9-5

The Sugar Controversy

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Executive Summary

Sugar, one of the world's most important food commodities, provides a high percentage of calories for the population in many countries. But consumption of calories either as sugar or fat by sedentary populations promotes overconsumption of energy and thus may contribute to the "globesity" epidemic and associated chronic diseases. In addition, sugar provides only energy ("empty calories"), potentially leading to micronutrient inadequacy, with corresponding health consequences.

The "sugar controversy" has its roots in an expert consultation held in early 2002 by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) on diet, nutrition, and physical activity for the prevention of chronic disease. This consultation produced a report (Technical Report Series No. 916, or TRS 916) that focused on the dietary and physical activity determinants of major chronic diseases and established the scientific basis for prevention of these conditions (WHO/FAO 2003). As part of the response to the global epidemics of diabetes and obesity ("diabesity")—major threats to the lives and well-being of populations across the globe—TRS 916 recommended limiting the population's mean intake of added sugars to 10 percent or less of total energy (Nishida et al. 2004). Sugar producers and sugar-exporting countries raised immediate concerns about the consequences of this recommendation for future markets. The recommendation was challenged on the strength of the evidence, its scientific merit, and the assumptions made; the sugar recommendation became the focus of a debate between the nutrition community, the sugar industry, and agricultural policy experts. The two positions contrasted the potential health gains with the economic implications of limiting sugar consumption.

This case raises several interesting issues that have wider implications, given that food policy is increasingly being shaped by health and nutrition considerations rather than solely by the economics of agricultural production. This case study analyzes the controversy from the perspective of health and nutrition consequences and presents policy options considering the potential trade-offs for agriculture.

Despite the controversy raised by TRS 916, in May 2004, 191 countries at the World Health Assembly adopted the WHO global strategy on diet and physical activity prevention of chronic disease, based on the recommendations of TRS 916, which include the need to restrict sugar intake to no more than 10 percent of total energy intake. Most governments are now implementing this strategy to varying degrees, driven by the urgent need to cope with the increasing problems of obesity, diabetes, and related chronic diseases. In addition, interesting economic alternatives to sugar production are presently being explored. The apparent threat to agriculture offers the possibility of shifting agricultural production from sugar cane to products with greater added value, such as fruits and vegetables. The WHO strategy is actively promoting the production of fruits and vegetables, which favors health, to prevent chronic disease. In addition, the potential use of sugar cane in the production of ethanol as a biofuel demonstrates the need to examine new opportunities in agricultural production that can yield win-win situations for farmers in developing countries.

Your assignment is to recommend a position in the sugar controversy to the government of a developing country that faces not only rapidly increasing overweight, obesity, and associated chronic diseases, but also dependence on sugar exports for foreign exchange.

Background

The current concept of the food chain considers the full spectrum of food as a natural resource from "farm to fork." This concept starts with seeds, soil, water, and climate and ends by considering the impact of foods on the health, nutrition, and well-being of individuals and populations. A basic tenet of this concept is that consumers who are well informed will make informed choices and select the foods that provide the best value for money. Thus food production today has implications well beyond the simple economic value of food as a trade commodity; the implications of food production include the health and nutritional consequences of consumption patterns as they

affect human populations. For example, consumers who know the benefits of phytochemicals provided by berries will demand these products and be prepared to pay a high price for them. Thus, demand based on health and nutrition considerations will affect the supply and prices of what is produced.

Nutritional recommendations can clearly benefit agricultural producers in some cases, as for berries, but can work to the detriment of other agricultural producers when these recommendations suggest the need to limit or restrict the consumption of given foods, as is the case for animal fat (to reduce saturated fatty acid intake) and sugar (to prevent obesity and its complications). In the so-called sugar controversy, the WHO/FAO expert consultation on diet, nutrition, and physical activity for the prevention of chronic disease that produced TRS 916 (WHO/FAO 2003) based its scientific considerations on the need to address the global epidemics of obesity and diabetes, which are major threats to the lives and well-being of populations across the globe ("globesity"). TRS 916 took the bold step of recommending that populations limit their mean intake of added sugars to less than 10 percent of total energy, raising concerns from sugar-producing countries about potential consequences for the future market for sugar. Recommendations contained in TRS 916 were challenged on their assumptions and the strength of the evidence and became the target of a debate between the nutrition community and agricultural policy experts.

