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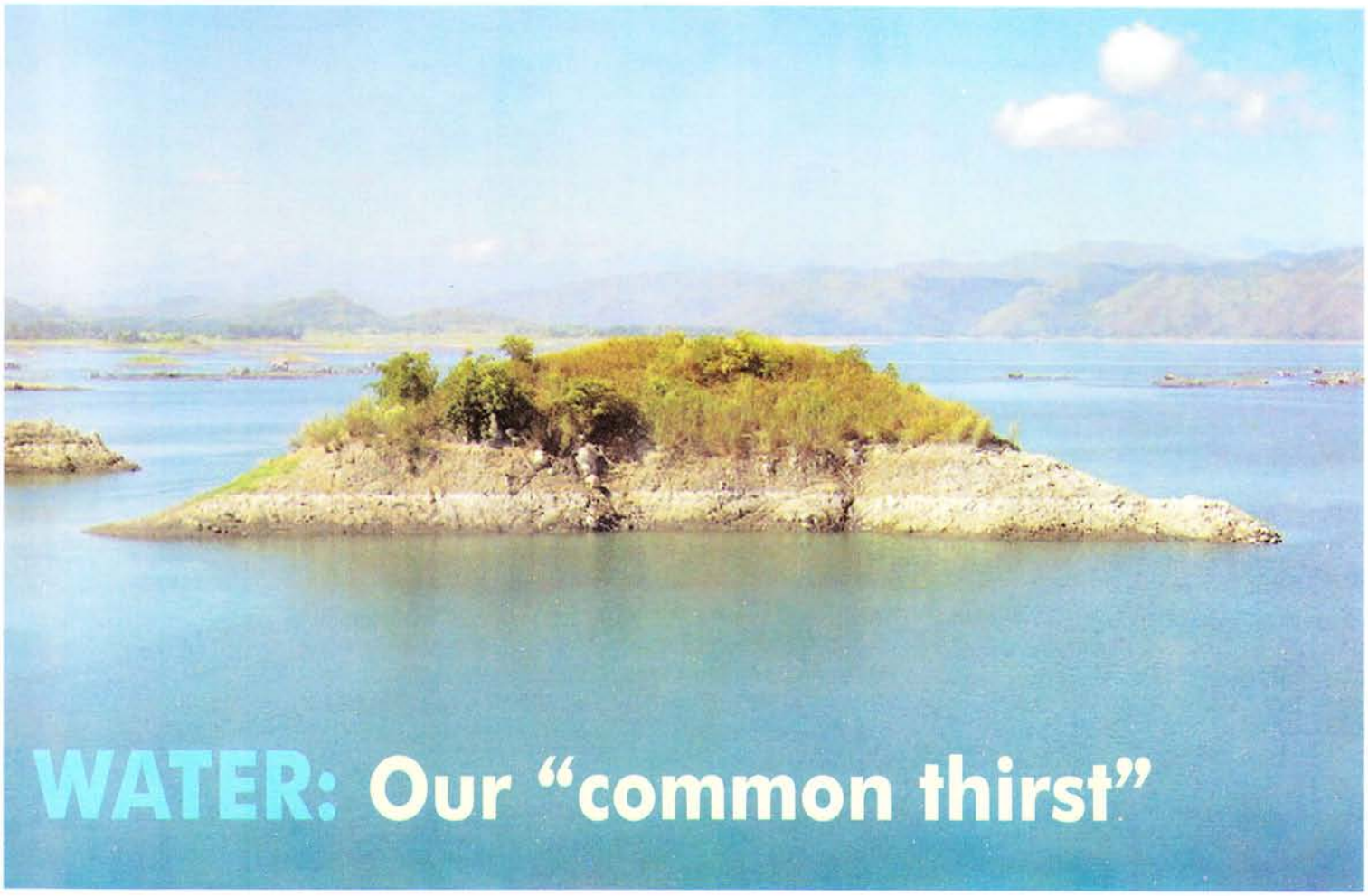

• Photo by Rdelacruz

WATER: Our "common thirst"

What's Inside:

BAR Research and Development DIGEST
The official quarterly publication of DA-BAR

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EDITOR'S NOTE

Our Common Thirst

You feel your mouth getting drier. Muscular weakness is setting in. Your ability to think clearly is fading and you feel a certain lightness in the head. You are experiencing dehydration. You need to get to water and you have to do it fast while you still can.

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It was not too long ago that the world felt that man had not given enough recognition of the vital importance of water - in fact, "the single most precious element for life on earth essential for satisfying basic human needs, health, food production, energy and maintenance of regional and global ecosystems"- that 2003 was declared as the International Year of Freshwater by the UN General Assembly.

The Secretary-General of the 2002 World Summit on Sustainable Development, Nitin Desai, called attention to the plight of the world's poor which cannot be alleviated without addressing the quality of the resource base upon which they depend - land and water resources. He drove home the point that, "the improvement of water use is central for all of the other dimensions of sustainable development."

Although 70 per cent of the world's surface is covered by water, only a fraction of that, 2.5 per cent, is freshwater. Of this small fraction, 70 per cent is frozen in polar ice caps and the remainder is found above or in the soil. This leaves less than one per cent of the world's freshwater resources in a form accessible for human use.

The call then is for the world to improve its stewardship of the extremely limited water resources. According to UN Secretary General Kofi Annan, "we need much more efficient irrigation, far less toxic agriculture and industry, and new investments in water infrastructure and services."

For its part, the Food and Agriculture Organization (FAO) has been active in promoting water development since its establishment in 1945. There are three basic concerns that govern the FAO's water programme: to produce more food with less water; to protect water quality and the environment, including human health; and to close the food consumption and production gap. Its focus is on getting "more crop for the drop" or more efficient irrigation and water management methods.

With this backdrop, the BAR *R&D Digest* brings to its readers three articles on water. The first one is on the traditional way of predicting the weather by Ilocano farmers which was shown to be uncannily correct a lot of times. The second is about the characterization of a city's inland waters as an input to the formulation of local fishing ordinances and coastal zoning. The last deals on a more micro level particularly with how to prevent water loss from impounding systems such as farm reservoirs.

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Pesticide overkill

(Whatever happened to integrated pest management?)

By MIKO JAZMINE J. MOJICA

• Photo by PhilRice

When farmers first learned of pesticide technology, they thought it would solve all their pestering problems with pests. They thought wrong.

Pests simply adapt to control measures that man innovates. We have to accept the fact that they are not going to just vanish in thin air, no matter the amount of pesticides we hurl on our crops. The truth is, the more we try to make these pests disappear through chemical means, the more they will swarm our fields. Worse, pesticides will not only damage the crops, it will also harm the environment and our health as well. Now, after decades of pesticide use, have those in the forefront of agriculture, the hands-on farmers, come to realize the impact of these critical concerns?

Survey shows...

In order to grow a healthy crop, planting materials should be of good quality, resistant to prevalent pests in the area and well adapted to local conditions, and free from diseases. But pest damage remains one of the biggest burdens for the vegetable farmers. Moreover, poor knowledge on proper pest control management practices aggravate the problem of growing a healthy and safe crop.

A survey on farmers who plant vegetables in the rainfed lowlands of Ilocos Norte was conducted to document their pest management practices, knowledge and attitudes toward pests and pesticides, and confirm the presence of pesticide residues on vegetables. It was conducted in 10 major vegetable-growing municipalities of the province with over 300 respondents interviewed.

The survey revealed that Ilocos Norte farmers were knowledgeable with regard to the kinds of insects and weeds attacking their crops but not on diseases. They usually plant vegetables such as tomato, pepper, eggplant, garlic, sitao, and ampalaya. They have different times of sowing, planting and harvesting months. In preparing the land for planting, they prefer to use tractors during the dry and wet seasons for plowing and harrowing.

The Ilocos Norte farmers also practice right spacing for their vegetable crops. When plants are closely-spaced, they compete for light, space and nutrients. Closer spacing can cause the plants to grow unhealthy and become susceptible to insects and diseases.

Too toxic

It was reported that overuse and misuse of pesticides have become commonplace in many countries. Researches show that there are many farmers who have indiscriminately used insecticides by mixing different insecticides or doubling the dosage than what is recommended. Their widespread use has often led to new problems including incidents of poisoning, development of insect resistance to chemicals, and the loss of the pests' natural enemies. Instead of benefiting the farmers, the intensive use of pesticides has resulted to the development of pest resurgence and pose a threat to human health and the environment. Chronic health problems are now being recognized due to intensive chemical use and exposure. But the catch is, chemical is still the most popular and predominant control measure employed by farmers against pests.

In the Ilocos Norte study, it was found that farmers depend highly on inorganic fertilizers to obtain maximum yield from their vegetable crops. Majority of the farmers spray pesticides on their crops once a week for the control of

● Photo by PhilRice

Integrated pest management (IPM) is an environmentally and economically sound way to control agricultural pests that involves the use of resistant varieties of crops, better water and fertilizer management, and need-based application of environmentally sensitive and less toxic pesticides. IPM aims to control pests using a combination of techniques that include the natural enemies of a pest and minimal use of chemical pesticides based on regular monitoring of fields to diagnose for pest damage.

