GST paid at the earlier stages. The overall burden of GST on the

Table							
Stage of supply chain	**Purchase value of Input**	**Value addition**	**Value at which supply of goods and services made to next stage**	**Rate of GST**	**GST on output**	**Input Tax credit Credit**	**Net GST= GST on output - Input tax**
Manufacturer	100	30	130	10%	13	10	13-10 = 3
Whole seller	130	20	150	10%	15	13	15-13 = 2
Retailer	150	10	160	10%	16	15	16-15 = 1

goods is thus much less. This is shown in the table above. The same illustration will hold in the case of final service provider as well.

How will GST benefit industry, trade and agriculture ?

The GST will give more relief to industry, trade and agriculture through a more comprehensive and wider coverage of input tax set-off and service tax set-off, subsuming of several Central and State taxes in the GST and phasing out of CST. The transparent and complete chain of set-offs which will result in widening of tax base and better tax compliance may also lead to lowering of tax burden on an average dealer in industry, trade and agriculture.

BE AWARE

GM Crops On Way : Govt.

New Delhi: The government on Thursday said many genetically-modified (GM) food crops may hit the market in the near future, even as the release of the first such crop for farming in India hangs in balance following large-scale protests. In the near future, we may expect many GM crops that have been modified for better availability of vitamins, iron, micronutrients, quality proteins and oils, which would ensure nutritional security to the masses", minister of state for agriculture K V Thomas said here.

(Source: The Economic Times, Dtd. 27.11.'09).

Consumer products poised for a rebound in 2010

Carrie Mellage

No doubt 2009 will go on record as one of the toughest years in the world's economic history, leveling a serious blow to the consumer products industry. Struggling with declining sales and profits, many retailers have shuttered doors or closed down completely. However, if history teaches us anything, it is that "This too shall pass." New US GDP (gross domestic product) figures already show a promising 3.5% growth rate for the third quarter, and we're seeing signs of a slow (and hope-fully steady) recovery. As we look ahead to 2010. we'll examine the question: What can consumer product companies do to get a jump on the recovery and get ahead in the coming year?

In nearly every sector, 2009 was unquestionably a rough year for the consumer markets. The news was dismal from both manufacturers and retailers:

- Store closings (C.O. Bigelow. Crabtree & Evelyn, and Ann Taylor, to name a few)
- Complete shutdowns (Linens 'N Things. Fortunotf. and Illuminations bid a final farewell)
- Discontinued brands (the legendary Max Factor has been pulled in the United States, and Prescriptives is no more)

Stymied by a steep increase in cost of goods sold for most of 2008 and followed by sharp sales

declines in 2009. Many marketers were forced to cut ad spending considerably. This leveled a serious blow to a number of magazines; some of which including Conde Nast's Modern Bride. Elegant Bride, and Gourmet, as well as Domino and Vibe - were forced out of print due to low ad spending. The news, however, has been relatively good for the consumer, as many of the major manufacturers turned to offering hefty promotions to retain and attract new customers.

THE BRIGHT SIDE

Fortunately, the news for marketers hasn't been all bad. so long as one knows where to look. The naturals segment remains a relatively high-growth proposition from both a product and packaging standpoint in personal care and in home care. Sales of natural personal-care products in the United States grew by about 8% in 2009 - down from 15.3% in 2008, but still well ahead of the overall market. Meanwhile. US sales of Seventh Generation natural household cleaning products more than doubled in 2008.

Around the world, consumers seem to have fallen in love with the idea of preserving the environment through the use of natural (or naturally inspired) products or concentrated formulations that reduce wasteful packaging—and marketers and retailers have responded. In the BR1C countries (Brazil, Russia, India, and China), the growth in naturals has been spectacular, with each market adopting its own unique perspective on this trend. In Brazil, the naturals movement is about biodiversity and the rainforest connection; in Russia, the emphasis is on Siberian earth minerals; India's surge is based on traditional Ayurvedic principles; and China's long heritage of herbal medicine serves as a foundation in this high-growth market.

Value brands and value channels have weathered the storm quite well, albeit at the expense of luxury brands and retailers, as consumers look to cut costs at every opportunity. Perhaps the biggest indicator of this trend in the United States has been the incredible surge in sales of private-label products. In many product categories, private-label products registered double-digit gains—as much as 30% in laundry detergents and liquid soaps - while the product categories as a whole barely stayed even or even lost momentum.

Already a number of earnings reports have indicated that 2010 will be the Year of Recovery—Procter & Gamble and Estee Lauder have both posted better-than-expected quarterly results. By far, the key to success in the coming year will be to take action—serious action—to turn these tip-of-the-iceberg glimmers into sustainable growth.

INNOVATION: THE KEY TO RECOVERY

Innovation in both product development and marketing strategy will be a key component in getting ahead of the curve as consumers begin to feel more comfortable. It took the industry about five years to recover from the last major recession (1990-1991), and even then it was innovation, particularly in the mass skin-care category, that lit the path to recovery.

Although the new GDP recovery numbers are promising, there is some evidence that the recovery may be coming at the expense of "intangible investments" such as research and development and new product design. In other words, in an effort to cut costs and quickly restore profitabil¬ity, some companies have slashed investment in areas that drive innovation, which could come back to haunt them in the very near future.

To prevent this innovation backslide, new product activity must be dusted off and pushed forward to renew consumer excite¬ment in shopping, spending, and trying new products. By invigorating the market with new formulations, novel delivery systems, and updated packaging, branded companies can differentiate themselves against the private-label surge. It may seem tempting to pull back brand support to trim costs, but marketers must continually re-invest to maintain a competitive edge and stave off pressure from private-label competitors.

SOCIAL MEDIA: OPENING NEW DOORS

Beyond product innovation, marketers must leverage the power of the Internet and social media to connect with consumers. As a sales channel, the Internet is no longer insignificant in the personal-care market with online sales tripling over the last five years. Consumers love the wider se-

lection, competitive pricing, and the convenience of shopping online, especially for replenishment of higher-priced items.

The explosion in social media has made the prospect of entering 2010 without a social media strategy in place akin to entering a dark cave with a candle - sure. there will he lots of opportunity out there, but you'll he missing out on it. A number of savvy brand marketers have already begun to tap into these ubiquitous and entirely affordable new media and have discovered the awesome power of engaging consumers on a more personal level. From fan sites on Facebook to tweeting on Twitter, social media are all about creating connection in an atmosphere of mutual benefit for both buyer and seller.

Cosmetic brands have used the YouTube platform as a how-to channel for demonstrating proper makeup application techniques - Lancome's demonstration of how to apply its new vibrating brush mascara and Maybelline's mineral makeup foundation video are two examples that drive consumer interest and investment in the products. Meanwhile. Gillette's provocative "How to Shave Your ..."YouTube video series takes a somewhat tongue-in-cheek look at personal grooming. Frankly, from a cost vs. benefits perspective, it is impossible to ignore the potential return on investment from a single YouTube clip gone viral.

GLOBAL MARKET PERSPECTIVE: A MUST FOR SUCCESS

From a manufacturing and distribution standpoint, marketers must become well attuned to the competitive landscape on a global scale and keep a watchful eye on changing cost structures, competitors' activities, product development, and con¬sumer trends. With the worst of the recession behind us, access to accurate and timely data about the markets and consumer behavior will be critical in remaining one step ahead of evolving opportunities. With retailer inventories tighter than ever, marketers must be able to anticipate changes in demand and up-and-coming trends to maintain a proactive rather than reactive posture.

Ironically, even though the economy seems weak, now is the perfect time to explore a global strategy. The market has suffered the most in mature countries, but growth in nearly all product categories in developing countries such as Brazil. India, and China remains quite robust. Tempting as it may be, now is not the time to restrain international expansion: instead, embrace it as an opportunity to gain an early foothold as these economies take off. With a strong presence on the ground in these regions, Kline's international experts know the culture, understand the competitive landscape, and can provide invaluable insight that can maximize the opportunities and minimize the risk.

Certainly. 2009 may go down in history as one of the worst times in our modern economic history. However, in retrospect, it may also be celebrated as a turning point, one in which the troubled economy forced marketers, retailers and consumers to rethink and retool their operational strategies. As we kick off 2010 with a much more optimistic outlook, it is a safe bet that we'll soon view 2009 as a period of necessary "growing pains" that ultimately propel the industry forward.

Carrie Mellage is director, Consumer Products at Kline & Company's office in Little Falls, New Jersey, USA. She can be reached at Carrie.Mellage@klinegroup.com.

Technology

ROAD MAP

The Market situation and political framework in Germany for biodiesel and vegetable oil

Dieter Bockey

The final details compiled by the Federal Statistics Office and Federal Office of Economics and Export Control (BAFA) confirmed the drop in sales of biodiesel and vegetable oil in Germany in 2008 in comparison to 2007. Although utilization of biodiesel as an admixture component in fossil diesel fuel increased by 190,000 metric tons (MT)to 1.613 million metric tons (MMT), a slump of 739,000 MT in sales of pure fuel offset this positive development. In absolute figures: Whereas 1.821 MMT of biodiesel were marketed as pure fuel in 2007, only 1.082 MMT were sold in 2008, which equates to a reduction of 40.6%. Taking into consideration the increase in the utilization of biodiesel as an admixture, component sales of biodiesel fell overall by 16.9% from 3.245 MT in 2007 to 2.695 MT in 2008.