In the past, national and international recommendations have set goals of 10 percent for maximum mean population intake of added sugar, based on sugar's facilitating role in the genesis of caries. The WHO/FAO consultation did not consider this impact of sugar a major problem given that dental hygiene and fluoride in drinking water can reduce the consequences of sugar consumption on caries. The TRS 916 recommendation in 2003 was well supported by nutrition experts and ministries of health across the globe but was heavily criticized by the FAO Committee on Agriculture (FAO/COAG 2004) because of the possible adverse economic consequences for sugar producers.

The controversy between the compatibility of health benefits and economic considerations is an issue that will likely continue to be present. Food policies are now increasingly shaped by population health, nutrition, and well-being considerations and not just based on food products as commodities for international trade. In the case of Brazil, the Ministry of Health supported the global strategy for diet and physical activity recommended by TRS 916 while the minister of agriculture was rallying the Group of 77 (G-77) to challenge the FAO on this issue. This case study will examine the scientific basis for this debate and highlight some of the contrasting views on the health and nutrition front and on the agricultural policy dimensions.

Classification of Sugars

The term "sugar" is used more or less synonymously with "sucrose" to refer to a food derived from sugar cane or beets. Until 1800, nearly all sugar was produced from sugar cane; by 1990, however, beets accounted for 60 percent of the world's sugar production. Over the past two decades in the United States, and progressively in other countries, high-fructose corn syrup (HFCS) has displaced sugar in sweetened beverages and processed foods. In fact, observed intake of sucrose is stable or decreasing, whereas the consumption of total added sugars continues to increase owing to a rapid rise in the consumption of HFCS (Bray et al. 2004).

From the perspective of human nutrition, sugars are generally divided into two main groups: those incorporated as structural components of the intact food (fruits and vegetables), often labeled "intrinsic sugars," and mono- or di-saccharides that are added to foods and drinks by manufacturers, cooks, or consumers and known as "added sugars." Dietary guidelines in general do not recommend restricting intrinsic sugars or milk sugars (lactose, galactose), because these are not considered unhealthy. Added sugars and concentrated sugars in honey, syrups, and fruit juices, however, are deemed broadly comparable when considering untoward health effects (Mann 2004).

Effects of Sugar on Human Health

Obesity has become a global health problem, and the term "globesity" has been coined. Obesity affects mainly poor and middle-income people in urban or semi-urban communities of middle- and higher-income countries. It is also increasingly present in low-income countries as the epidemiologic and nutrition transition continues to

progress. According to analysis conducted over the past decade by WHO, overweight and obesity are major contributors to the burden of death (mortality statistics) and disability (disability adjusted life years [DALYs] statistics). Obesity, acting as an important determinant of other nutrition-related chronic diseases (NRCDs), has an indirect impact on the global burden of disease. Obesity contributes to the potential for coronary heart disease, hypertension, diabetes, and some forms of cancer. The relationship is not one of direct causality, but rather obesity is one of several interactive determining factors (WHO/FAO 2003).

Sugar is one of several dietary factors that contribute to obesity in sedentary populations and thus may affect the occurrence of some nutrition-related chronic diseases. Sugar contributes to the energy density of the diet, facilitating overconsumption of energy and generating a hormonal/metabolic response (insulin/glucose) that in sedentary populations promotes the development of the metabolic syndrome (an association of abdominal obesity, insulin resistance, altered plasma lipid levels, and hypertension) (Poppitt et al. 2002). This constellation of signs (syndrome) underlies the occurrence of diabetes, hypertension, heart disease, and some forms of cancer (Schulze et al. 2004). These conditions, however, have other contributory factors that act in synergy with excessive energy stores in determining the health outcomes (Mann 2004).