Experts explain that because IPM is a people-oriented and knowledge-based technology, a communication strategy is essential to its success. Various methods should be used to bring IPM to rural communities to effectively convince farmers to adopt it. A communication campaign through radio programs, audio cassettes, and local "resource centres" with exhibits and educational materials, including videos of local people's experiences with IPM, comic books, leaflets, and posters can be used to popularize IPM. Also, intensive on-farm and hands-on training is needed to acquire the necessary decision-making skills that will make IPM a success.

insects, diseases, and weeds attacking their vegetable crops. Major pests attacking their crops are aphids, fruitworms, thrips, fruitborers, fruitflies, and diamondback moth, while the major diseases are damping off, bacterial wilt, mosaic, purple blotch, and tangle top. On the other hand, the weed species associated with their crops are *Cynodon dactylon* (bakbaka), *Trianthema portulocastrum* (pig weed), *Echinocloa colona* (dukayang), *Cardiospermum halicacabum* (parparya), and *Cyperus rotundus* (barisanga).

An effect of the farmers' heavy reliance on pesticides, as the study revealed, is the presence of residues in some vegetables sampled from farmer's field. Samples (cabbage and sweet pepper) gathered from the markets ready for selling to consumers exhibited positive results for carbamates and organophosphates.

Residues of pesticides in food, being the main source of contamination, are often the result of the misuse of pesticides. The pesticide residues found in the vegetables in Ilocos Norte are classified as, "contact, stomach, and systemic in action. Their containers are colored yellow and red indicating moderately toxic and highly toxic, respectively. Only a small percentage of farmers is using pyrethroids with green label which is relatively non-toxic and is recommended for vegetable crops."

Residues of pesticides in food, being the main source of contamination, are often the result of the misuse of pesticides.

Not the only option

The use of pesticides is not the only option to control pests. But what can make the farmers use other practices?

Agricultural experts recognize that serious efforts should be exerted for an intensive dissemination of appropriate integrated pest management technologies that are safe to humans and the environment.

Constraints to success

The government launched a national program on integrated

pest management some years ago but its success has yet to be fully measured. Despite data and experience illustrating the success and benefits of IPM, farmers continue to see it as a lesser alternative, as the experts who are involved in this program say. According to them, the hindrances to IPM can be linked to the following considerations:

1) Traditional practice of the trader-farmer "mutual advancement" arrangement where farmers borrow against their harvest to buy pesticides with the produce delivered directly to the trader post-harvest;
2) Marketing of farm produce is undertaken by researchers. The farmers themselves need to be equipped with marketing knowledge and skills; and
3) Unsuccessful incorporation owing to cultural factors working against the idea of "IPM scouts" formed to assist older farmers whose poor eyesight makes it difficult to visually monitor crops. Out of school youth were trained as IPM scouts. The scheme did not work because Filipino parents often send children to work in urban settings since farming is seen in our country as less financially rewarding than other jobs.

The other option: sex hormones for pest control?

A new farm technology was recently developed that promises to reduce the cost of chemicals, i.e., pesticides, while getting rid of pests without harming both quality of produce and the environment.

Pest Science International has successfully introduced and applied in several commercial farms in India the technology of using sex pheromones, the synthesized hormone secreted by female moths. When placed in a rubber septum and exposed to 27 degrees or more, this expands, thereby releasing in minute quantities the female hormones that will attract males to the septum that is inside a sealed plastic container trap. Once there, they cannot leave the septum container leaving them to die naturally from suffocation and overcrowding.

A local corn grower and commercial crop farm, Pentagon Agribusiness Corp., is the first to express interest in the commercial application of this zero chemical pest management. Pentagon expects reduced labor cost since there is no more chemical spraying and rigid pest monitoring to be done. Hence, the savings can be used in other areas of improving farm productivity and marketing strategies.

Pest Science has been experimenting on different insect hormones to reduce the severity of pest attacks in farms in the US, Europe and India. Thus far, the company has developed and perfected four sex pheromones to control farm pests, notably: rice stem borers, tomato fruit worm, cut worm (which affects almost all types of farms and vegetation), and sugarcane entomode larvae. If the technology trials make results impressive to Pentagon, perhaps the government can consider promoting the use of this technique which is a fine alternative.■

A new farm technology was recently developed that promises to reduce the cost of chemicals...

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Natural enemies of pest insects

Boll weevil

Ladybird beetle

•Photo by IPMWorld

Pink ballworm

Growing healthy, pest-free *pak-choi*

By RITA T. DELA CRUZ

Pak-choi (a type of leafy vegetable represented by *pechay)* is a well-known leafy vegetable commonly served on the dinner table of the average Filipino family. Packed with Vitamins A and C, calcium, iron, and riboflavin, pak-choi is also a favorite in other Asian countries. *Pak-choi* is a short duration crop making cultivation easy to manage either for backyard farming or for commercial production. Although it is widely-grown in almost all regions in the country, *pak-choi* is extensively grown in the lowland areas particularly in the provinces of Nueva Ecija, Quezon, Laguna, Batangas, and Rizal.

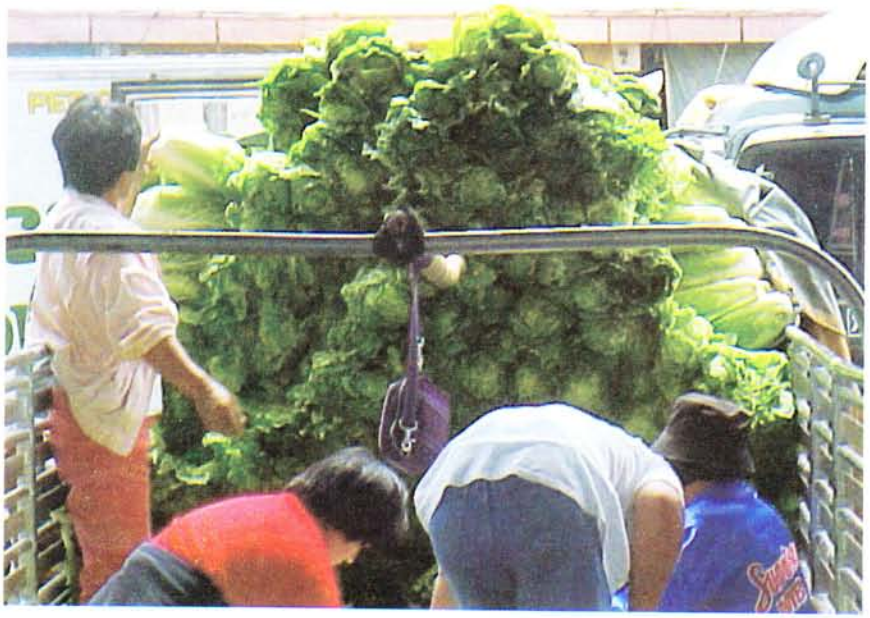
But like any vegetable growing industry, production of *pak-choi* is faced with many problems one of which is infestation by the striped flea beetle *(Phyllotreta striolata)*. The threat of *P. striolata* is even more serious compared to other vegetable pests because *pak-choi* is grown throughout the year, making food sources for its development and spread constantly available.

The research office of the Central Luzon State University (CLSU) led by Dr. Marilyn Gagelonia-Patricio of CLSU and Dr. Virginia Ocampo of the University of the Philippines Los Baños (UPLB) conducted a study to provide *pak-choi* farmers with effective management options against the striped flea beetle. Funded by the Bureau of Agricultural Research (BAR), the study results were formally presented during the 16th National Research Symposium (NRS) held in October 2004.

Stripping the havoc of the striped flea beetle

The key to carefully manage the production of *pak-choi* is first to know the enemy. Knowing the enemy evens out the playing field, making it easier for farmers to lessen any serious damage to the crops.

• Photo by BAR



The development of the striped flea beetle consists of five stages: egg, three larval instars, prepupa, pupa, and adult. The total development period takes 14-28 days on detached leaves and 19-33 days on potted plants. The female striped flea beetle produces a mean fecundity of 619.08 ± 148.60 eggs per female. Meanwhile, adult longevity of striped flea beetle is 39.68 ± 14.02 days for males and 36.56 ± 11.53 days for females.

Aside from *pak-choi*, these little rascals do not feed only on *pak-choi* for food. They also feed on other crucifers particularly, Indian mustard (*Brassica juncea*). Likewise, in the CLSU study, the researchers found out that the pests also fed on weed species like the fringed spiderflower (*Cleome rutidosperma*) and tickweed (*Cleome viscose*). These weed species were abundant around the experimental fields during the time of the study. This information is valuable since these weeds can serve as alternate hosts for the pest when little or no cruciferous crops are grown in the field.

Managing the pests effectively

After knowing what the enemy is like, it's now time to lay down the options. So far, available information on how to effectively manage flea beetle is insufficient. Thus, there is a need for effective control methods that are not only economical but, most of all, effective and ensure high yield of quality *pak-choi*.

Currently, the widely popular method used by farmers

to control striped flea beetle is the application of insecticides. As we know today, this can cause both environmental damage and safety concerns. With this in mind, the CLSU researchers conducted their own study on viable and effective methods to control, if not, totally exterminate the insect pest.

The researchers subjected different management options to tests including: soil solarization and net tunnel barriers; organic mulching and soil amendment; evaluation of *pak-choi* cultivars; and verification of the effect of control practices against striped flea beetle in two *pak-choi* cultivars.