This negative sales development unfortunately also indicates the stark reduction in the number of public filling stations offering biodiesel. Whereas around 1.900 stations did so at the start of 2007 according to an AGQM (Arbeitsgemeinschatt Qualitatsmanagement Biodiesel e.V.) survey, this figure had fallen to around 250 by the end of 2008. Subsequently, the AGQM was obliged to discontinue quality assurance at the filling station level. Guided and supported intensively by UFOP (Union zur Forderung von Oel- und Proteinpflanzen) for around 20 years, this distribution channel was by far the most significant provision instrument for alternative fuel throughout Germany up to 2007. This network no longer exists, and given that each biodiesel filling station was an important public relations multiplier biodiesel will also gradually disappear from the public eye. The pure vegetable oil (PVO) sector registered an even more dramatic slump in sales from 772,000 MT in 2007 to 418.000 MT in 2008 a drop of 46%.

Notable from the perspective of the biodiesel and PVO business sectors is the fact that - measured against overall diesel fuel consumption - these biofuels replaced 12.7% of the fossil diesel requirement in 2007 and 10.2% in 2008. As a consequence, the two fuels contributed to a CO_2 reduction within the transport sector of around 9 MMT in 2007 and 7.1 MMT in 2008. The federal government's national decarbonization strategy envisages a targeted reduction within the transport sector of 30 MMT of CO_2 per year from 2020. These figures show that the utilization of biodiesel and PVO is necessary if this climate protection target is to be achieved on time. As a result of the German Bundestag (lower house of German parliament) resolution to change the biofuels policy, a response is even more urgently needed to the question of how the reduction of biodiesel and vegetable oil utility can be compensated in light of climate protection mandates.

BIODIESEL

Biodiesel without waste

In Amsterdam, the Netherlands. Yellow Diesel B.V. announced in mid-October that the company has succeeded in producing high-quality biodiesel in a continuous fixed-bed micro plant based on heterogeneous catalysis. Starting with various types of feedstock, including low-quality oils, waste oils, and fats, the process yields pure biodiesel with specifications better than those required by the European norm. EN 142 14 and cosmetics/ food grade glycerol.

All aqueous waste streams, as generated by conventional homogeneous acid base catalyst technology, are eliminated. With the novel catalyst used in the reaction and the integrated process design, the process saves up to 40% of the

capital costs and 30% of the operating costs compared to a conventional plant.

The company is presently scaling up the process to pilot-scale.

HIGH ENERGY

Shocking algae

Organic Fuels, a Houston, Texas (USA)-based biodiesel producer, has entered into a joint venture (JV) with the University of Texas at Austin's Center for Electrome-chanics to use electricity to break open algal cell walls and release oils contained in the cells. The concept is somewhat similar to that of OriginOil (see inform 20: 576. 2009), which is using ultrasound to remove oil from cells.

The JV. called Organic Fuels Algae Technology (OFAT). subjects cell walls to "electromechanical lysis." OFAT claims the process is inexpensive, and estimates that their process would produce oil for about $ 1.50 per gallon ($0.40 per liter). The oil would then be processed further into biodiesel. Their technology could avoid having to harvest algae and dry them, both of which are expensive, before using solvent to extract their oil. And solvent extraction is costly, as well as hard to scale up.

OFAT's technology can work on algae in concentrations as low as the ones found in natural waters, 0.1-0.2% by weight, although the process is more cost effective if the concentration can be increased to 10% or more.

OFAT is seeking to raise about $4 million to build a commercial prototype. The company plans to sell its technology to algae biofuels makers, instead of growing algae and converting them to fuel.

SHOOT

Aflatoxin trigger found

Jennifer Fitzenberger

University of California Irvine (UCI; USA) scientist Sheryl Tsai and colleagues have discovered what triggers aflatoxin to form on nuts and grains, which could lead to methods of limiting its production.

Aflatoxin, which is produced by mold, can cause liver cancer if consumed in large quantities.

Because of lax or nonexistent regulation, 4.5 billion people in developing countries are chronically exposed to vast amounts of aflatoxin - often hundreds of times higher than safe levels. In places such as China. Vietnam, and South Africa, the combination of aflatoxin and hepatitis B virus exposure increases the likelihood of liver cancer occurrence by 60 times, and toxin-related cancer causes up to 10% of all deaths in those nations.

"It's shocking how profoundly these molds can affect public health." says Tsai, UCI molecular biology and biochemistry, chemistry, and pharmaceutical sciences associate professor and lead author of a study that appeared in Nature (461:\ 139-1143, 2009).

Aflatoxin can colonize and contaminate nuts and grains before harvest or during storage. The US Food & Drug Administration considers it an unavoidable food contaminant but sets maximum allowable limits.

The toxin wreaks havoc on a cancer-preventing gene in humans called p53. Without p53 protecting the body, aflatoxin can compromise immunity, interfere with metabolism, and cause severe malnutrition and cancer.

Tsai. graduate student Tyler Korman, and undergraduate Oliver Kamari-Bidkor-peh, along with Johns Hopkins University researchers, found that a protein called PT is critical for aflatoxin to form in fungi.

LMEGA-3S

And heart failure

The news release headline was definite: "No Major Role for Fish in the Prevention of Heart Failure. Study Suggests." With interest high among consumers for information about omega-3 fatty acids, the story made the rounds quickly. In fact,

by early November 2009, 9,960 websites and blogs had broadcast the "news" about the study. which appeared in the European Journal of Heart Failure (11:922-928. 2009).

A closer look at the study results, however, suggests the jury is still out on omega-3 fatty acids and congestive heart failure. First, although large, the study was observational, involving men and women over the age of 55 living in a suburb of Rotterdam. The analysis comprised 5.299 subjects (41% men. with a mean age 67.5 years) who were free from heart failure and for whom dietary data were available. During 1 1.4 years of follow-up. 669 subjects developed heart failure. Their habitual diet had been assessed at baseline (in a self-reported checklist and by expert interview); subjects were specifically asked to indicate the frequency, amount, and kind of fish they had eaten, either as a hot meal, on a sand-wich or between meals.

Results found that the dietary intake of fish was not significantly related to heart failure incidence. This relative risk was measured according to five levels of fish consumption as reflected in intake of two long-chain omega-3 polyunsaturated fatty acids (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]), both of which have been shown to exert some cardiovascular benefit via n anti-inflammatory mechanisms, anti-arrhythmic effects, and/or a reduction in serum triglycerides, blood pressure, and resting heart rate.

"Scientists and health authorities are increasingly persuaded that the intake of fish even in small amounts will protect against the risk of fatal myocardial infarction." said Marianne Geleinjse (Wagenin-gcn University, the Netherlands) in a news release. Geleinjse was the corresponding author on the study, which was led by S. Coosje Dijkstra, also of Wageningen. "However, there is no strong evidence that eating fish will protect against heart failure. One study has suggested that this might be so, but we could not confirm it in our cohort study of older Dutch people."

Harry Rice, who is director of regulatory and scientific affairs for GOED (Global Organization for EPA and DHA Omega 3; Salt Lake City, Utah, USA) questions that conclusion. He points out that the study Geleinjse alludes to (Journal of the American College of Cardiology 45:2015-2021, 2005), which was led by Dariush Mozaf-farian of the Harvard Medical School, is not mentioned in the actual 2009 study by Dijkstra and colleagues.

"The Mozaffarian study was the first to examine the relationship between fish intake (EPA + DHA) and risk of heart failure. Findings from that study support a role for fish intake (EPA + DHA) in the prevention of heart failure," Rice wrote in an e-mail.

Further, fish intake (EPA + DHA) likely was too low in the 2009 study to demonstrate a benefit for the prevention of heart failure. "In fact, the level of EPA + DHA in four of the five quintiles was below what has previously been reported to have a benefit." he wrote.

For more on this issue, see the online report on a recent Heart Failure Society of America meeting at www.natap.org/2009/ newsUpdates/ 101709_05 ,htm.

NEEDED

Genetic Engineered Crops

A report on pesticide use and geneti¬cally engineered (GE) crops claims that GE corn, soybeans, and cotton have increased the use of weed-killing herbicides by 383 million pounds (about 174 million kilograms) in the United States for the 13-year period from 1996 to 2008. The report, entitled "Impacts of Genetically Engineered Crops on Pesticide Use in the United States: The First Thirteen Years," was released November 17 by The Organic Center, the Union for Concerned Scientists, and the Center for Food Safety.

Sharon Bomer Lauritsen, executive vice president, food and agriculture for the Biotechnology Industry Organization (BIO), issued a statement in response: ". . .Biotech crop varieties have dramatically reduced farmers' reliance on pesticide applica¬tions. Since 1997, the use of pesticides on global biotech crop acreage has been reduced by 790 million pounds, an 8.8% reduction.

"Decades of documented evidence demonstrate that agricultural biotechnology is a safe and

beneficial technology that contributes to both environmental and economic sustain-ability. Many experts agree that agricul¬tural biotechnology has an important role to play in helping to feed and fuel a growing world. In the future, biotech¬nology's benefits will only improve."

For more on the report, visit http:// truefoodnow.files.wordpress. com/2009/11 / 13years2009-fullre-port-ll-l6-09.pdf.

NOVEL

Oil filtration process

Oberlin, T., el al., Oberlin Filter Co.. US7566468B 1, July 28, 2009

A process of continuous, on-line active filtration of cooking oil during food processing in a vat to remove free fatty acids and other undesirable impurities includes moving oil from the vat to a treatment tank: adding an amount of adsorbent to the oil in the treatment tank: mixing the oil and the adsorbent in the treatment tank for a time to allow substantially all of the free fatty acid adsorption of the process to occur in the tank: drawing treated oil from the treatment tank and moving it to a flatbed pressure filter; filtering the treated oil through the filter to remove the impurity-laden adsorbent therefrom; returning the filtered oil to the vat; and conducting the foregoing steps at a rate such that a volume of oil substantially equal to the volume of the vat is filtered each hour.