Substantial published work suggests that human appetite control systems are unable to fully accommodate the intakes of high-sugar and high-fat (energy-dense) foods and sweetened drinks by decreasing the consumption of other foods, thus maintaining energy balance. Frequent, regular consumption of energy-dense snack foods and sugary drinks leads to passive overconsumption of energy, resulting in weight gain. Reducing the intake of such foods would be expected to facilitate energy balance at a healthier level of stored energy, assessed by body weight or body adiposity (Raben et al. 2002). Much of the research on the effect of energy density on energy balance includes manipulations of both the sugar and fat content of diets. The responses are quite similar and reflect mainly energy density rather than fat-to-carbohydrate ratio (Stubbs et al. 2004). The case for sweetened drinks (soda beverages and fruit juices) as a contributory factor in the genesis of obesity in children and adolescents has been better documented in recent years (Ludwig 2002).

Physiological Effects of Sugar and Its Impact on Obesity

The effect of sugar on health has been a source of discussion for some time, as described in 1924 (Harris 1924 as quoted in Ludwig 2002):

> One of the causes of hyperinsulinism (and hypoglicemia) is the excessive ingestion of glucose-forming foods and that, as the result of overactivity induced by overeating, the islands of Langerhans become exhausted and ... (diabetes) follows. It is possible that the hunger incident to hyperinsulinism may be a cause of overeating, and, therefore, the obesity that so often precedes diabetes.

This statement was clearly speculative at the time and remains controversial today. Nonetheless, it serves to illustrate the controversy that has followed for nearly a century. Extensive modern studies have confirmed some aspects of the statement, whereas others, like the exhaustion of the pancreatic islets, remain purely speculative. A better understanding of the role of sugar in regulating appetite and the effect of obesity in establishing both insulin and leptin resistance is needed to provide strong mechanistic underpinnings showing the critical role of added sugars as a contributory factor in the present obesity epidemic. This discussion highlights the need to address both the individual and population-wide health consequences of sugar consumption in various settings, in terms of diet and physical activity. It is still not possible to precisely define the risk of obesity and other NRCDs, at a population level, that can be attributed to increased sugar consumption. There is a consensus, however, that limiting the consumption of sugar, especially in the form of sugary drinks and snacks, is an important component of the diet and physical activity interventions required to control obesity and type II diabetes in urban sedentary populations (IOM 2007).

The amount of sugar and its rate of absorption after a meal have significant effects on postprandial hormonal and metabolic responses. A meal with a high glycemic index produces an initial period of high blood glucose and a concomitant rise in

insulin; in some individuals this rise is followed by reactive hypoglycemia, owing to counterregulatory hormone secretion, and elevated free fatty acid concentrations. The rapid drop in blood sugar will trigger a hunger sensation and may induce excessive food intake, beta-cell dysfunction, dyslipidemia, and endothelial dysfunction.

The human data show that when individuals consume either high-sugar foods or drinks, they are not able to adjust the amount of calories consumed in the meals that follow (Warren et al. 2003). Thus, the habitual consumption of high-glycemic-index foods may increase the risk for obesity and type II diabetes; multiple experimental studies, clinical trials, and epidemiologic analysis support the existence of this sequence in the chain of events that controls food intake and energy storage (Tuomilehto et al. 2001; Ludwig 2002; Bouche et al. 2002). Drinks that are rich in added sugars are especially important in the promotion of weight gain. Children with a high consumption of soft drinks rich in sugars have a higher risk for overweight and excess weight gain (Berkey et al. 2004). Evidence from cluster randomized controlled trials suggests that replacing sugary drinks with noncaloric beverages decreases overconsumption of energy and obesity prevalence (Ball et al. 2003; James et al. 2004; Ebbeling et al. 2006).