Soil solarization is a non-chemical technique that can control many soil-borne pathogens and pests. This simple technique captures radiant heat energy from the sun, thereby causing physical, chemical, and biological changes in the soil. Aside from solarization, *pak-choi* is further protected from infestation using net tunnel barriers. Meanwhile, organic mulching and soil amendment are management options that enhance the soil by adding nutrients and humus as they decompose and improve its tilt and moisture-holding capacity.

From these management options, CLSU researchers found that solarization using plastic mulch reduced the number of larvae and pupae in the soil. Subsequent protection with net tunnel significantly increased the number of marketable leaves. With the net-tunnel covering, the plants were simultaneously protected from infestation by the striped flea beetle and other *lepidopterous* insects but not from fungal infection particularly in the plot solarized without mulch.

The use of rice straw and rice hull mulch reduced the feeding of striped flea beetle on the leaves but it did not provide good control. Using organic fertilizer like chicken manure and household waste allowed the rapid growth of the seedlings and enabled them to shorten the early stage which is particularly susceptible to damage. However, the persistent occurrence and abundance of adult striped flea beetle in the field still caused high feeding damage on the leaves.

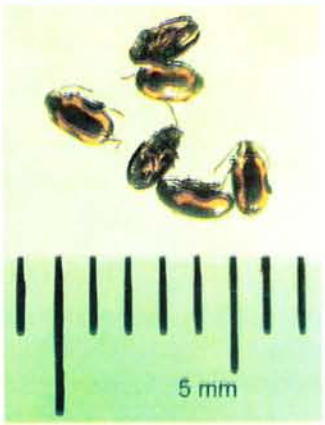
The researchers also resorted to proper selection of chemical insecticides and netting which proved to consistently protect the *pak-choi* from pest infestation and provided the best yield. Likewise, they found that the application of Ascend (*fipronil*) protected the plants from any pest damage more effectively than *carbaryl*. ■

Source:
Patricio M.G. and V.R. Ocampo. "Development of striped flea beetle, Pyllotreta striolata (Fab.) on pak-choi and management options against the pests" (unpublished research). Central Luzon State University (CLSU). April 2004.

For more information, please contact study leader, Dr. Marilyn Gagelonia-Patricio, through the Research Office, CLSU, Science City of Muñoz, Nueva Ecija 3120 or e-mail at merlie_clsu@yahoo.com or call at tel.no.. (044) 456-0704

Soil solarization is a non-chemical technique that can control many soil-borne pathogens and pests.

● Photo by Gardenweb



Striped flea beetle

● Photo by Nodak

Expanding agricultural exports: How to market perishables

By MIKO JAZMINE J. MOJICA

The Philippine mango, indisputably, is the best-tasting mango in the world. As such, it ranks next to banana and pineapple among our total fruit exports with the highest demand in Hong Kong, Japan, and Singapore. A study funded by the Bureau of Agricultural Research (BAR) shows that fresh mango comprises 80 percent of the total fruit export while the rest are processed as dried mango, puree, juice, and frozen product.

Recently, Marsman Drysdale Foods Corporation, one of the country's biggest exporters of fresh and processed mango products, pioneered the use of state-of-the-art cryogenic freezing technology. Their new product, Philippine Carabao Mango Dice, is processed through this efficient freezing process which does not only retain the taste and appearance of a freshly-picked mango, it can significantly cut freezing time to 10 - 15 minutes at negative 18 degrees centigrade, yielding higher production than mechanical blast freezing. Aside from diced mango, Marsman Drysdale will also be processing other tropical fruits such as papaya and pineapple through cryogenic freezing.

This technology advancement may prove to be a way to turn around the continuously declining volume of agricultural exports that is currently affecting the Philippine economy. In the study, which was conducted by researchers from the Department of Economics, College of Economics and Management at UP Los Baños, they cited agricultural growth over the past two decades as registering one of the lowest average growth rates ever in gross value added (GVA) that includes agricultural exports.

• Photo by Japlor

Agricultural export economics

The study titled, *"Towards a Philippine-Japan Economic Cooperation in Agriculture"*, was done to evaluate the potential of Philippine agricultural exports to Japan. It was reported that our country ranked 16th among the top food suppliers to Japan in 1999-2000. The Philippines was also considered the second largest exporter of fresh and prepared fruits to that country next to the USA.

With more than 80 million Filipinos, 37 percent of which depends on agriculture for their livelihood, the researchers asserted that expanding economic cooperation with Japan must be initiated. For the past several years, Japan has served as the second largest market for our agricultural exports next to the United States. Together, these two countries account for half of our country's agricultural exports.

"Fruitful" potential

Banana, pineapple, and mango were among the top commodities exported by our country to Japan with shrimps and prawns, tuna, and asparagus following behind. On the other hand, our vegetables still get a small share of the Japanese market mainly because the industry has not been able to meet the strict plant quarantine and food sanitation laws of Japan.

The researchers noted that although these commodities, particularly banana and pineapple, dominate our agricultural exports, the top exports of the country today are no longer agricultural commodities but electrical equipment and parts, and garments. Similarly, the range of the foreign market for our agricultural products remains very narrow.

Our agricultural exports have very low value added aside from the labor component. Thus, they cannot command higher prices.

This is the reason why the researchers affirm the need to expand our economic cooperation with Japan. According to their study, a ten percent increase in our exports could easily mean an additional $50 million in export

revenue. The study provided several strategies on how to strengthen agricultural trade facilitation and agreement.

Initiatives for agricultural export cooperation

The study noted that we should not be complacent with the fact that we are one of the leading exporters of fresh tropical fruits since other countries are becoming more aggressive in producing and marketing their produce. To expedite the quarantine clearance process, it is recommended that sample imports be forwarded to official laboratories designated by the Japanese government.

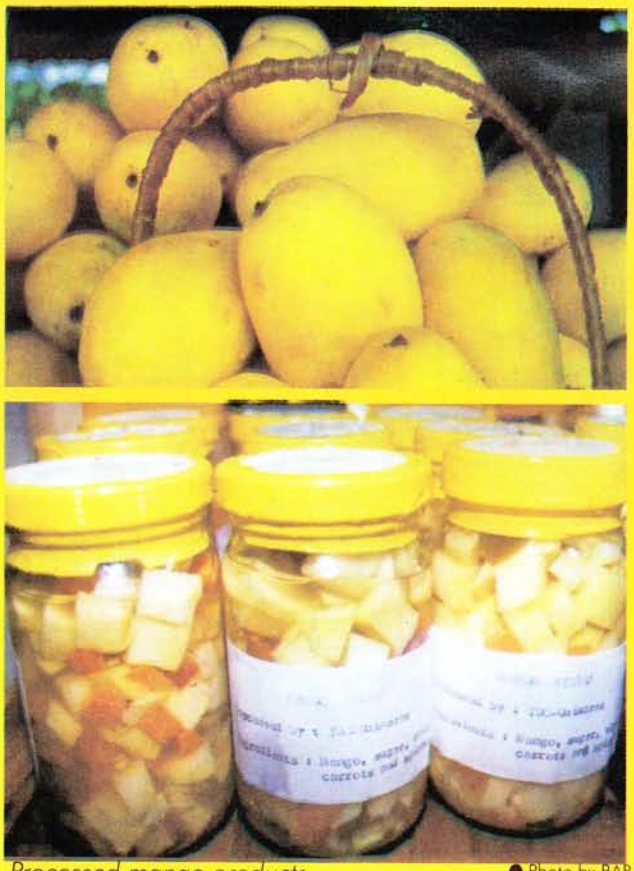
The researchers also came up with a preliminary listing of other agricultural commodities that have potentials for export. These agricultural products include: kingcrabs, seaweeds, onions (Welsh variety), potatoes, ginger, garlic, carrots and turnips, eggplants, avocados, and rice straw.

However, as mentioned earlier, Japan is very conscious and exacting with regard to the freshness and sanitary condition of imported goods. They also adhere to strict rules on labeling and packaging. Because of these, the researchers say there is a need for exporters to be more innovative to expand trading. Fruits that cannot be exported fresh can be canned or processed into juices, jams, or diced and frozen fruits.

It is worth mentioning that "fruits contribute significantly to the economy in terms of employment, income and foreign exchange generated through various production, processing, and marketing activities. Estimates of the Department of Agriculture indicate that at least 10.03 million Filipinos are dependent on banana, mango, papaya, pineapple, and cashew industries".

The study also endorses a trade agreement between the Philippines and Japan that encourages trade promotion activities such as holding of trade fairs and exhibits, and regular interchange of commercial and technical representatives, groups or delegations.