FINALLY !

Biodiesel preparation in a batch emulsification reactor

Hajek, ML, el al., Eur. J. LipidSci. Tcchnol. II 7:979-984. 2009.

The transesterification of vegetable oils (rapeseed oil was used here) by low molecular weight alcohol is the most used method of biodiesel production. Since the reaction proceeds at the alcohol-oil interface, it is necessary to create a large interphase surface area using a special emulsifying attachment. We studied how the conditions (e.g., independent variables: molar ratio alcohol to oil, amount of catalyst used. KOH. time and temperature of reaction, intensity of stirring, revolution of emulsifying attachment) affected the quality and quantity (dependent variables) of the ester phase, i.e., the biodiesel. The amount of used catalyst was calculated with respect to the content of free fatty acid in the oil. The statistical system of Plackett-Burman was used for experiment planning. The relationship between independent and dependent variables was determined and described by multidimensional linear regression. Various statistical tests (principal component analysis, correlation matrix) were also performed.

LAP IT UP

Mechanisms of aqueous extraction of soybean oil

Campbell. K.A.. and C.E. Glut/. J. Agric. Food Chem. 57:10904-10912. 2009.

Aqueous extraction processing (AEP) of soy is a promising green alternative to hexane extraction processing. To improve AEP oil yields, experiments were conducted to probe the mechanisms of oil release. Microscopy of extruded soy before and after extraction with and without protease indicated that unextracted oil is sequestered in an insoluble matrix of denatured protein and is released by proteolytic digestion of this matrix. In flour from flake, unextracted oil is contained as intact oil bodies in undisrupted cells, or as coalesced oil droplets too large to pass out of the disrupted cellular matrix. Our results suggest that emulsification is an important extraction mechanism that reduces the size of these droplets and increases yield. Protease and sodium dodecyl sulfate were both successful in increasing extraction yields. We propose that this is because they disrupt a viscoelastic protein film at the droplet interface, facilitating droplet disruption. An extraction model based on oil droplet coalescence and the formation of a viscoelastic film was able to fit kinetic extraction data well.

GET IT

Update on Jatropha

Marguerite Torrey

Inedible oil from the seeds of *Jatropha curcas* is reputedly a wonder crop for biofuels in the middle latitudes of the globe (~30°N to ~30°S) because (i) it is not a source of food, (ii) it can be home-grown, reducing or eliminating the need to import petroleum-based fuels, and (iii) in sufficient quantity, it can be exported, thus providing an income stream forthe producing country. Furthermore, the plant can grow on land unsuited for crops needed by humans and animals.

Perspectives on jatropha as a biofuel

There is no doubt that the global financial downturn has contributed to disappointment in jatropha as a biofuel, but there are other considerations. Rob Bailis. an environmental scientist with Yale University, was quoted in Nature (461:328-329. 2009) as saying. "Over the past three years, the investment [in jatropha] got way ahead of the plant science."

Yields for crops such as maize have been optimized over the past several thousand years, whereas jatropha is still a newcomer in the tield of agriculture. Dl Oils (see inform 20:421. 2009). which initially started as a business to plant jatropha and harvest oil. is now conducting a breeding program to develop seeds with high oil yields. SG Biofuels (Encinitas, California. USA) is also collecting samples from jatropha plants growing in the wild and developing a library of genetic material to use in developing enhanced seed strains (inform 20:320.514,2009).

At a discussion organized by the Second Jatropha World Africa meeting (held in Brussels on October 14-15. 2009). Chris Unter and James Scruby, Directors of Viridesco (London. UK; Mozambique: Zambia), pointed out that, in theory, there is no problem with jatropha as a large-scale plantation plant. It is necessary, though, that the crop be studied and cultivation techniques perfected.

In an article written for Cleantech.com (http://cleantech.com/news/5177/sg-biofuels-potential-jatropha). Kirk Haney, chief executive officer of SG Biofuels, pointed out. "The genetic improvement of jatropha through traditional plant breeding could increase yields 50% to 100%, and quite possibly much higher." Further. "By way of comparison, yield of the rubber tree was increased by 400% through similar breeding efforts." If biotechnology is brought to bear on the question, the yield may be increased even more.

From another perspective, Commodity Online reported that Scruby suggested that converting jatropha oil to biodiesel may be misguided. Putting jatropha oil through a chemical processing plant creates added costs. This may not be important in a large-scale plantation, where product is being exported to colder climates. In climates where temperatures do not fall far enough to congeal jatropha oil, though, pure oil (straight vegetable oil) can be pressed in local pressing equipment and the filtered oil used virtually as-is. Scruby said, "Within this model, I see a commercial approach, which has better margins and benefits local communities."

Thus, jatropha may have a future in sub-Saharan Africa once crop improvements have been devised and management practices are established. And an answer must be reached, perhaps uniquely (breach country, whether the goal is to produce oil for local consumption straight vegetable oil and/or biodiesel or for export.

(Inform Technical Projects Editor Marguerite Torrey can be reached via email at mtorrey@aocs.org.)

LOWER PRICE

Catilin technology lowers biodiesel cost

In November 2009. SRI Consulting of Menlo Park, California. USA. completed a technical and economic analysis of the process invented by Catilin. Inc. (Ames. Iowa, USA) for producing biodiesel. SRI concluded that Catilin's solid catalyst process has a value advantage over the traditional catalytic process of $0.13 per gallon of

biodiesel. When the capital expense savings are included, the advantage increases to $0.19 per gallon of biodiesel.

The heart of the Catilin process is the T300 heterogeneous catalyst, which is a non-toxic direct replacement for the commonly used toxic sodium methylate. Unlike other solid catalysts trying to enter the market. Catilin's T300 catalyst is able to operate at industry standard pressures and temperatures. As a result, current producers can retrofit their plants in a matter of days at very low cost. Another advantage is that the glycerin coproduct has a purity greater than 98% and qualifies as technical grade, which significantly enhances its overall value.

The abstract of the SRI Consulting report is available at www.sriconsulting. com/PEP/Public/ Reports/Phase-2009/ RW2009-5/.

Flaxseed may reduce osteoporosis risk

Animal studies suggest that adding flax-seed oil to the diet could reduce the risk of osteoporosis in postmenopausal women and women with diabetes, according to a report published in the International Journal of Food Safety, Nutrition and Public Health (2:189-201.2009).

Mer Harvi and colleagues at the National Research Center in Cairo. Egypt. have studied the effect of diabetes on bone health and evaluated how flaxseed oil in the diet might delay the onset of osteoporosis. The researchers studied 70 female albino rats of which 30 had their ovaries removed (ovx) to simulate the postmenopausal state and experimental diabetes was present in one group of rodents.

After two months, the team collected urine and blood samples from the rats and measured serum insulin-like growth factor 1 (IGF-1) and the bone-creating protein osteocalcin. They found that these two compounds were present at higher levels in the ovx and the diabetic ovx groups, but much lower in the non-ovx diabetic group. The concentrations of IGF-1 and osteocalcin could be raised to normal levels by adding flaxseed oil to the diet.

The team also found that levels of deoxypyridinoline in the urine were raised in the diabetic group. Deoxypyridinoline is normally present in healthy bone, and its presence in urine is a specific marker for bone resorption associated with osteoporosis. Levels of this marker compound fell when the rats were given flaxseed oil.

The team concludes that diabetes has a more pronounced effect on bone health than ovariectomy and that diabetes in postmenopausal women may also be a greater risk factor for osteoporosis than the decline in sex hormones associated with menopause. However, their results suggest that flaxseed oil has a beneficial effect on bone mineral density and reduces markers associated with osteoporosis, suggesting that this dietary supplement could be beneficial to women with diabetes in reducing their risk of osteoporosis.

The team explains that the presence of cx-linolenic acid in flaxseed oil may play a role in protecting the processes of matrix formation and bone mineralization, which are apparently compromised by diabetes and menopause. "We recommend further investigations using animals and humans to confirm the effect of using dietary flax-seed oil to improve bone health and to prevent osteoporosis." Harvi and colleagues conclude.

Omega-3s and bone health

Previous studies on omega-3 fatty acids and bone health have looked at older adults and young men. A new study led by Susanne Eriksson of the University of Gothenburg. however, looked specifically at 8-year-old boys in an urban Swedish community.

The scientists found that children with higher long-chain omega-3 intakes had significantly better bone mineral density, which is a sign of strong and healthy bones. Further, those boys with a lower omega-3 intake and a higher omega-6 intake had

the lowest bone density. The researchers also found that children who seldom or never drank milk had stronger bones than those who drank milk. A possible explanation is that most dairy cows are fed grains and. therefore, their milk is high in omega-6 fatty acids, the researchers said.

The study appeared in the British Journal of Nutrition (102:401-4T, 2009).

QUANTUM LEAP

Mechanisms of aqueous extraction of soybean oil

Campbell. K.A.. and C.E. Glat/. J. Agric. hood Client. 57: \ 0904-10912. 2009.