It is difficult to assess the effect of a small excess of consumed energy over energy expenditure and the corresponding increase in body fat stores leading to obesity (Saris et al. 2000). The magnitude of the positive balance required to gain 2 kilograms (kg) of body fat over a year is on the order of 50 kilocalories (Kcal) per day (which corresponds to 12.5 grams of sugar)—well below the measurement error of methods for assessing dietary energy intake. On a more practical note, the health consequences of limiting energy intake from sugar depends on what replaces sugar in the diet. The ideal would be to increase consumption of high-fiber vegetables or legumes, because according to observed patterns of consumption, these plant foods are consumed in lower amounts than recommended. Moreover, they promote satiety, provide essential micronutrients, and have low energy density (Salmeron, Ascherio, et al. 1997; Salmeron, Manson, et al. 1997).

Empty Calories

A further concern regarding high sugar intake, especially in developing countries, is the fact that refined sugars provide energy but no specific essential nutrients such as vitamins and minerals. These sugar-derived "empty calories" satisfy energy needs but may result in vitamin and mineral deficits unless the rest of the diet is sufficiently rich in these specific nutrients. There is limited room for foods that provide only energy, such as sugar, because meeting the recommended intake of foods that provide the necessary fiber (fruits and vegetables), essential amino acids (protein), and essential fatty acids (fats and oils) can easily take up 90 percent of the total energy allowance. This leaves 5–10 percent for sugar and alcohol as potential sources of empty calories.

The U.S. Department of Agriculture (USDA) food-based dietary guidelines for individuals whose energy needs are 2,000–3,000 Kcal leave not more than 10 percent of energy for sugar, after the recommendations for the other food groups have been met. Thus in practice the recommended healthy diet limits the amount of added sugars to less than 10 percent unless energy expenditure is sufficiently high (that is, greater than 3,000 Kcal a day for a typical adult). Additional observational data from developing countries show that diets with greater than 10–12 percent of energy from sugars may have limited content of folate, thiamine and other B vitamins, calcium, magnesium, and potassium (USDA 2005). This finding raises concern about acute deficiency syndromes, such as observed in Cuba in the early 1990s after the collapse of the Soviet Union, when there was a need to increase sugar intake and ration nutrient-dense foods (Gay et al. 1994; Ordunez-Garcia et al. 1996). In addition, vitamin and mineral deficiencies may have long-term effects on the emergence of chronic diseases, including cardiovascular diseases, certain cancers, osteoporosis, and hypertension (Jenkins et al. 2004; USDA 2005).

Intake of Traditional Starchy Foods

Over the past 200 years or more, the increased consumption of refined-carbohydrate foods appears to have gone hand-in-hand with a reduced intake of high-fiber traditional starchy foods, including truly whole-grain breads, cracked wheat, dried peas, beans, and lentils. These foods are high in fiber and thus more slowly digested, have a

lower glycemic index, and are higher in vitamins and minerals than the refined counterparts as presently consumed. Low-fiber, high-glycemic-index, and high-glycemic-load diets are associated with an increased risk of heart disease, diabetes, and certain cancers. As traditional high-fiber carbohydrates such as whole grains are progressively eliminated from the diet, humans may lose the protection that slow-release carbohydrate foods and their associated nutrients provide against many major chronic diseases (Jenkins et al. 2004).

Policy Issues

In the joint WHO/FAO report of the expert consultation (WHO/FAO 2003), it is suggested that added sugars should be restricted to less than 10 percent of total energy, providing further justification for a guideline to restrict sugar intake that is in place in more than 20 countries. This report provided much of the scientific justification for the WHO global strategy on diet, physical activity, and health approved in 2004 by the World Health Assembly and being implemented at national and regional levels. The consultation group, composed of 30 experts from across the globe, agreed to the text and spirit of the WHO report "Diet, Nutrition, and Chronic Diseases," recommended nutrition requirements for the population, and recognized that a population goal for added sugars of less than 10 percent of total energy could be considered controversial by some (WHO/FAO 2003). The consultation group believed, however, that the studies showing no effect of added sugars on excess weight had limitations and that the detailed analysis of weight change and metabolic indexes for those with metabolic syndrome revealed the clear benefit of replacing sugars with complex carbohydrates. The consultation group also recognized that higher intakes of added sugars threaten the nutritional quality of diets by providing significant energy without specific nutrients. The group also believed that restricting added sugars was likely to contribute to reducing the risk of unhealthy weight gain, noting that added sugars contribute to the overall energy density of diets and promote a positive energy balance. Drinks that are rich in added sugars increase overall energy intake by reducing appetite control (IOM 2007).