A specific plan of action to facilitate RP-Japan cooperation in agriculture was also proposed. To achieve greater market access for Philippine agricultural products, allowing more Japanese investments in certain industries can be initiated. The Philippine Agricultural Attaché in Japan may also conduct an in-depth review of the Japanese food market, while in the Philippines, there should be an inventory of agricultural product exporters to Japan to determine their problems and gather pertinent information. It is likewise necessary to review and assess the technical assistance given by Japan to the Philippines and for the government to effectively oversee trade facilitation. Lastly, to operationalize these, a special committee should be formed with representatives from the Departments of Agriculture and of Trade and Industry, and the private sector. ■



Processed mango products ● Photo by BAR

Source:

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Liquid sweetener from molasses: Natural, nutritious alternative to sugar

By RITA T. DELA CRUZ

It's thick, sticky, and has a bittersweet taste to it. If you have never tried molasses, it is hard to describe the taste and sensational effect of this strong thick sweet syrup. But if you could think of gingerbread freshly baked from the oven and remember how it smells and tastes, the effect is somewhat close to having the aroma of molasses stick up your nose. The underlying flavor in most gingerbread is derived from the distinctive flavor of molasses. It is an excellent substitute for brown sugar, as it adds a very nice flavor to baked beans, breads, muffins, and cookies.

Mostly, molasses has been used as a major component of livestock feed and silage additives. Over the years, molasses has also been used for human consumption, particularly as a healthy alternative for sugar. This goes back to the time when early settlers had to learn to make their own sweetener from crops because sugar was such an expensive commodity.

Essentially, liquid sweeteners are different from the regular table sugar because they don't have the wide range of functional properties of real sugar which food manufacturers use in controlling the control color, aroma, texture, and shelf-life of their products. However, liquid sweeteners also have a number of functional properties not found in our regular table sugar, making them ideal for some products.

Liquid sweet from molasses

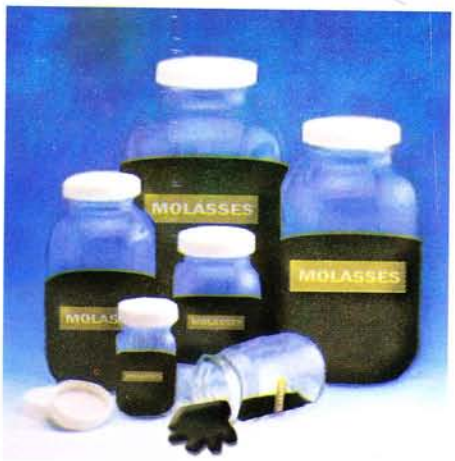
A group of researchers from the Sugar Regulatory Administration (SRA) conducted a study with the aim of producing highly fermentable, nutritious syrup from molasses that would be ideal for commercial food products as additives palatable for human consumption.

Molasses is a by-product of sugar milling. When allowed to ferment for three months, molasses produces valuable by-products, alcohol and vinegar. The fermented molasses is usually considered a waste product. In this study, the researchers explored the possibility of producing liquid sweetener from fermented molasses as a co-product of alcohol.

When the alcohol is removed, the liquid syrup obtained has a bitter taste, which is a sign of its abundant glucose content. The liquid syrup is subjected to a process, called enzymatic isomerization, for three days so that the product obtained is less bitter. The change in taste indicates that the glucose content has been converted to fructose. The liquid syrup obtained from fermented molasses is very rich in a glucose/fructose complex. Likewise, sweeteners produced from molasses were found to contain considerable amounts of antioxidants. This can be attributed to the high fermentable factor of molasses. The more fermentable the liquid syrup is, the more antioxidants are being produced.

Storage, level of sweetness, and palatability

In the study, researchers found that the sweet liquid obtained from fermented molasses was found to be stable up to a two-year



period. However, after undergoing the enzymatic isomerization process, the stability of the liquid sweetener could vary depending on the Brix scale used. Brix is the scale used in a hydrometer for measuring the sugar content of a solution at a particular temperature. Studies showed that liquid sweetener from molasses could favorably be prepared under 30°Brix scale.

Since the liquid syrup is rich in fructose (unlike regular sugar which is rich in sucrose), the level of sweetness may vary but the preserving characteristics and anti-oxidant content of liquid sweetener is higher. Thus, they become suitable for commercial products as additives or supplements.

When it comes to taste, liquid sweetener from molasses was found to be palatable and consumable in small dosages, i.e., 1-2 tablespoons. To further improve the palatability of liquid sweetener from molasses, commercial additives like soy sauce and honey were used.

Sweet effect

The results of this study is not only beneficial for those who have special cravings for sweets in addition to being a healthy alternative to our regular table sugar, it is

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Waste not swine waste

By MA. LIZBETH J. BARONA

● Photo by BAR

We have been encouraged, requested, coaxed, pleaded to, and pushed to recycle. Cans, plastic, paper, and now, *swine dung*? This could be recycling gone too far, but nothing is "too far" if it is for a good cause. Researchers Edgardo V. Casas and Sheila G. Gesmundo of the College of Engineering and Agro-Industrial Technology (CEAT) at the University of the Philippines Los Banos(UPLB) found ways to optimize swine manure composting for agricultural purposes, and determined the effect of inoculants, aeration rate, air temperature, and composting time on compost temperature, acidity, weight loss, and carbon dioxide generation.

The swine, the waste, and the environment

All you want to do with your pork chop is eat it. Not think about how its previous form's waste is being treated. But the fact that management of the swine industry's waste is starting to pose an environmental problem, this study would help in finding ways to manage the gargantuan waste of the swine industry.

Pollution coming from the vast volume of waste materials from the swine industry poses threat to the air, soil, and water. Swine waste collection and storage systems can be put up, but if not designed correctly, it can cause contamination of the ground water. Nitrates found in animal manure can be a danger to a community's health, if these find their way to the source of drinking water.

The fact that backyard raising comprises more than 80% of our swine industry with commercial operators accounting for less than 20%, there is higher possibility of unsystematic waste disposal.

Composting

A complex treatment system may not necessarily be the answer to this problem. But, composting can.

Composting is a biological process where microorganisms consume oxygen while feeding on the organic matter, generating heat and large quantities of carbon dioxide and water vapor.

Several factors affect the speed of the composting process. These are moisture content, temperature, level of oxygen available, size of manure particles, and quantities of carbon and nitrogen available for the microorganisms to consume.

In the case of the swine manure, it is best if the waste material is composed of around 35% solid waste. This can be achieved by screening freshly

gathered manure. Addition of bulking agents like saw dust or straw helps adjust the moisture content of the manure. About 50% of the volume of manure is lost during composting.

Compost in a vessel

This study used bioreactors, closed vessels or containers, of steel flooring that allows hot air to enter the container. Inside 27 treatment reactors with 3 replicates, swine waste that had been treated with the inoculant PasEn (P) and Biosec (B) obtained from commercial suppliers was placed. Each of the inoculants were mixed with 500 ml of water and incorporated in the swine waste. The temperatures of the samples were monitored regularly.

Optimizing swine waste compost

The treatment that had the highest rate of decomposition after 4 days was the treatment with initial moisture content of 62%, incorporated with P inoculant, aerated for 1 hour daily at 50 degrees Celsius.

The authors said weight loss is possibly the most important parameter in assessing the efficiency of the composting process. This is because the rate of weight loss indicates the rate of decomposition of biological matters. Weight loss indicates the lowering of moisture content of the mass, the evolution of carbon dioxide, and generation of heat.

"The application of inoculants, reduction of particle size, extending exposure time, and increasing temperature all help increase weight loss during the composting of organic materials like swine waste", the study explains.

The authors however, recommend additional tests on larger volumes of waste to validate the identified optimum conditions in optimizing swine waste composting. Furthermore, field trials using compost from swine waste should be conducted to determine their efficiency under various field conditions, therefore justifying the effectiveness of composting as a viable waste management, and also as a means to reduce the cost of fertilization borne by our crop farmers.■

Sources:

1. *"Optimizing Heated Air Composting of Swine waste". EV Casas and SG Gesmundo, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños, College, Laguna. March 2004.*
2. *http://www.fao.org*

Monitoring...*from page 20*

low tide.

The study further showed that since Dagupan City is surrounded by marine coastal waters and inland waters where fishponds, fishpens, fishcages, fish corrals, and oyster farms abound, proliferation and unregulated installation of fishpens and cages and other fishing structures in the city rivers coupled with very intensive feeding management have resulted to water quality deterioration and possible ecological imbalance.

According to the study, pollution and water degradation is a great obstacle to the development, protection, conservation, optimum production and utilization of both inland and marine fishery resources of Dagupan, and may endanger the safety of the public. Specifically, pollution and perennial flooding are likely to occur in the city.

Implications to the community

Enormous resources are required to conduct hydrographic studies of water. But, these are indispensable for monitoring and clearly showing the implications of low water quality to the environment, local government units, and the socio-economic status of communities .

The study also identified the watershed areas, the use of which need regulation, rehabilitation, or intervention. Furthermore, the information gathered by the study proved useful to the management of the fishery resources of Dagupan City which is known for its milkfish industry.

With these studies, local government units (LGUs) are empowered to disseminate information about their water resources, which can be used for coastal zoning and resource management. Ultimately, these may be used in the formulation and implementation of a coastal development plan, and serving as the basis for detecting changes in the environment.■

Source:

Sotero M. Aban, Rene B. de Vera, Armando C. Garcia. "Hydrographic study of inland waters in Dagupan City, Pangasinan". Pangasinan State University, College of Fisheries, Binmaley, Pangasinan. March 2002-2004.

Weather lores have scientific basis

By MIKO JAZMINE J. MOJICA

● Photo by USFWS

At least those which were scientifically validated, that is. Weather lore is a traditional method that dates back to our forefathers who made a practice of predicting the weather. Short- and long-range changes in weather were forecasted through close observation of the changes in nature and how these affect the behavior of insects, animals, birds, and even plants. Of course, not all of these work, but as was found out, many of them do have scientific basis.