Aqueous extraction processing (AEP) of soy is a promising green alternative to hexane extraction processing. To improve AEP oil yields, experiments were conducted to probe the mechanisms of oil release. Microscopy of extruded soy before and after extraction with and without protease indicated that unextracted oil is sequestered in an insoluble matrix of denatured protein and is released by proteolytic digestion of this matrix. In flour from flake, unextracted oil is contained as intact oil bodies in undisrupted cells, or as coalesced oil droplets too large to pass out of the disrupted cellular matrix. Our results suggest that emulsification is an important extraction mechanism that reduces the sizes of these droplets and increases yield. Protease and sodium dodecyl sulfate were both successful in increasing extraction yields. We propose that this is because they disrupt a viscoelas-tic protein film at the droplet interface, facilitating droplet disruption. An extraction model based on oil droplet coalescence and the formation of a viscoelastic film was able to tit kinetic extraction data well.

SO WHAT ?

Improved bioethanol production

Sugars released from agricultural residues such as wheat straw and corn stover are formed in conjunction with significant quantities of acetate. Acetate can slow or even halt bioethanol production by the yeast Saccharomyces cerevisiae. Another problem is that about 4% of the sugar is lost to the formation of the by-product glycerol.

By introducing into the yeast a single gene from the bacterium *Escherichia coli*, researchers of the Netherlands-based Delft University of Technology and the Kluyver Centre for Genomics of Industrial Fermentation enabled the conversion of acetate to ethanol, thus increasing the yield of ethanol. This substitution also replaced the normal role of glycerol so efficiently that key genes in glycerol production could be removed, thus completely abolishing glycerol production.

Follow-up research on the transfer of this concept to industrial yeast strains and real-life process conditions is continuing. The Delft yeast researchers V. Guadalupe Medina. M.J.H. Almering, A.J. A. van Maris. and J.T. Pronk - who applied for a patent on their invention, hope to intensively collaborate with industrial partners to accelerate its implementation and commercialization.

"D" FOR DISPUTE

Miracle of Vitamin D : Science or hype?

Tara Parker Pope

Research suggests great potential in this nutrient, but little is known about its ideal level or the side effects of high doses. Now a major study aims to find some answers.

Imagine a treatment that could build bones, strengthen the immune system and lower the risks of illnesses like diabetes, heart and kidney disease, high blood pressure and cancer.

Some research suggests that such a wonder treatment already exists. It's vitamin D, a nutrient that the body makes from sunlight and that is also found in fish and fortified milk.

Yet despite the health potential of vitamin D, as many as half of all adults and children are said to have less than optimum levels and as many as

10 percent of children are highly deficient, according to a 2008 report in The American Journal of Clinical Nutrition.

As a result, doctors are increasingly testing their patients' vitamin D levels and prescribing daily supplements to raise them. According to the lab company Quest Diagnostics, orders for vitamin D tests surged more than 50 percent in the fourth quarter of 2009, up from the same quarter a year earlier.

But don't start gobbling down vitamin D supplements just yet. The excitement about their health potential is still far ahead of the science.

Although numerous studies have been promising, there are scant data from randomised clinical trials. Little is known about what the ideal level of vitamin D really is, whether raising it can improve health, and what potential side effects are caused by high doses.

And since most of the data on vitamin D comes from observational research, it may be that high doses of the nutrient don't really make people healthier, but that healthy people simply do the sorts of things that happen to raise vitamin D.

"Correlation does not necessarily mean a cause-and-effect relationship," said Dr JoAnn E Manson, a Harvard professor who is chief of preventive medicine at Brigham and Women's Hospital in Boston.

"People may have high vitamin D levels because they exercise a lot and are getting ultraviolet-light exposure from exercising outdoors," Manson said. "Or they may have high vitamin D because they are health-conscious and take supplements. But they also have a healthy diet, don't smoke and do a lot of the other things that keep you healthy."

Manson is leading a major study over the next five years that should provide answers to these questions and more. The clinical trial is recruiting 20,000 older adults, including men 60 and older and women 65 and older, to study whether high doses of vitamin D and omega-3 fatty acids from fish-oil supplements will lower risk for heart disease and cancer. (For more details of the study, go to www.vitalstudy.org.)

FISH OIL COMBO

Manson said fish-oil supplements were included in the study because they are another promising treatment that suffers from a dearth of clinical trial evidence. In addition, both vitamin D and fish oil are known to have an anti-inflammatory effect, but each works through a different pathway in the body, so there may be an added health benefit in combining them.

Study participants will be divided into four groups. One will take both vitamin D and fish oil pills. Two will take either a vitamin D or a fish-oil supplement and a place-bo. The fourth will take two place-bo pills.

Vitamin D is found throughout the body and acts as a signaling mechanism to turn cells on and off. Right now, the recommended dose from all sources, counting food and sunlight, is 400 international units a day, but most experts agree that is probably too low. The Institute of Medicine is reviewing guidelines for vitamin D and is expected to raise the recommended daily dose.

Study participants will take 2,000 IU's of vitamin D3, believed to be the form most easily used by the body. The study will use one-gram supplements of omega-3 fish oil, about 5 to 10 times the average daily intake.

The vitamin D dose is far higher than what has been used in other studies. The well-known Women's Health Initiative study, for instance, tracked women taking 400 units of vitamin D and 1,000 milligrams of calcium. The study found no overall benefit from the supplements, although women who consistently took their pills had a lower risk of hip fracture. Even so, many experts think 400 units is far too low for any additional health benefits.

Another study, of 1,200 women, looked at the effects of 1,500 milligrams of calcium and 1,000 units of vitamin D. Women who took both supplements showed a lower risk for breast cancer over the next four years, but the numbers of actual cases seven breast cancers in the placebo group

and four in the supplement group - were too small to draw meaningful conclusions.

RISKS OF EXCESS

Although consumers may be tempted to rush out and start taking 2,000 I.U.'s of vitamin D a day, doctors warn against it. Several recent studies of nutrients, including vitamins E and B, selenium and beta carotene, have proved disappointing - even suggesting that high doses do more harm than good, increasing risk for heart problems, diabetes and cancer, depending on the supplement.

Despite the promise of vitamin D in observational studies, research into other supplements shows it's difficult to document a benefit in otherwise healthy people, and virtually impossible to predict potential harms, notes Dr Eric A Klein, chairman of the Glickman Urological and Kidney Institute at the Cleveland Clinic. Klein recently worked as national coordinator for Select, a study of vitamin E and selenium for prostate cancer. The study seemed promising, but in the end it showed no benefit from the supplements and a potentially higher risk for diabetes in selenium users.

"My sentiment is that the lesson we have learned form large trials with other vitamin supplements, including Select, is that there is no proven health or preventative benefit for dietary supplements in nutritionally replete populations, which accounts for most of the people who enter this sort of clinical trial," Klein said. "It makes more sense to me to study dietary supplements or vitamins in populations who are deficient."

People most at risk for vitamin D deficiency are older, have diabetes or kidney disease, stay indoors or have darker skin. African-American teenagers are at particularly high risk, possibly because in addition to their dark skin, as teenagers they are less likely to drink milk or play outside.

The scientific community continues to debate the optimum level of vitamin D. In general, people are considered to be deficient if they have blood levels below 15 or 20 nanograms per millilitre. But many doctors now believe vitamin D levels should be above 30. The ideal level isn't known, nor is it known at what point a person is getting too much vitamin D, which can lead to kidney stones, calcification in blood vessels and other problems.

People's vitamin D levels are influenced by whether they have light or dark skin, where they live, how much time they spend outdoors and by fish and milk consumption. To raise vitamin D without supplements, a person could increase sun exposure for 10 to 15 minutes a day. Eating more fish can help — a 3.5-ounce serving of wild fresh salmon has 600 to 1,000 IU's of vitamin D - but it would take a quart of milk day to get the recommended dose of vitamin D.

We know is that there are a lot of people who are vitamin D deficient based on estimates from surveys. But we don't know what happens when the curve shifts to the other end. There probably is a risk to having too much vitamin D in the system.

— Dr. Michal Melamed

EXCITING NEWS

GOSSYPOL EFFECTS IN ANIMAL FEEDING CAN BE CONTROLLED

Steve D. Martin, *National Cotton Products Association, Cordova, USA*

Abstract

Gossypol, a substance found naturally in cottonseed and cottonseed products has been the subject of numerous research projects and articles in the past. However, controlling gossypol intake is still a concern in many livestock classes. This review article includes a summary of the classical information on limits and effects as well as results from recent research projects with immature and adult ruminant and non-ruminant species. The intent of this article is to provide practical information and guidelines for the safe and efficient use of cottonseed and cottonseed products.

Cottonseed meal has long been a popular and economic protein concentrate for animal feeding.

The realities of least cost ration formulation and simple economic incentive have been the prime reason that this co-product of the cottonseed oil extraction industry has found its way into feeds for many classes of animals. Cottonseed meal has some natural limiting factors that must be considered for safe use. Chief among these factors are protein level and quality, fiber level and the gossypol content. Here, we want to review what is known about this last factor, the proper control of gossypol in animal feeds and limits of free gossypol when consumed by production animals.

Included in this review will be the effects of free gossypol in cottonseed meal, whole cottonseed or cottonseed hulls on non-ruminants, mature and immature ruminants and on the fertility of bulls and cows. The latest recommendations for safe levels of gossypol are also reviewed.

What is gossypol?

A comment on cottonseed processing and the occurrence of gossypol may bp helpful. Along with each 100 lb. of cotton fiber produced in the field, about 140 lbs. of seed are also produced. Thus, more seed than fiber is produced from an acre of cotton. About 1.5 percent of the approximately five million tons of seed produced annually in the U.S. are needed for planting, leaving the rest for processing or feeding. In the past five years the amount of cottonseed that has been crushed has amounted to between 40-50% of that available. The remainder is fed as whole seed. In a typical year, about 1.1 million tons of cottonseed meal is fed to livestock in the U.S. with excellent results.