Stakeholders

Considering the policy implications of TRS 916, the sponsoring organizations, WHO and FAO, found it of paramount importance to inform key stakeholder groups of the content of the report and provide an opportunity to comment on and react to it. As soon as the initial draft was ready, in this case three months after the expert meeting ended (a record time for a major WHO/FAO report), it was placed on the WHO website and comments were invited. In addition, meetings with industry (food and nonfood sectors) and with nongovernmental organizations (NGOs) of various types (consumers, nonprofit foundations, and academic centers) were scheduled.

There was great interest in the report by all parties. The lay press, the specialized technical and financial media sectors, media traditionally covering nutrition and health information, consumer and farming interest groups, and in some cases countries with particular interests in specific food products participated and openly debated the science and the policy implications outlined in the draft report. A period of three months was given to provide input in writing to the drafting group; comments derived from the open forum meetings were also considered in the final version of the report.

The inclusion of major stakeholders in the discussion of a draft version of the report provided an opportunity to assess reactions for or against the report's proposals and initiated a policy debate that was unusual for a report that had not even been published. This debate heightened the interest and expectations of consumer and other public interest groups as well as the concern of some governments and private sector organizations that could be affected. The WHO and FAO noted this process with interest after having received more than 100 comments originating in national organizations of industrialized and developing countries and a comparable number from individuals and organizations with technical expertise in the topic of the report.

The final draft was ready by December 2002 and circulated for individual approval by each of the 33 experts who participated in the meeting; it went to press early in March and was released in April 2003. The report was then taken to regional-level meetings and discussions involving member

governments, the private sector, and technical organizations during 2003. Based on the progressive public and government interest in the topic, WHO/FAO convened an ad hoc reference group to develop a global strategy to support the implementation of the main recommendations of the report at national, regional, and subregional levels. This process of sharing the results of the report included presentations at the UN Standing Committee on Nutrition (SCN), the WHO Executive Board, and the FAO COAG early in 2004. The report elicited high-level reactions for and against its main conclusions, and efforts to suppress its launching took the form of preventing approval and adoption by the World Health Assembly. One of the issues that took the debate beyond the traditional academic discussion into the realm of a heated controversy was the recommendation to limit the amount of sugar added to foods.

After the report was launched in 2003, intensive lobbying from the U.S. sugar industry and other sectors of the food industry threatened World Health Assembly adoption of the global strategy that emerged from TRS 916. This policy document recommended reductions in fat, salt, and sugar content of foods and increased physical activity as effective measures to prevent the major nutrition-related chronic diseases. It addressed the need for individual responsibility but also signaled that unless changes in the environment were implemented to facilitate healthy choices, it would be unrealistic to expect that major changes would be adopted. Industry objections centered largely on the recommendation to limit the intake of sugar, from two points of view.

In the first perspective, the food industry and some governments claimed that scientific evidence was insufficient and that other authoritative reports were discordant with TRS 916. Regarding the first point, industry quoted the Institute of Medicine (IOM 2002) report on dietary reference intakes for macronutrients issued in September 2002, which suggested that added sugars could provide up to 25 percent of total energy without detrimental effects on health. The president of the IOM, however, said in a written statement to the WHO that this interpretation was misleading because this maximal intake level was based on nutrient intakes observed in the United States, where the other components of the diet contain sufficient essential micronutrients to meet the needs of the population. This finding could not be extrapolated to other populations where empty calories from sugar-containing foods and beverages could compromise the supply of other critical nutrients. Thus this maximum intake amount does not imply that this level of intake is acceptable or desirable in other respects, such as for the prevention of chronic disease.