What's forecasting for?

Simply defined, weather forecasting is a prediction of what the weather will be like in an hour, tomorrow, next week, or during a season. It is indispensable to agriculture and fisheries mainly because it provides signals when or when not to do cropping activities. Failure to predict adverse weather conditions could mean decrease in yield or total lost of production, waste of resources and, sometimes, loss of lives.

Farmers and fisherfolk use traditional methods to predict the weather condition. Weather forecasting is important to them simply because both good and bad weather have an impact on their various day-to-day operations. Their own simple but skilled observation of nature is the most convenient means for many farmers and fisherfolk for predicting the predict the weather.

But how reliable are these predictions? A study made by Mariano Marcos State University researchers sought the answers on the validity of this interesting folk practice.

The weather lores of Ilocos Norte

In most of the remote barangays of Ilocos Norte, people rely on traditional weather predictions or weather lores for their farming and fishing activities, as well as disaster preparedness. They predict the actual and expected weather by observing the behavior of insects, animals, and birds; the appearance of the clouds, moon, and sea; and the phenology or biological changes in plants.

In order to know the effectiveness of these traditional weather forecasts, the study was made to validate them for proper scientific footing and as a basis for developing weather advisories that can meet the information needs of farmers and fisherfolk particularly in remote areas.

With the help of Municipal Agricultural Officers (MAOs), the MMSU researchers interviewed farmers, housewives/housekeepers, and fisherfolk aged 60 and above who have significant knowledge in traditional weather forecasting. They were asked to identify indicators they use as bases or clues for the onset of rainfall, upcoming rain, or adverse weather conditions.

Valid indicators

Scientific validation reveals that *Bristol*, a forecast method used by skilled participants through observing the weather condition during the last twelve days of December was found to coincide not only with the weather outlook of Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), but also with the scientific forecast of

Australia, New Zealand, and the USA.

Similarly, the PAGASA noted that the natural phenomena observed by the Ilocos folks in forecasting the weather for the next few months are the best indicators for the onset of the rainy season.

The validated indicators are the following: armies of ants start migrating to new sites of colonies; cicadas, a nocturnal insect, begin producing an incessant humming sound; crickets start chirping earlier and longer in the evenings and hordes of the winged insects start gathering around streetlights to find their mates; and frogs jumping on roads and pathways, waiting eagerly for the rain.

The observation of weather indicators such as the plaintive cuckoo *(pitopit)* making a mournful sound, dragonflies flying low, and dogs defecating at the middle of the road or at a higher elevation were also validated. An explanation for the dog's behavior is its keen sense of smell and hearing. Because sound travels farther in moist air and dogs can detect frequencies up to 35,000 vibrations per second, dogs can probably hear or smell the coming of rain; hence, they become restless in anticipation.

With regard to birds such as the Himalayan swiftlets or insects, i.e., dragonflies, their flying down low indicates an incoming rainfall because of the drop in air pressure. This pressure causes the air to be heavier resulting in the difficulty of certain birds and insects to fly at higher altitudes.

It was also reported that when lunar corona (moon with rings) occurs, a long parallel band of feathery clouds forms in the sky, and a roaring of the sea or giant sea waves are observed, these can mean that an atmospheric disturbance or a tropical cyclone can occur in a day or two. Apparently, "coronas are a result of diffraction process which spreads a beam of light into a region behind an obstacle. As for the observation of a long parallel band of feathery clouds called 'cirrus' converging towards a point in the horizon, then a storm is present in that direction. They appear to be converging, but they are actually coming out from the top of a distant storm."

On the other hand, the sea roars or high sea waves are seen when there is an upcoming disturbance in the waters. Scientific explanation offers that this is because of the chain reaction from the immense surface circulation of a storm especially if it is still over the sea. Accordingly, tropical cyclones form in regions where there are large and warm oceanic areas.

Unreliable indicator

But if those mentioned are supported by scientific explanation, the phenology of plants did not prove reliable. Although the shedding of physic nut *(tawwa-tawwa)* and siniguelas fruits coincided with the onset of rainy season, which farmers claim is the right planting time for the first crop of rice, the early ripening or shedding of bangkal *(bulala)* fruits was not a valid indicator.

Weather lore for agriculture

The results indicate that indigenous knowledge cannot be ignored. Certainly, it has a role to play in farm operations and planning of agricultural activities. If such traditional weather forecasts can supplement PAGASA services and guidelines for long range or seasonal planning and selection of crops, then this would help in producing an adequate food supply. Validated weather lore is also a tool for disaster preparedness and is especially useful to people in remote areas where advisories from the formal weather institutions may not be available in time. ■

Sources:

1) Evangeline S. Galacgac, Criselda M. Balisacan. Validated traditional weather forecasting methods in Ilocos Norte. Research and Development Directorate, Mariano Marcos State University, Batac, Ilocos Norte. December 2003.

2) What is a weather forecast. Retrieved from http://www.pagasa.dost.gov.ph/genmet/pwf.html

3) Importance of weather forecasting. Retrieved from http://www.vusat.org/learning/weather/crop_weather/weather_forcasting/importance.htm

● Photo by Rdelacruz

Increase profit from coconut-based farming

By RITA T. DELA CRUZ

• Photo by PCA-ARC

The growth of agricultural production is not always proportional to the increase in total land area. Take the case of the coconut industry. In 2000, the country's total area planted to coconut reached 4.09 M hectares but the average annual nut productivity per tree remained the same. This could remain static for the next few more years if not immediately addressed. This could also create a major impasse on the coconut industry since coconut farming is a way of life in the country.

Mindanao has the biggest area devoted to coconut with 1.76 M hectares. Zamboanga del Sur was identified as one of the best areas to plant coconut, thus, 40% of its total land area has been devoted to coconut farming.

Coconut is a basic source of income in Zamboanga del Sur. However, as a tree crop, it has peculiar problems in production. Due to the long period of cropping the coconut trees, farmers' yield and income are declining. With the flagging economy and the continuous price increase of basic commodities, it's but natural to seek alternative means to increase income and profit. For our coconut farmers, the key is to have an effective strategy on how to increase productivity with the given amount of land that they have.

Identifying suitable and sustainable technologies

In a study conducted by the Western Mindanao Integrated Agricultural Research Center (WESMIARC) of the Department of Agriculture (DA), one of the identified strategies to increase farm productivity and income from coconut is the development of suitable and sustainable technologies for coconut-based farming. The study attempted to determine the adaptability and profitability of the addition of other perennial crops in coconut-based farming and its viability in the industry in the Mindanao region.

An initial study was conducted in Betinan Research Station in Zamboanga del Sur during the wet and dry seasons of 2003 to test the suitability and economic viability of integrating perennials in a coconut-based farming system. Among the perennial crops subjected to adaptability and profitability were banana, lanzones, pineapple, and black pepper which were grown under 25-year old coconut trees.

Reaping the benefits

Limited space is not always equated with limited productivity. Even farmers with small land holdings could still produce more if a farming system is suitable and well adapted to the area. Total farm productivity can be achieved by maximizing the use of every space of the farmers' land.

The integration of perennial crops in coconut-based farming showed potential as additional source of income for the farmers. Researchers from WESMIARC found that the high initial investment per hectare to finance the establishment and maintenance of plants during the years when there are no yields could be a hindrance to some farmers in trying the technology. However, they guaranteed that the return in food or in cash would be rewarding compared to that of a monoculture farming system.

For farmers who were interested in trying the strategy, the researchers recommended that the integration of new crops begin with just one or two crop components gradually increasing it until all the components are integrated. By gradually integrating perennial crops, farmers can progress without much difficulty. For maintenance, farmers are encouraged to use cultural methods like manuring, mulching, and recycling of farm waste materials.

In terms of economic viability, the study showed that the total gross returns from the farm amount to P140,735 with a net income of P91,567 for a one-hectare farm. The highest net income came from the main crop, coconut, contributing 36% of the total income. Meanwhile, among the perennial crops with the highest contributions were: pineapple with 34% and banana with 30%. The benefit-cost ratio is high (2.30), which means that the integration of perennial crops maximized the benefits and potential of the coconut farm with the additional sources for the coconut farmers.■

Source: Rodriguez, D.C., P.C. Jover, and T.B. Pactol. "Adaptability and profitability of perennial crops in coconut-based farming." (Unpublished research). Department of Agriculture-Western Mindanao Integrated Agricultural Research Center (DA-WESMIARC). 2004.

For more information, please contact study leader, Danilo C. Rodriguez, DA-WESMIARC, Ipil, Zamboanga del Sur or e-mail at wesmiarc@zambo.ph.net or call at tel.nos. (062) 333-2537 or fax at (062) 333-2877.

New corn varieties *IES Glut 4* and *IES Cn 5* developed and distributed

By MA. LIZBETH J. BARONA

New open-pollinated varieties of yellow and glutinous corn, IES Cn 5 and IES Glut No. 4, respectively, which have been declared fit for use of marginal farmers to increase income, were developed by the Cagayan Valley Integrated Agricultural Research Center (CVIARC). CVIARC is the Department of Agriculture's research arm in Region 2, which is considered the leading corn producing region in the country.