Cottonseed oil, meal, hulls and linters are the four major products of cottonseed. Cottonseed meal (CSM) may be sold in the form of meal, cake, flakes or pellets. Most meal is sold at a 41% protein level and has been popular with stockmen for more than a century. Cottonseed hulls (CSH) are used as a roughage source for ruminants. Hulls are comparable in quality to grass hay and require no further processing.

Gossypol is a polyphenolic yellow pigment found naturally throughout the cotton plant. In the seed, gossypol is found in small pigment glands. When the seed kernels are flaked and heated as part of the oil extraction process, these small glands are ruptured and the gossypol is released. Some of the gossypol will bind with components in the seed (Adams and Geissman, 1960; Jones, 1985). This is the reason for the terms "bound" and "free" gossypol. All of the gossypol in whole seed is in the free form (Ponset al., 1953), but as a result of processing, both free and bound gossypol will be present in meal (Jones, 1985). During processing, free gossypol is bound to cottonseed protein resulting in bound gossypol and unavailable amino acids. This binding reduces the protein quality, especially with regard to lysine availability. Lysine is believed to be the primary amino acid that is bound to free gossypol (Baliga and Lyman, 1957; Conkerton et al., 1957: Kuiken and Lyman, 1948).

The binding of free gossypol is important because, based on the traditional concepts, the free form is the toxic form. The degree of binding is also critical due to the importance of available lysine especially when meal is fed to non-ruminants. This creates the trade off in cottonseed meal where more bound gossypol results in a lower level of the already marginal lysine. It is unknown at this time if some of the bound gossypol is released in the gut of the animal and this is a fertile area for more research.

Gossypol levels in cottonseed products

Whole cottonseed (WCS) has a significantly higher level of free gossypol than meal or hulls. In a survey completed by Texas A&M researchers, whole seed in Texas ranged from 0.47 to 0.63% free gossypol and meal ranged from 0.079 to 0.298% on an as-fed basis (Calhoun, 1989). Hulls were recently sampled for free gossypol and found to contain 0.06% on an as-fed basis (NCPA, unpublished data). Table I contains information concerning gossypol levels in various cottonseed products. There is a lack of understanding regarding free gossypol values in whole seed, and the basis for gossypol reporting. Commercial testing labs report free gossypol as a percent of the kernel only. The weight of hulls and linters has to be considered to calculate gossypol levels in whole seed. These weights can vary but both together generally make up 45% of the dry weight of ginrun whole seed (Tharp, 1948). Another possible area of confusion is the fact that even though all of the gossypol in whole seed is considered to be

in the free state, analyses for free and total gossypol will not necessarily result in the same numbers. This is because there are two separate official analytical procedures for free and total gossypol even though in theory, they are measuring the same thing.

As indicated by the Texas A&M survey, there is quite a variation of free gossypol levels in cottonseed meal. This variability is due to different processing methods used to extract oil as well as some natural variation in cotton varieties and an influence of growing factors (Cherry et al.. 1978). Recently, cottonseed meals from several oil mills in Texas were analyzed for free gossypol. The four processes and their respective free gossypol levels were, on an as-fed basis: mechanical (screw press), 0.02-0.05%; pre-press solvent. 0.02-0.07%; direct solvent, 0.1-0.5%: and, when expanders were used in the solvent process, 0.06-0.1% (Calhoun, 1989). The values found in this survey are in line with what the industry has historically seen in each of the common processing techniques (Jones, I 981). The mechanical (or screw press) method involves the most heat and pressure, thus the low free gossypol levels. The direct solvent method uses the least amount of heat and pressure, and results in higher free gossypol levels. The free gossypol levels for prepress are intermediate due to an intermediate amount of heat and pressure. The use of expanders in the solvent process is a new development in the industry that results in more efficient oil extraction. These adaptations of the familiar extruder are now common in solvent mills and subject the kernel to moist heat and moderate pressure before extraction. Mills that employ the direct solvent process alone without the use of an expander are becoming increasingly uncommon in the U.S. Statements regarding the heat and pressure resulting from each process is generalities and the process at individual mills may vary. Table 1 contains a list of cottonseed products and their respective free and/or bound gossypol levels.

It has been known for many years and is well documented that the gossypol in cottonseed feed products could be toxic to some animals in certain situations if known precautions were not followed. Several good reviews exist of these observations and they can be consulted for specific information (Berardi and Goldblatt, 1980; Holmberg et al.. 1988, and Feedstuffs, Dec. 21 and 28,1981). Some of the classical signs of chronic gossypol toxicity seen in a variety of species as compiled by Berardi and Goldblatt (1980) are depression, loss of appetite, anorexia, "thumps" or labored breathing, dyspnea, weakness, emaciation, weight loss, diarrhea, vomiting, decreased egg size and hatchability in poultry, injury to the heart, liver and kidneys and widespread edema. These symptoms have been observed consistently in non-ruminants and occasionally in young ruminants or in mature ruminants with very high free gossypol intakes (Hudson et al., 1988).

Recommendations for non-ruminants

The early knowledge of the dose level in swine, which was determined in the 1950s, allowed researchers to recommend the safe level of free gossypol in this specie. The limit in swine rations has been identified in several studies as 100 ppm (Tanksley and Knabe, 1981). The ration levels determined as safe for poultry are 50 ppm for layers and 100-150 ppm for broilers (Waldroup. 1981: NCPA. 1970). A study comparing CSM to soybean meal as a protein source in the concentrate for yearling horses showed no clinical signs of toxicity when the free gossypol concentration in the total ration was 115 ppm (Potter, 1981). In another study, weanling horses were not affected by a ration containing 343 ppm free gossypol (McCall. 1982). Gossypol tolerance in fish appears to be higher than in other animals and is also specie specific. For instance, Roehm et al. (1967) reported no effect when rainbow trout received 250 ppm of free gossypol. Growth of catfish, however, was not found to be inhibited at a level of 900 ppm of free gossypol per day (Dorsa et al., 1982). Tilapia seem so be more resistant to gossypol than other species offish. A level of 1,800 ppm of free gossypol did not adversely affect this specie (Robinson et al., 1984). Some of the values quoted in this paragraph were reported as-fed, some on a dry matter basis and others were not specified. Tables 2 and 3 contain these and other data, and the as-fed/dry matter basis, when known, is included.

Using iron salts

The addition of iron salts to cottonseed meal

has long been known to allow the level of gossypol to be increased without toxicity to some non-ruminant species. It is thought that the iron binds to the free gossypol (NCPA, 1966). The recommendation is a 1:1 ratio of the iron itself to free gossypol for swine diets containing more than 100 ppm of free gossypol on an as-fed basis (Tanksley and Knabe, 1981). However, the safe limit even with the inclusion of iron is 400 ppm of free gossypol (NCPA, 1970). The recommendation is 1-2 ppm additional iron for each 1 ppm of free gossypol for broilers and a 4:1 ratio of additional iron to gossypol is recommended for layers. Even with the inclusion of iron salts, it is suggested that the maximum gossypol levels be 400 ppm for broilers and 150 ppm for layers on an as-fed basis (Waldroup, 1981). Table 3 contains a summary of accepted free gossypol levels for swine and poultry, with and without iron salts. If iron salts are used, care must be taken to mix the salts well with either CSM or the final ration. As well, care must be taken in calculating the available iron if dried (exsiccated) ferrous sulfate ($FeSO_4.H_2O$ with 32% iron) is used or if copperas ferrous sulfate ($FeSO_4,7H_20$ with 20% iron) is used.

Gossypol and ruminants

For many years, it was assumed that only non-ruminant animals were susceptible to gossypol toxicity. Reports earlier this century of injury to cattle being fed cottonseed products were thought to be gossypol related, but were eventually discovered to be a vitamin A deficiency (Adams and Geissman,1960). Work by Reiser and Fu (1962) identified the mechanism by which functional ruminants avoid gossypol toxicity. These researchers found that the detoxification was a result of free gossypol becoming bound to soluble proteins in the rumen. The gossypol most likely binds to the epsilon-amino group of lysine. This bond is not broken by the proteolytic enzymes secreted in the lower gut. It is known, however, that ruminants are susceptible to gossypol toxicity if the rumen detoxification process is somehow bypassed. Intravenous administration of gossypol in sheep resulted in similar symptoms to those seen in non-ruminants (Danke et al.. 1965). Commercial beef cattle that are consuming cottonseed meal as a protein source in mixed feed or as a supplement are very unlikely to be in danger of a toxicity situation. There are at east two reasons for this: the rumen's detoxification abilities and the fact that a mature beef animal in a production situation usually won't receive enough CSM to tax the rumen's gossypol detoxification process. Over the decades, the largest proportion of cottonseed meal has been fed to beef cattle and this is still the case. This extensive practical use did much over the years to build confidence in cottonseed meal and tempted dairy and sheep producers to use large amounts of meal almost all of it without incident. Cottonseed meal was included in rations or many classes of livestock like baby dairy calves, high—producing dairy COWS and young sheep. However, these additional uses for meal were not as well supported by scientific data, and the unsupported use of CSM in several types of rations has resulted in some apparent toxicity conditions reported in the farm press. We'll consider some of these instances and how to avoid them.