Who wants corn?

This country's staple food is rice. Still, about 20% of Filipinos eat corn as staple. Corn also makes up 50% of our country's livestock and poultry feed requirement, 70% of which is yellow corn.

How it was done

Germplasm materials collected from different breeding institutions were evaluated for one cropping season. From these, promising materials were chosen and included in the genetic base population. Sixty percent of the germplasm collected from the breeding institutions were selected for genetic improvement purposes. The selection was based on vigor, ear size, leaf orientation, plant and ear height, uniformity, kernel depth and flintiness, and resistance to natural occurring insect pests. They were also subjected to tests for the downey mildew fungal disease every wet season.

The performance of the inter-crossed genetic-based material was evaluated during the preliminary yield trial (PYT), on-farm trial (OFT), and the National Cooperative Test (NCT).

All varieties that showed potential were maintained. Seed production was done in a 2,500 sq. meter land to ensure availability of basic seed. Genetic purity was ensured through isolation in time and space.

The new seed

During the preliminary trial of the glutinous corn, IES Glut No. 4, it yielded significantly more than the rest of the varieties tried during both the wet and the dry seasons. Apart from an average yield of 5,890 kg/ha for the wet season, and 6,078 kg/ha for the dry season, the IES Glut No. 4 also has special attributes like longer ear size, soft pericarp, and sweet taste.

The new variety of yellow corn, IES Cn 5 was also tried during the wet season of 2001 and the dry season of 2001 to 2002. It gave the highest average yield in both seasons. It yielded an average of 7,839 kg/ha during the wet season and 7,877 kg/ha during the dry season. It also exhibits attributes like long ears, deep kernel, high shelling percentage, and flintiness.

Both new varieties were recommended by the Corn and Sorghum Technical Working Group (CSTWG) to the National Seed Industry Council (NSIC) in May 2004 for commercial release following consistent performance in six testing locations.

Economic implications

In the study, it took P16,500 to produce IES Cn 5 per hectare. With the IES Glut No. 4, it required P16,052 per hectare for grain (corn used as staple food), and P13,500 per hectare as green (these are sold either broiled or roasted). Net income for the IES Cn 5 was P40,000/ha, while for IES Glut No. 4 it was P47,548/ha as grain and P31,500/ha as green.

IES Glut 4


IES Cn 5

• Photos by CVIARC

Spreading the seed

The DA-CVIARC anticipates increase in demand for the new varieties, thus, they are regularly planting about 3-5 hectares to newly-developed corn varieties. From 2001 to July 2004, the center distributed 68,958 kg of IES Glut No. 4, worth P1,861,926. The bulk of this was in 2003 when 30,340 kg of seeds were distributed. Farmers in Regions I, 2, 3, 4, 5, 9, 12, the Cordillera Administrative Region (CAR), and the National Capital Region (NCR) benefitted from the distributed seeds.

A total of 41,373 kg of IES Cn 5, valued at P1,117,107 was distributed from 2001 to 2004. These seeds were used by farmers in Regions 2, 3, 4, 5, 7, 11, CAR and NCR. To be able to sustain the supply of these seeds, CVIARC also trained seed growers.

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Evaporative cooling system for short-term holding of Chinese cabbage and tomato

By RUDYARD R. ROXAS

• Photo from BAR PhotoLib

In a tropical country like the Philippines, temperature is an important factor affecting the quality of agricultural produce such as vegetables kept under hot conditions. Vegetables lose moisture which leads to loss of firmness, turgor, weight, and nutritional content. Keeping these highly perishable commodities at low temperature prevents excessive loss of moisture. This gives growers, and even traders, leverage in marketing their produce at better prices.

However, as conventional refrigerated storage facilities are costly to own or operate and rented cooling systems are not available in the areas of production, many farmers and farmer cooperatives find the idea not so cool.

An alternative to conventional cooling system

Researchers at the Postharvest Horticulture Training and Research Center in UP Los Baños conducted a study to evaluate the performance of active evaporative cooling system as an alternative storage for short-term holding of perishable commodities and to assess its economic viability.

Evaporative cooling system operates under the principle of heat absorption to generate cool air from a wet medium. Unlike conventional refrigeration that recycles cooled air from refrigerated coils to lower the temperature inside a chamber, evaporative coolers constantly circulate cool filtered air from evaporative cooling pads holding the wetted medium.

Also, evaporative coolers generate high relative humidity (RH) in its storage space unlike refrigerated cooling, as a result of the cooling of hot air drawn through a wetted medium. High RH in the storage chamber results to reduction in weight loss associated with non-refrigerated storage.

Verifying the efficiency of the system

The research team constructed a storage chamber measuring 3.36 meter long by 2.85 meter wide by 2.84 meter high to produce a 20.9 cu. meter storage area. Glass wool insulation wrapped in steel sheet and measuring 12.6 cm served as the wall.

Evaporative cooling system operates under the principle of heat absorption to generate cool air from a wet medium.

The evaporative cooling pad made of mild steel frame held the wetted media and were covered on both sides with a 2.5 cm wire mesh for easy passage of air through the pads. Lufa sponges and charcoal were used for the study because of their high surface area and availability. A small perforated galvanized water tank was placed on top of the pad to keep them moist. A similar tank (without perforations) at the bottom of the pad collected excess water. An aquarium type submersible pump returned the collected water back to the perforated tank. The system used in the study consumes approximately 11 liters of water (average) over an 8-hour period.

Circulating cool, filtered air may either be passive or active. A passive evaporative cooling system allows cool air to circulate without any forced movement within the chamber. In this study, a 40-watt ventilator fan with 30 cm. blade was installed in the ceiling of the storage chamber

to pull and distribute air throughout the chamber. The speed of the fan was controlled by a variable resistor type controller.

A baffle, made from a piece of plywood, forced cooled air to move to the bottom of the chamber holding the stored commodity instead of being removed by the fan prematurely.

Initial tests carried-out without any stored commodity proved that temperature inside the chamber can drop by as much as 4.1°C and that RH can increase by 22.3%. Succeeding tests showed the cooling system's capability to extend shelf life of Chinese cabbage and tomato. The rate of moisture loss per day for cabbage was reduced by fourfold from the normal 20% to 5%. Improving storage and extending shelf life of cabbage can reduce the frequency of thrips for procuring cabbages. This improvement can mean an additional profit of about P13,454 per year.

For tomato, decrease in moisture loss resulted to reduced daily weight loss and longer marketable life from an average of 16 days to 30 days. However, partial budget analysis on tomato showed a loss of P1,484 below the usual profit.

In general, the evaporative cooling system has the edge over refrigerated storage facility for storing perishable commodity. Setting-up an evaporative cooling system requires a minimal amount of investment. It is simple to operate and requires minimal supervision to operate and maintain.

• Phots by LCuevas

Source: "Storage trials on vegetables using an evaporative cooling pad by K.F. Yaptengco, F.A.P. Echague, A.C. Goleng, and G.D. Masilungan of PHTRC, University of the Philippines Los Baños.

For more information, call the researchers at (049) 536-2444 or fax at 536-3259

Water evaporating...from page 22

irrigation system brings back the problem of falling short of the water requirement of growing crops, and even livestock.

Slowing down the vanishing act

During the rainy season, farmers in Ilocos harvest and store water in open surface reservoirs only to lose the stored water rapidly to evaporation during the long summer months. Researchers from Philrice-Batac tested the effectiveness of plastic nets to reduce evaporation from evaporation pans. Six treatments with different plastic net sieve numbers were tested. One of the treatments was the control, which had no cover. The researchers tested nets with sieve numbers, 5, 7, 18, 25, and 40. The measurement of evaporation from these treatments lasted five months.

Researchers found that the plastic nets with sieve numbers, 25 and 40, significantly reduced the evaporation rate. They registered an average daily evaporation rate of 0.97 mm and 0.93 mm, respectively, as opposed to the control treatment, which registered an average evaporation rate of 2.94 mm. Sieve numbers 5, 7, and 18 have average daily evaporation of 2.263 mm, 2.19 mm, and 1.54 mm, respectively.

So that farmers need not worry about the cost of plastic nets the researchers used the cheapest nets they could find in the local market for the treatments.

Source:

1. *Reynaldo C. Castro, ND. Ganotisi, LM Cabalat, "Effectiveness of commonly available plastic nets in minimizing evaporation". Philippines Rice Research Institute, Batac, Ilocos Norte. 2004*
2. *http://www.dpi.vic.gov.au/ retrieved on March 17, 2005*
3. *National Geogpraphic, October 1993 (water quote) retrieved on March 18*
4. *http://www1.oecd.org/publications/observer/212/Article7_eng.htm retrieved on March 18*

New corn...from page 17

People were informed of the newly-developed seeds through leaflets, brochures, and packets of seeds given to walk-in clients in the DA-CVIARC Technology Advance and Agribusiness Information Center. These seeds were also distributed for free to farmers in the area.

The study confirmed the point that research focusing on a specific solution for a specific problem, in a specific location for a specific group of people, seldom, if ever, fails.