Dairy cows

Today's high milk production levels have caused some new concern with regard to gossypol toxicity in ruminants. In order for a modem dairy cow to reach her genetic potential, her ration has to have a much higher protein (and energy) content than in the past. In many parts of the U.S., cottonseed and CSM can supply a major part of this requirement. The concern that this high level of meal feeding could tax the rumen's gossypol detoxification ability prompted research to answer this question. In their classical work, Lindsey et al., (1980) found gossypol in the plasma and livers of dairy cows fed a diet containing 45% direct solvent and screwpress process cottonseed meal. This level of meal was much higher than what is usually used commercially. However, the purpose of the study was to determine if the rumen could be overloaded with free gossypol. The fact that free gossypol was found in the plasma and livers, indicates that there is a limit to how much free gossypol can he detoxified in the rumen of lactating dairy cows. One cow receiving the highest level of free gossypol died, and symptoms and post-mortem inspection were both consistent with gossypol toxicosis. This study demonstrated that the consumption of 24.2 g of free gossypol per head per day for these high-producing Holsteins was too much. This translates into an intake of 19.4 mg/lb. body weight per day (42.7 mg/kg bodyweight per day). The study, however,

did not reveal how much gossypol could be safely handled by the high producing milk cow. Observations in the study did lead the researchers to believe that a high free gossypol intake caused the animals to be more susceptible to ill effects caused by heat stress and other stresses incurred in today's production system.

When discussing gossypol in dairy cows, the popular practice of feeding whole cottonseed must be considered. Many dairymen feed whole seed to benefit from the convenient package of protein, energy and fiber. Very few feedstuffs available to U.S. dairymen are as nutrient-dense as whole cottonseed, and this accounts for its attractiveness. Rumination of whole seed causes a somewhat slower release of these nutrients which makes seed feeding even more beneficial. Cows being fed whole seed frequently show increases in milk production as well as milk fat percentages along with a slight reduction in milk protein. As mentioned, 100% of the gossypol in whole cottonseed is in the free form. If too much seed is fed, it could cause the gossypol level in the rumen to reach or exceed the detoxification limit. The problem could he exaggerated when some amount of whole seed is fed in addition to a concentrate that contains CSM. The question is, how much gossypol is too much, or in practical terms, how much whole cottonseed or cottonseed meal is too much? In response to these kinds of questions concerning gossypol and dairy cattle, many articles have appeared in the farm press containing recommendations on how much whole seed can be fed. The usual safe recommendations vary from 5-8 lb. of whole seed per head per day (Bath, 1976; Coppock. 1984; Jimenez, 1979,1980. I98la, I981b). There is still much to be learned about the mature ruminant's ability to detoxify gossypol.

High availability at certain times of the year, economic factors, and a lack of specific literature in the past may have led to the overuse of some cottonseed products. With the above cited recommendations in mind, cottonseed and cottonseed meal can be safely used as high-quality dairy feedstuffs.

Rumen function and gossypol

The subject of gossypol with regard to young ruminants is an area of more uncertainty. In order for gossypol to be detoxified, the animal must have a functioning rumen. It is suggested by Wardrop and Coombe (1960) that the development of ruminants can be generally divided into three phases: (1) birth to three weeks old, a non-ruminant phase: (2) three to eight weeks old, a transitional phase; and (3) eight weeks and onward, a functioning ruminant. The National Research Council (NRC) recommendations for beef cattle agree with Wardrop and Coombe and state that the rumen becomes functional at six to eight weeks of age (NRC, 1984). These are certainly not hard and fast guides and will vary widely as milk and feed composition and consumption vary. Based on the knowledge of the development of ruminants, it would be reasonable to treat young lambs as well as calves as non-ruminants at least until six weeks of age and probably up to eight weeks or more so be safe. It is important to keep in mind that the wide ranges in the time it takes newborn sheep and calves to have enough rumen function to detoxify a significant free gossypol load have not been determined by controlled trials at this time. Currently, there are research projects in progress to better define safe gossypol levels in young calves and lambs and this information should he available in the near future.

Pre-ruminants

There have been occasional press reports and scientific reports (Holmberg et al.. 1988; Rogers et al.. 1975) of what was assumed to be the practical impact of free gossypol on pre-ruminant calves. One report was from ranches in the U.S. which suffered actual calf losses that were diagnosed as having been caused by gossypol toxicity. Holmberg et al. (1988) reported on a typical situation. Calves were individually housed in hutches at one day of age and were fed a commercial milk replacer. The usual pattern was that on day seven, the calves were fed a 17% crude protein starter ration that contained 27% CSM. Free gossypol in the total ration ranged from 250 to 380 ppm. The calves were placed into group pens at 60 days of age and near that same time they were switched to a lower protein ration and the milk replacer was discontinued. The second ration was fed until the calves were 110 days old at which time they were sold. The basis for this high level of cottonseed meal feeding is not certain. One possibility is a ration formulation con-

taining up to 27.9% CSM that was reported in at least two publications (Anonymous, 1968; Ensminger and Olentine, 1978).

In another published report, gossypol toxicosis occurred in young calves fed a liquid diet that contained 57% milk replacer and 43% CSM plus a little hay. The calves were fed this ration starting at three weeks of age and the free gossypol concentration in the diet dry matter was about 840 ppm. Some of the calves receiving this ration died and others showed evidence of gossypol toxicity. The authors of the report have recommended that CSM should not be fed to young calves as part of a liquid feed (Rogers et al., 1975). This recommendation seems logical based on what is known about milk passage in young ruminants. When a young ruminant drinks milk, the esophageal groove closes and causes most of the liquid to bypass the rumen and go directly into the omasum. This of course would prevent any rumen detoxification of free gossypol regardless of rumen development.

It is certain that these practices did not have research support. In fact, there was literature available that would have indicated the possibility of problems from feeding rations containing 27% or 43% CSM (Hollon et al., 1958). Several research reports, one dating as far back as 1894 (Emery, 1894), indicated that young calves are sensitive to cottonseed meal poisoning (Hollon et al., 1958). Results of extensive research conducted in North Carolina to try to determine the safe level of dietary free gossypol for young calves indicated that the maximum concentration was 100 ppm. as was suggested for swine (Hollonetal., 1958). There was certainly adequate literature available on gossypol toxicity in young calves to prevent economics from being the sole factor determining levels of cottonseed meal use in baby calf rations.

In recent years, gossypol toxicity in young ruminants has received much attention in the popular farm press, even to the point of making producers and feed manufacturers wary of including the safe levels of CSM supported by available research data.

The symptoms of gossypol toxicosis reported in young ruminants are similar to those listed earlier for non-ruminants. These symptoms appear to be most prevalent after long-term feeding of unsafe levels (greater than 70days, more than 100 ppm free gossypol). Death may result and may be preceded by the typical symptoms or it may be sudden. Fatalities have been reported to occur up to 30 days after the removal of CSM from the diet (Holmberg et al., 1988).

Based on the data currently available, the use of cottonseed meal in the diets of pre-ruminant calves or lambs requires careful attention to details and a precise understanding of what time period encompasses the pre-ruminant period. It appears that if any guess is to be made at a safe level, then the best guess at a recommendation for pre-ruminants is a maximum of 100 ppm in the total diet based primarily on the observation by Hollon et al. (1958) as well as on the observation that 100 ppm appears to be safe for growing swine. With baby calves consuming milk replacer, starter rations and sometimes hay, the gossypol concentration in the total diet is often difficult to calculate. It is important to remember that the recommendations are on a total intake basis. Also, considering recommendations on an amount per day basis instead of a percentage basis is best. With this in mind, the recommendation of less than 140mg of gossypol/cwt per day for young calves is useful (3.1 mg/kg bodyweight per day) (Hollon et al., 1958). Another important piece of information is the knowledge of the free gossypol concentration in the meal to be mixed. As noted earlier, the process by which oil is extracted from the seed determines to a large degree how much free gossypol will be in the meal. So, by knowing the normal ranges of gossypol in meals from the various processes, calculations can be performed to help prevent problems. Even better than using the normal ranges, testing of large individual lots of meal will help insure safe feeding. As with any feedstuff, the only sure way to know what is in the lot you are dealing with is to test that lot. Many analytical laboratories in the U.S. routinely test for free gossypol in meal or can direct feed manufacturers to labs that will perform the analysis, which is routine and not exorbitant in cost.

Lambs

Young lambs are also fed meal in many of the cotton-producing areas. Lambs are not as likely to receive CSM as early as calves in the dairy

industry. A common situation in sheep production is the need to wean lambs early at 6-8 weeks of age due to drought conditions often seen in sheep-producing regions. Normal weaning age for range lambs is 16-20 weeks. Concern about feeding cottonseed meal to these early-weaned lambs was the reason for a research project recently completed in West Texas. Early-weaned lambs were fed rations containing the following types of meal: (1) mechanical; (2) direct solvent; (3) solvent with expanders, or (4) glandless, each at two protein levels (15-19%) for 98 days. The direct solvent meal contained 0.364% free gossypol, a higher than average value, and produced obvious signs of toxicosis and death in four out of 20 lambs when included at 23% of the high-protein ration. These four lambs were the only ones in the entire study showing visible symptoms of toxicosis.

A consistent finding in all lambs except those fed glandless cottonseed meal was an increase in red blood cell fragility, but this did not appear detrimental to the animals and feedlot performance was not affected in any of the remaining lambs. This highest level of free gossypol fed which caused the four deaths was 17.6 mg/lb. of body weight per day (38.7 mg/kg bodyweight per day) or approximately 820 ppm in the total diet dry matter (Calhoun et al, 1990; Calhoun, 1990). This work indicates that there is a limit to the amount of gossypol detoxified in the rumen of an early weaned lamb. This level was achieved with an unusually high free gossypol-containing direct solvent meal that comprised a higher percentage of the ration than was necessary to meet protein requirements (NRC, 1985).