Sources:

1. *New Improved Open Pollinated Varieties (OPVs) of Yellow Corn and Glutinous Corn for Marginal Farmers, SC. Tumamang, RY Aquino, RM Atalin, CA. Malana, OJ. Lorenzana, VC. Perdido, A. Bongat, O. Masinna, Department of Agriculture Cagayan Valley Integrated Agricultural Research Center, San Felipe, Ilagan, Isabela 2002*
2. *Http:///bpre.gov.ph/PHIndustry/ corn.htm*
3. *http://www.eap.mcgill.ca/MagRock/COG/COG_P_97_05.htm*

For more information, contact the researchers at (078) 622-0961

Monitoring the condition of inland waters

By MIKO JAZMINE J. MOJICA

•Photo by BAR

What is the common denominator between population growth, industrialization, and agricultural and aquacultural development? They all pose threats to the environment. In the continuous escalation of these developments which compromise the condition of our environment, there is a serious need to conserve and rehabilitate our watershed areas which include rivers, streams, lakes, and dams.

Development vs. degradation

The disposal of agricultural, industrial, and domestic wastes in inland waters such as rivers and streams lead to water pollution. If this continues, destruction of the environment and death of aquaculture in the near future is highly probable.

Aquaculture, in particular, has its benefits as well as its downsides. On the plus side, aquaculture can provide high income, employment, foreign exchange earnings, and improved nutrition. On the negative side, it can have adverse effects on the environment that may eventually affect the sustainable development of aquaculture.

Water quality

If the fact that water is the natural source of human life remains real to you, then you can make perfect sense out of the results of the study conducted by three researchers from Pangasinan State University.

The hydrographic study of inland waters of Dagupan City in Pangasinan was conducted by Sotero M. Aban, Rene B. de Vera, and Armando C. Garcia to determine the water quality characteristics of the city's inland waters to be used as criteria for the formulation of local fishing ordinance and coastal zoning.

Water quality was considered as one of the major criteria for river zoning of Dagupan City. By comparing the gathered data with the water quality standards set by the Department of Environment and Natural Resources (DENR), the study showed that the quality of water in Dagupan is slowly deteriorating due to high concentrations of nutrients, particularly phosphates, and very high total and fecal coliform levels in some rivers which are attributed to domestic, agricultural, and industrial wastes. In fact, out of the 24 river stations used as samples to cover the whole riverine system of Dagupan, eight exceeded the DENR standard for total coliform.

High turbidity readings and total suspended solid levels in all rivers also confirmed water quality deterioration in all areas caused by high agricultural, aquacultural, and industrial operations in Dagupan City.

Generally, however, the physical quality of Dagupan City waters passed the water quality standards for Class C type of water, indicating that rivers are still suited for aquaculture/ fisheries activities. All river stations are also suitable for fish culture except those areas with depths below three meters during

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Saving the endangered *buga*: A potential health food

By RITA T. DELA CRUZ

With the continuous degradation of our natural resources and the unabated growth of population, farmers are unable to meet the demand for more food, thus the per capita food production of the country continues to decrease. Furthermore, we are losing traditional crops as more farmers shift to the use of commercial plant varieties. However, global concerns are now being focused on how to save the biodiversity and conserve thousands of our endangered plant species.

In 2001, a group of scientists from the Mariano Marcos State University (MMSU) conducted a survey to identify indigenous and vanishing plant species and hopefully save them from total extinction by using their potentials. Of the 122 plant species, 58 passed the criteria set by the International Union for the Conservation of Nature (IUCN). From the 58 plant species, seven of them were identified in the "near threatened" category, including *buga*. This means that although the species still abound in the wild, they are facing a near threatened status due to continued use and harvesting without the attempt to cultivate or improve its cultural management.

The potential of buga

Buga is a wild variety of *Dioscorea esculenta* and is indigenous to the Philippines. It is almost identical to the yam or *ube* (*Dioscorea spp.*) Since this rootcrop can thrive well in the wild, this means that it is well adapted and resistant to local pests and diseases. Its promising benefits are ensured if optimally used and appropriately cultivated.

Among the yams, *buga* is considered one of the most productive, producing 4 to 20 tubers per plant. The tubers, which are short, cylindrical and sometimes lobed, could weigh as much as one kilo or more per tuber. It is also highly nutritious. When boiled for food, it is rich in carbohydrates, proteins, and vitamins. The *buga* can also be used as animal feed, particularly for swine, and they are a good source of carbohydrates during the lean months.

Proximately, the composition of *buga* (per 100 grams edible portion) include: water (70-80g), protein (1.3-2.1g), fat (0.1-0.3g), carbohydrate (26-36g), fiber (0.2-1.5g), ash (0.5-1.2g) vitamin A (0.017 mg), vitamin B1 (0.08 mg), vitamin B2 (0.02 mg), and vitamin C (20.3 mg).

Optimizing the use of buga

In 2004, another group of scientists from the MMSU, headed by Miriam E. Pascua of the College of Agriculture and Forestry, conducted a study on how to conserve and utilize the near threatened species of *buga*. The rationale of their study is that, the best way to prevent the extinction of this indigenous rootcrop is to promote its use.

Before, when the food potential of *buga* was not yet known, local inhabitants ignored it and its benefits remained unknown. To maximize the utilization of buga, research efforts are now being exerted to develop new products from its tubers, namely: *buga haleya*, *buga maja*, *buga pastillas*. The acceptability of these food products from *buga* has opened livelihood opportunities particularly for those who are unemployed.

In developing these food products, the researchers focused on the formulation and improvement of recipes for *ube* using *buga* as the main ingredient. The best formulations for *buga haleya* include 100% buga and 75% *buga* + 25% *ube* as these elicited favorable acceptance when it comes to taste and posted a marginal benefit-cost ratio (MCBR) of 0.25. For *buga maja*, the best formulations were 75% *buga* + 25% cornstarch and 50% *buga* + 50% cornstarch, while for *buga pastillas*, the best formulation was 800g *buga* + 600g condensed milk. Both food products had favorable palatability. The MCBRs were 0.23 and 0.20 for the *buga maja* and 0.28 for *buga pastillas*, respectively. Aside from these food products, the researchers also standardized two recipes: baked *buga* and *buga kutsinta*.

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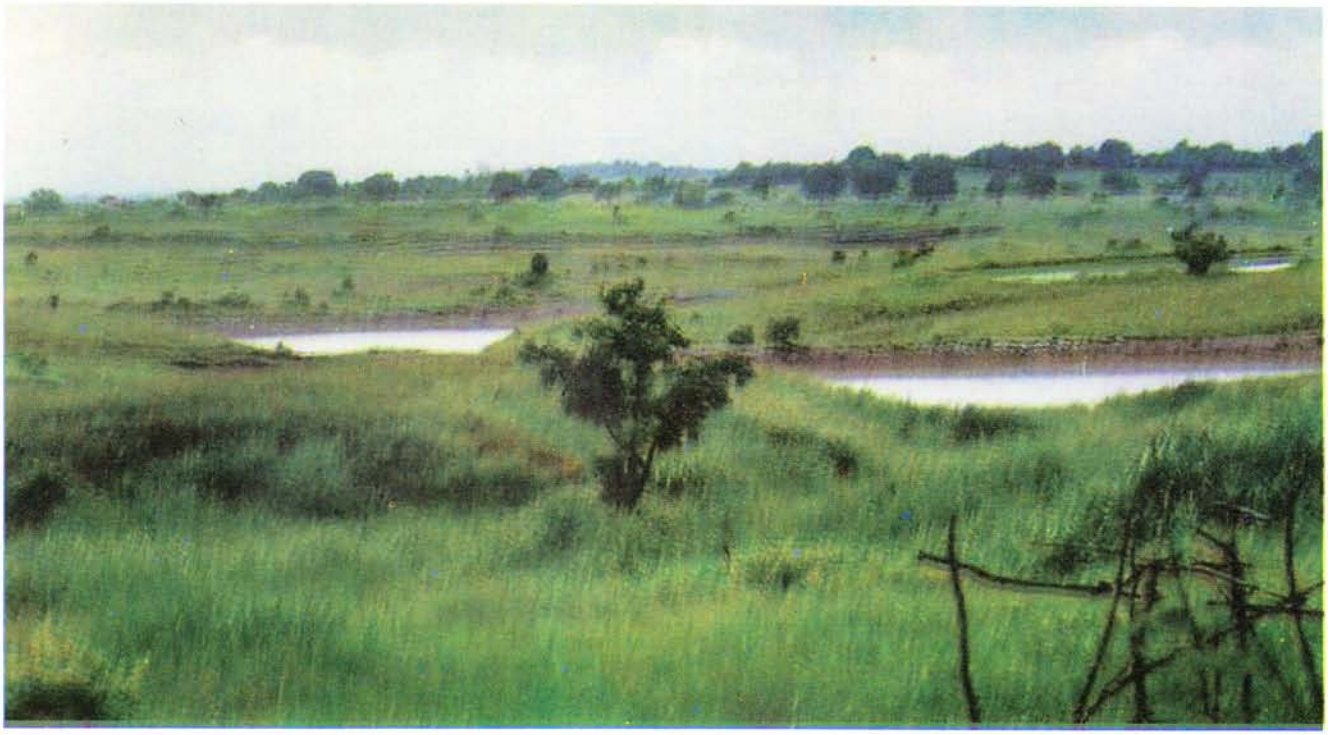
Water evaporating too fast? Slow it down with plastic nets

By MA. LIZBETH J. BAROÑA



● Photo by PhilRice

"All the water that will ever be is here right now", so quoted the National Geographic. The importance of water in just about every aspect of life cannot be emphasized enough. Not only does it sustain life, it also takes care of mundane things in everyday living, like wiping off a sticky spill on the table, that its absence brings about conditions that range from a simple inconveniences to threatened lives.