Based on research completed in Oklahoma, workers had previously reported that 9.1-11.4 mg of gossypol/lb of body weight (20.0 mg/kg bodyweight per day) resulted in the death of feeder lambs before the end of a 30-day study (Morgan et al., 1988). The researchers in Texas fed graded levels up to twice this amount for twice the length of time before effects were seen. The difference seems to be attributable to the method of administration and the form of the gossypol. In the Oklahoma study, the gossypol was administered as gossypol acetic acid powder, which was dosed once per day. This would result in the rumen receiving the entire day's dose of free gossypol at one time. It is logical that this single, large dose of free gossypol could exceed the rumen's capacity for binding gossypol to soluble proteins. In the Texas study where a level of 17.6 mg of gossypol/lb of bodyweight was found to be toxic in four out of 20 lambs, the gossypol was contained in meal in mixed rations that were consumed throughout the day as in a production setting. Therefore, data from this study would more readily apply to the typical on-farm situation.

The Texas research group designed an experiment to determine if there were in fact differences in effect due to the route of gossypol administration. Eight-week-old lambs were fed one of four levels of free gossypol for 28 days. The gossypol was derived from either gossypol acetic acid administered by capsule, from direct solvent CSM or whole cottonseed. All lambs receiving gossypol at the two highest levels. 9.1 and 13.6 mg free gossypol/lb of body weight per day (20 and 30 mg/kg BW) died by day 15 of the study. This is consistent with the findings of Morgan et al.(1988). However, lambs receiving the same amount of gossypol from CSM or whole seed showed no clinical signs of gossypol toxicity and none died. The results of this study indicate that the single dose, oral administration of gossypol acetic acid is much more toxic than the same dose of gossypol fed in CSM or whole seed (Huston et al., 1990). Thus, results from studies using the single dose administration of gossypol acetic acid may not apply to the usual production situation where animals are receiving the gossypol dose through the consumption of CSM or whole cottonseed.

Lambs, cows and calves

When considering early-weaned lambs, dairy cows and dairy calves, safe levels of free gossypol seem to be similar between the weaned lambs and mature cattle, while these levels differ from those that appear to be safe for young dairy calves. The reason for this appears to be the functionality of the rumen in each case. The 6- to 8-week-old weaned range lambs should have a functioning rumen. The new born dairy calf, however, is basically a non-ruminant, at least for the first several weeks of life. When put on a bodyweight basis, the level of free gossypol resulting in toxicity in dairy cows as determined by Lindsey et al. (1980) is similar to the unsafe levels found for lambs by Calhoun et al. (1990). Both researchers found that

levels around 18 mg/lb. of bodyweight (40 mg/kg bodyweight per day) resulted in deaths of some animals. In contrast, Hollon et al. (1958), based on their research suggested the limit for dairy calves at 1.4 mg/lb. of body weight (3.1 mg/kg bodyweight per day). It seems most obvious that the safe level of free gossypol for ruminants is mainly determined by the functionality of the rumen. Table 4 contains a summary of research results for ruminants.

Effects on fertility

CSM has been a common source of supplemental protein for mature ruminants for many years. Much of this meal was fed to animals in the breeding herd. For years, brood cows and bulls have been helped through the winter with a couple of pounds of cottonseed cake or meal per day. As knowledge developed in recent decades regarding gossypol's effect on fertility in humans, questions have been raised regarding feeding large amounts of cottonseed or CSM to production animals. There is a limited amount of data in this area and projects are currently in progress to determine the effects of supplemental CSM or whole cottonseed on reproduction in mature ruminants. It is almost certain that the answer to this problem is not simply refraining from this type of supplementation. The intent of the research trials in this area is to determine how to use cottonseed products as a supplement for breeding animals and at the same time insure high reproductive efficiency. One thing hampering information on this subject is the preliminary nature of the research findings and subsequent recommendations. This is a relatively new area of research and as such, all the questions are not answered. It is also a very important area of study because of the important relationship between reproductive efficiency and profit.

Males

The recent interest in gossypol's effect on male reproduction is a result of reports in the 1970s of the contraceptive effect of gossypol in men in China. These observations were the basis of research to determine the value of gossypol as a male anti-fertility agent in lab animals and humans. In the Chinese studies, a dose level of 20mg of free gossypol per day for two months resulted in infertility in 99.98% of the 4,000 men in the study (National Coordinating Group on Male Anti-Fertility Agents. 1978). Infertility resulting from gossypol has also been found to be reversible as early as six weeks after the removal of gossypol (Sotelo et al., 1982). The research area has been relatively active (Segal, 1985; Xue, 1985) and several researchers have attempted to determine if the results seen with men in China are applicable to other species.

Considering the large amount of cottonseed products fed to male breeding animals, projects were initiated to determine if whole seed or CSM feeding had any negative effects on reproductive ability in bulls and rams. Based on research completed up to this point, effects of gossypol (fed at levels discussed below) on male reproduction include immature spermatozoa, detached sperm heads and a decrease in number and mobility of spermatozoa. (Ruttle.1989). Some of the causes for these problems have been attributed to a degeneration of testicular tissue (Chase et al.. l990a), a decrease in the number of sperm reaching maturation and an increase in the percent abnormal sperm. It was observed that it takes approximately six weeks after gossypol is removed from the diet for the semen to return to normal (Ruttle, 1989). In one study, yearling bulls fed whole seed that delivered 15 g of free gossypol per day for 60 days showed signs of a higher percent abnormal sperm (Stahnke. 1986).

In another research trial, young weaned bulls were fed whole seed, which delivered 27 g per day, or CSM which delivered 1.9 g free gossypol per day for more than 400 days. The bulls consuming whole seed were later in reaching puberty and bulls on both treatments had lower quality semen than bulls on a gossypol-free diet. Both sets of bulls recovered when gossypol was removed from the diet (Chaseetal, 1989). A critical factor in this study is the extremely long duration of intake of gossypol. The practice of feeding this type of ration to bulls every day for more than 400 days is not likely to occur in a commercial situation. Most commercial bulls would receive a few pounds of CSM per day before and during breeding season or through the winter which should not result in the accumulative effect seen in the bulls fed for over 400 days. In another research trial,

TABLE 1. Gossypol Levels Seen in Common Cottonseed Products.

Product	% total gossypol	%tree gossypol	Reference
Cottonseed Kernel	-	0.4-1.4b	Altschul et al.,1958
	0	0.75-0.86'	Cherry et at.,1978
	0 0.39-1.7'	0.39-1.7r-	Pons at al., 1953
Whole Cottonseed		0.47-0.636	Calhoun, 1989
Delinted Whole Cottonseed		0.47.0.53[b]	Calculated
Cottonseed Meal			
Screw Press		0.02-0.05°	Berardi & Goldblatt. 1980
	1.02[d]	0.044	NCPA.1970
		0.02-0.07°	Berardi & Goldblatt, 1980
			NCPA, 1970
Prepress Solvent			
	1.13[d]	0.05[d]	
Direct Solvent		0.1-0.5[b]	Berardi & Goldblatt, 1980
	l,04[d]	0.3°	NCPA, 1970
Solvent (expander process)		0.06-0.1[d]	Calhoun. 1989
Cottonseed Hulls		0.06[d]	NCPA,
Glandless Whole Cottonseed	0.01'		Unpublished data Calculated'

a The kernel is reported to comprise, approximately 55 %' g.nne*", c.,:'onceod (Tharp,1949;.
b Dry matter/as led basis not reported
c Dry matter basis.
d As led basis.
e Calculated from Cherry at al., 1978 and Nc; ns, 1982
f Calculated from Lusas and Jividen, 1987 and Tharp.1948

2.7 g of free gossypol was fed in a mixed ration containing whole cottonseed for 120 days with no adverse effects on any semen parameters that were measured (Smith et al. 1989).

Another study has recently been completed in Texas to determine if gossypol intake had any effects on testosterone secretion. Young bulls were used in the study and were fed diets containing whole cottonseed, CSM or soybean meal. Testosterone secretion measured before, at and after puberty was not affected by gossypol intake (Chase et al., 1990b).

In routine feeding practices, the use of 3-5 lb. of CSM fed either as a supplement or contained in a mixed feed is most unlikely to expose the breeding animals to the levels of gossypol needed to cause reproductive problems. The effects on semen quality seen in the research trials mentioned did not determine if it left the bulls infertile. It is important to point out at this time that it has not been proven that feeding CSM would negatively affect actual breeding percentages in a range or pasture breeding situation. It is, of course, more likely that the feeding of whole cottonseed might result in fertility problems compared with CSM simply because of the higher concentration of free gossypol. Simply put, more work needs to be done in this critical area.

TABLE 2. Reported "Effect" and "No Effect" levels of free gossypol In nonruminants from research trials.

Class of Livestock	Free_GossypolIntake (ppm) Effect	No Effect	Reference
Yearling horses	-	115[a]	Potter,1981
Weanling horses	-	348[a]	McCall,1982
Catfish	-	900[b]	Dorsa et at., 1982
Tilapia	-	l,800[bc]	Robinson at al,, 1984
Rainbow trout	l,000[ac]	250[ac]	Roehm at al., 1967
Shrimp (Penaeus vannamei)		170[b]	Fernandez, 1987

[a] Dry matter(as led basis not reported
[b] Dry matter basis.
[c] Fed as gossypol acetic acid

TABLE 3. Currently accepted tolerance levels for free gossypol in poulty and swine (as fed basis).