Water is as vital to the farm as oxygen is to a breathing organism. The absence, or the lack of it, therefore, is calamitous. The problem of farmers in the Ilocos Region, and most of other farmers in the country, is there is too much water during the wet season while the dry season leaves the farmlands thirsting for moisture. Constructing small farm reservoirs (SFRs) was a solution that the farmers in the region tried, only to be faced with an ensuing problem: evaporation.

Rapid evaporation occurs in open surface water storage like the SFRs. To find solutions to this inevitable water loss, the authors of the study - Reynaldo Castro, Noel Ganotisi, and Leila Cabalar of the Philippine Rice Research Institute in Batac, Ilocos Norte - tested the effectiveness of commonly available plastic nets in minimizing evaporation and found that plastic nets can indeed decrease the rate of evaporation.

Water and agriculture

Agriculture, both crops and livestock, requires a lot of water. In rice, the importance of adequate water can be illustrated with the fact that water is a major component of its tissues, a solvent for movement of metabolites and minerals within the plant. It is essential for cell enlargement through increasing turgor-the stiffness of a cell due to the outward movement of water in the cell membrane.

When the crop does not receive enough water, physiological processes associated with plant growth are adversely affected. During severe deficits, the effect of water stress varies with the degree and duration of the shortage and the growth stage of the rice plant. Water requirement is low at the seedling stage. Water stress during vegetative stage reduces plant height, tiller number and leaf area.

The dry season highlights these issues. Even as irrigation has allowed the expansion of the farming event to usually dry areas, the lack of an efficient and sustainable

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Our common...*from page 2*

We also aim to satisfy the thirst for new knowledge. Or at least slake it just enough to make one still look for more.

We have therefore lined up other articles on various topics. Three articles talk on things that we take for granted but are potentially valuable. Researchers pinched their noses and held their breath to study ways to optimize the efficiency of processing swine waste into compost.

Another set of researchers put out their tongues to prove that molasses, a by-product in the production of sugar, can taste just as well and substitute for refined sugar. Molasses may even be the base ingredient for a different class of food products.

A plant that is hardly noticed save, perhaps, in times of calamity is the *ube*-like *buga* of Ilocos Norte. An indigenous plant from the yam family that grows wild, *buga* was found to substitute very well for *ube* in various *ube*-based food products. With this important finding on the *buga*, we now have all the reasons to conserve this plant.

Three other articles are on postharvest handling of vegetables, cryogenic freezing of tropical fruits for export, and fortification of food with Vitamin A. Evaporative cooling can lower the temperature of Chinese cabbage and tomatoes and extend their shelf lives without having to resort to expensive refrigerated storage facilities.

A private company is reported here as meeting success in its trials with a more efficient freezing process that not only retains the look and taste of freshly harvested mango but freezing time is effectively reduced to 10-15 minutes, thus ensuring higher percentage survival of the fruits during export.

We have read about research into the fortification of rice with iron and Vitamin A. We now have an attempt on the fortification of coconut-based cooking oil with Vitamin A. Also called "food enrichment", this technique gives us another option to solving the problem of Vitamin-A deficiency.

The remaining two articles have to do with the control of vegetable pests, adaptability trials for coconut-based farming systems, and a report on two new corn varieties. Four management options were tested for striped flea beetle in *pak-choi* (your everyday *petsay*) with differing results. Three types of pest control that included pesticide use, IPM, and the use of pheromones, were evaluated on the advantages and the disadvantages of their use as applied to various vegetable crops in Ilocos Norte.

Currently, Mindanao has the biggest land area devoted to coconut. However, not all is well with the coconut industry. So what better way to meet the problems but to grow non-coconut crops in the same land alongside the coconuts. This way, the farmers can ride out the ups and downs of the coconut crop.

Finally, open-pollinated varieties of yellow and glutinous corn types were developed by the Cagayan Valley Integrated Agricultural Research Center (CVIARC) in Cagayan province. These varieties are the progeny of inter-crosses among selections coming from the germplasm collections of different corn breeding institutions and are suited for marginal corn farms.

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In 2003, the National Book Development Board commissioned the Social Weather Stations to conduct a survey on the reading attitudes and preferences of Filipinos. To date, this is the most comprehensive study on book readership in the country. It was conducted from 10 to 25 of March 2003 with 1,200 respondents composed of 300 voting-age adults from various study areas that included: National Capital Region, Luzon (areas within Luzon but outside NCR), the Visayas, and Mindanao. Of the total respondents, 63.6% are from rural areas, while 36.4% from urban. Approximately 7.7% belong to classes A, B, & C; 67.4% to class D, and 24.8% to class E.

What matters most from the results of the survey is that 94% of Filipino adults can read (simple words at least). Some 90% have read books in at least some time in their lives. About 68% have read non schoolbooks. For those who do read, 91% do it to gain knowledge while only 9% read for enjoyment.

Compared to books, the *R&D Digest* would be a small format publication. But it can still pack a mean punch. We estimate that in the pages of one issue, these contain sufficient and relevant information as reading material for college level courses in agriculture.

We also aim to satisfy the thirst for new knowledge. Or at least slake it just enough to make one still look for more.

But a more ambitious expectation is that, such information would influence the way our agriculture and fisheries enterprises are run. Once this is achieved, then BAR would have done its share in the task of promoting technology and other research-generated information for development ends and help quench the thirst for knowledge. ■

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Conserving the buga

Biodiversity plays an important role in ensuring food security and substantial income for small farmers. It is through conserving different plant species that a country meets its current and future food demand in terms of variety and nutrition. Expanding agricultural productivity to meet food needs increases competition for our natural resources and declines in soil fertility. More and more, the marginal areas and wild lands must be tapped to fill the deficits that are being incurred.

Reduction of biodiversity leads to the reduction of options for ensuring more diverse nutrition, enhancing food production, raising income, coping with environmental constraints and managing ecosystems. Recognizing, safeguarding, and using the potential and diversity of nature is critical for food security and sustainable agriculture.

For us to fully utilize the potential of *buga*, its conservation must be undertaken. Aside from the gene bank which was established by MMSU for the *ex situ* conservation, mass propagation has been started to save this indigenous crop. Although the *buga* was first observed in the wild, the researchers found that this crop could be domesticated and propagated through planting of its tubers. *In situ* conservation was also carried out as another means to maintain *buga* in the wild, identifying possible sources of planting materials and specific locations where these could thrive.■

Source: M.E. Pascua, M.A. Antonio, M.P. Domingo, L.M. Valera, E.O. Agustin, D.S. Bucao, E.G. Pugat, T.N. Pablo, M.L.S. Gabriel, and B. S. Malab. "Conservation and utilization of buga (Dioscorea esculenta) and indigenous and vanishing plant species" (unpublished research). Mariano Marcos State University (MMSU). April 2004.

For more information, please contact study leader, Miriam E. Pascua, College of Agriculture and Forestry, MMSU, Batac 2906, Ilocos Norte or e-mail at rddirectorate@hotmail.com or call at tel.no.. (077) 792-3131

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general nutritional status before the experiment was conducted. The children in the experimental group were underweight and under-height for their ages, as compared to the other two groups. Data gathered in different periods during the experiment showed no significant difference in weight-for-age within and among the three groups. This means that the experimental group was able to catch up.

The same is true with the vitamin A status of the children. They started the experiment at different levels but the experimental group, again with the initially lower average serum retinol than the two other groups, was able to catch up.

What is interesting with this finding is that VAFCCO is cheap. Analysis by the researchers shows that cooking oil fortification costs only P1.89 a day to improve one's vitamin A status way cheaper than popping high-dose vitamin A capsules that costs P11.58 a day.

Even as VAFFCO does improve one's vitamin A status, the researchers say it is best to couple this with the habit of eating food that are naturally rich with vitamin A. The natural means is still the "safest and the surest" way to go.

Sources:

1. *"The Effect of Vitamin A-Fortified Cooking Oil Intake in the Serum Retinol Level of 4 to 6 Year-old Children". LV Candelaria, CR Magsadia, RE Velasco, CVC Barba, CV Tanchoco, conducted at Food and Nutrition Research Institute, Department of Science and Technology, funded by the Bureau of Agricultural Research, Department of Agriculture, May 2002*
2. *http://www.who.int/nut/vad.htm*
3. *http://www.fnri.dost.gov.ph/him/fdforti.htm*

Liquid sweetener...from page 11

environmentally friendly as well. Stillage, or the waste resulting from the distillation process of alcohol production, could be a major pollutant due to its high biochemical oxygen demand (BOD) content. But because researchers found ways to make them usable, the environment can be spared from possible pollution.■

Source: T.O. Macuro, L. Sanchez, D. Gatanela, and M.L.T. Escarrilla. "Liquid sweeteners from molasses" (unpublished research). Sugar Regulatory Administration. December 2003.

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