Class of Livestock	Free Gossypol Intake (ppm)	Maximum Free Gossypol Intake with iron salts	Reference
Broilers	100.150	400 ppm (1-2 ppm Fe:l ppm Free Gossypol)	Waldroup. 1981 NCPA, 1970
Layers	50	150 ppm (4 ppm Fe:l ppm Free Gossypol)	Waldroup, 1981 NCPA. 1970
Swine	100	400 ppm (1 ppm Fe:l ppm Free Gossypol)	Tanksley & Knabe,1981 NCPA, 1970

Table 4. Reported "effect" and "no effect" levels of free gossypol in ruminants from research trials

Class of Livestock	Free Gossypol Intake (ppm) Effect	No Effect	Reference
Pre-ruminant calves	-	100[a]	Hollon et al., 1958
Young lambs	824[b]	-	Calhoun, 1989
Mature dairy cows	1076[b]	-	Lindsey et al., 1980

[a] Dry matter/as led basis not reported b Dry matter basis
[b] Dry matter basis

Females

It is reasoned that if gossypol has an effect on testicular function in males, it may also have an effect on the ovaries in females. In a review by Nomeir and Abou-Donia (1985), nine studies were cited where gossypol did not cause females of several species to become infertile. In one of these studies, Wu et al. (1981) observed altered follicle stimulating hormone secretion in female hamsters consuming gossypol. Many questions remain in the area of gossypol and female reproduction. There have been very few producer reports of reproductive problems that were thought to be due to cottonseed feeding. It is not at all certain that these problems could be due to gossypol or anything in the cottonseed, since there is a lack of scientifically controlled investigation. Reports of female dairy cow infertility have been uncommon and have not pointed to a specific problem.

Embryos

There is limited data on the effect of gossypol on embryos. Zirkle et al (1988) discovered a dose-dependent effect of gossypol on bovine embryos, in vitro. Thisaction, the result of the in vitro culturing of embryos in fluid containing from 1-30 micrograms of free gossypol appeared to be a physiological effect upon the embryo itself and not a mutational effect. It is unlikely that an embryo in uteri could be exposed to that amount of gossypol when considering the dam's rumen detoxification ability. More work, preferably, in vivo, is needed to determine if this is a problem that could effect reproductive efficiency in a production situation.

Conclusion

The one final word that can he said now is the classic acknowledgement that more information is needed in each of these specific production situations. The research trials planned and those in progress may help to answer the large number of questions that have been raised by the current emphasis on even greater animal productivity and the need for economic efficiency. Once again, it is certain that the answer is not the total removal of all cottonseed products from the rations of all producing classes.

Cottonseed, CSM and CSH have been shown to be fine sources of protein, energy and fiber and are palatable to many classes of livestock. The presence of gossypol has always required that cottonseed products be fed with attention and care if the maximum benefit is to he derived. The development of CSM as a protein concentrate over the last century has been dependent on applying carefully conducted research studies to actual feeding practices. This has been the firm basis of cottonseed product use in the past. In this regard, nothing has changed. Knowing the limitations of cottonseed product applications in animal feeding practices will allow for their safe and efficient use.

Editor's Note - Steve D. Martin is assistant to the director of research and education for the National Cottonseed Products Association.

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TIME IT DID

Govt. To Impose Trans Fat Limits On Vanaspati Soon

Vanaspati makers are apprehensive over a proposed regulation seeking to limitthe Trans Fatty Acids (TFA) content in their product to 10 per cent by early next year and to 5 per cent over the subsequent three years.

The Food Safety & Standards Authority of India (FSSAI), it is learnt, is in the process of drafting a notification fixing the above limits in line with the recommendations of the National Institute of Nutrition, Hyderabad.

"The draft limits are to be put up shortly on the FSSAI's Web site to invite public comments within 45 days, after which the final version would be notified", sources told Business Line. The Prime Minister's Office had earlier directed that the norms for TFAs be laid down by December, 2009.

(Source : The Hindu Business Line dated 30th Nov 09).

BIO DIESEL

1. During the calendar year 2009 (Jan-Dec), World wide Biodiesel output was 15.9 Mn T and it is estimated that during 2010, it will increase to 19.2 Mn T.
2. Following is the year-wise World production of Biodiesel, installed capacity and capacity utilization percentage.

Year	Production MnT	Capacity MnT	Production % of capacity
2006	7.1	12	59%
2007	9.5	26	37%
2008	14.3	38	38%
2009	15. 9F	47	34%
2010	19. 2F		

3. Higher usage mandates come into force in 2010 and hence the Biodiesel production may increase by 3.2/3.3 Mn T during 2010 v/s 2009.
4. EU usage of Rapeseed Oil for Bio-fuel may rise to 6.5 Mn T in 09/10 from 5.7 Mn T one year and 5.5 Mn T two years ago.
5. In 2008/09, World consumption of Oils and Fats for Bio-fuels (Biodiesel and Power-Plants) reached 16.2 MN T or 10% of total world consumption. This was a lot for the Oils and Fats market, but amounted to only 0.4% of Mineral Oil output.
6. During 2009 composition of usage of Soya Oil in Biodiesel was 82% in Brazil and 98% in Argentina.
7. World usage of Mineral Oil was 4260 Mn T (Crude Mineral Oil) and World usage of Veg. Oils / Animal Fats was 163 Mn T in 2008/09. Bio-fuels produced from Oils and Fats can not even partly solve the Global Energy problems.
8. Country-wise production of Biodiesel during 2006 to 2010 is as under.
   Source: GGN , Research, Indore

BIODIESEL : Production, by Country (Mn T) - January / December

	Forecasts				
	2010F	**2009F**	**2008**	**2007**	**2006**
France	2.20*	2.00*	1.82	.87	.74
Germany	2.73*	2.50*	2.67	2.93	2.55
Italy	.98*	.82*	.66	.47	.50
Poland	.53*	.49*	.35	.20	.17
Spain	.60*	.42*	.19	.15	.12
Other EU	2.51*	2.19*	1.80	1.33	.77
ED-27	9.55*	8.42*	7.49	5.95	4.85
U.S.A.	2.10*	1.80*	2.69	1.70	1.13
Argentina	1.60*	1.16*	.74	.18	.05
Brazil	2.00*	1.40*	1.03	.36	.06
Colombia	.35*	.19*	.04	.01	--
Thailand	.65*	.53*	.37	.05	.02
Turkey	.05*	.03*	.06	.10	.33
Oth. countries	2.86*	2.39*	1.90	1.17	.68
Total	19.16*	15.92*	14.32	9.52	7.12
Change in (Mn T)	+3.24*	+1.60*	+4.80	+2.40	+3.53

Source: Oil Word.

NO STINK

Urine-processing technologies yield cash flow potential

The stink is out of urine, literally and metaphorically, with a growing number of researchers spotting commercial and ecological value in a liquid most people consider waste.

The Indian Institute of Technology (IIT) Delhi, for instance, is working to harvest this human waste and convert it into fertiliser. The Delhi government is willing to consider a revenue-share commercial venture selling the phosphates and nitrates in urine.

On the outskirts of Delhi, a little-known non-government organisation, Fountain for Development Research and Action, is laying the ground for the first urine bank. It has diverted urine from two schools, where it has installed odour-free urinals, into a tank transferred the run-off to a village nearby for use as fertiliser.

Director Madhab Nayak says the foundation is working towards farmers aware of its potentials as replacment for expensive urea.

"There is no such thing as waste," says Vijayraghavan M Chariar, assistant professor at the Centre for Rural Development and Technology at IIT. "Urine consists of a lot of inorganic salts, which produce gases only when mixed with water. It is, in fact, pure fertiliser, urinal which it has successfully tested on campus. The odour-free urinal combines technology with simple science to translate into a significant water-saving initiative (urine smells only when mixed with water, which this technology eliminates).

Urine is collected through a tank placed undergroud, harvested and used as liquid fertiliser two or three metres below the ground on a five-acre field on campus, said Chariar, who can talk animatedly about this human waste and how its poor treatment alone has led to sanitation problems.

The public urinal at IIT uses a simple technology called Zerodor, developed by Chariar, that fits into the waste coupler in the pan and diverts the urine throug a drain where it is collected and harvested. The idea is not to allow it to mix with water at any stage.

Chariar has already transferred this technology to Good Yield Environmental Technologies, a Kolkatta firm, and filed for a patent. Chariar claims that Zerodor is a low cost product and would need replacment in only about two years.

Meanwhile, the Delhi government, which has already installed 200 such odourless urinals in different part of the city, uses a different and perhaps more expensive technology. Amiya Chandra, deputy commissioner of the city's municipal corporation, says, "Other than problems of vandalism, these urinals are working perfectly."

In preparation for the common-wealth Games, the Delhi government is planning to install 1,000 such urinals at a nominal cost of Rs. 3 lakh.

Charirar already working on the second phase of his project, which was initiated by UNICEF and Stockholm Environmental Institute, for setting up a small reactor to extract nitrates and phosphates from urine. "This could become a micro-enterprise from the urinals." says Chariar.

Chariar has even designed similar urinals for women. "We have filed for trademark registration and we are in discussion with companies for marketing it," he says. With little more investment, he says, a hydrphobic coating on pans could make it water resistant and completely drain the urine, leaving no room for any oxidisation, which can also cause odour.

In the developed world, communities have been quick to realise the huge economic potential of urine. "Communities in Germany are exporting urine to neighbouring countries that are using it on their farms, says Chariar, explaining how it could be diverted for use as a nutrient by a simple plumbing.

The urine tank could deliver the liquid nutrient directly to plants about two to three metres below the soil, he says.

The centre for Banana Research in Trichy is already using it for banana plantations and the University of agriculture, Bangalore, too is looking at its varied use.

(Business Standard, March 2010)