The food industry also argued against the recommendation using the joint WHO/FAO report on carbohydrates in human nutrition published in 1998 (FAO 1998), which acknowledged that a direct causal association might not exist between consumption of sugars and chronic diseases. The expert group recognized, however, that sugars contribute to the energy density of the diet and could contribute to the global epidemic of obesity and its related health consequences, including type II diabetes, coronary heart disease, and obesity. Furthermore, investigative journalism by the BBC revealed that the FAO/WHO carbohydrate report was heavily influenced by the sugar industry (BBC 2004). The sugar sector was instrumental in funding the meeting, selecting the experts, and securing funds for the employment of the final scientific editor of the technical report.

In the second perspective on this issue, some food policy institutions, like the World Sugar Research Organization (WSRO), and developing-country governments claimed that reductions in sugar consumption might have an adverse impact on sugar producers and the food industry. Some specialists have argued that limiting sugar intake may depress demand for the commodity and imperil the livelihoods of poor farmers. In this regard, it is important to remember that sugar is hugely important in the global economy and to consider whether sufficient evidence indeed exists to recommend restricting intake.

On the one hand, some people from the sugar industry claim that recommendations to restrict sugar consumption would lead to a decrease of income in the poorest sugar-producing countries, with consequences for labor, poverty, and development. They argue that in developing countries sugar is a relatively cheap source of calories for which few alternatives may be available (Mitchell 2004). On the other hand, economists criticize the world's current system of heavily subsidized sugar production, particularly in the European Union

(EU), Japan, and the United States. Farmers in these countries receive more than double the world market price, thanks to government-guaranteed prices, import controls, and production quotas. Such high protection has over the past 30 years converted this group of countries from the Organization for Economic Cooperation and Development (OECD) in aggregate from net importers of half of the world's internationally traded sugar to net exporters. In the process, lower-cost developing-country producers have been deprived of export opportunities, a situation that is devastating livelihoods in sugar-producing countries in the developing world.

Substantial sugar subsidies have made the EU the largest exporter of white sugar, despite being one of the world's highest-cost sugar producers. Other OECD countries that heavily protect sugar producers include Mexico, Poland, and Turkey. Turkey has a higher protection regime for sugar producers than does the EU, leading to rapid production increases and periodic large exports from that country. Other developing countries, such as China, have import restrictions that generally keep domestic prices higher than world market prices. India, the world's largest sugar producer, has a heavily regulated domestic sugar market and high import tariffs to protect local producers. Kenya has high tariffs and import quotas to protect domestic producers. In light of this situation, there is an opportunity to introduce changes to sugar policy and comply with the WHO/FAO recommendation, pushing for full liberalization of the world sugar market in order to allow efficient producers to expand production and exports and consumers in protected markets to benefit from lower prices (Irz 2003).

Policy Options

The WHO/FAO report on diet, nutrition, and the prevention of chronic diseases (FAO/WHO 2003), which forms the basis for the WHO global strategy, faced the strong opposition of the sugar industry. The influence of this industry was such that sugar producers persuaded the U.S. government to lead the attack, ably supported by countries such as Cuba, Mauritius, and other sugar producers in the G-77. They managed, through heavy lobbying, to block adoption of the strategy at the WHO Executive Board meeting. One of the major arguments drew on the WHO/FAO carbohydrate report (FAO 1998), which expressed doubt about recommending a restriction on the intake of added sugars.

The G-77 were also present at the 18th Session of the FAO Committee on Agriculture, following up on the WHO/FAO report (Rome, February 9–10, 2004), where they stated: "Regretfully, it is the view of the G-77 that the WHO technical report fails the test of scientific rigor, objectivity, and fairness." They argued that the differences in diets among nations and between groups within each nation are so marked that any recommendation for the percentage distribution of food items in the diet is "like walking into a dark alley" and that any "one-size-fits-all" diet is an illusory concept. Finally, the report on the FAO Committee on Agriculture meeting stated:

> The Experts' Report defines a population nutrient intake goal for free sugars of 10 percent or less of total energy supply. The Report acknowledges that this goal might be controversial, and it has indeed prompted concerns that its adoption might have an adverse impact on sugar producers and the food industry. In practice, the impact would depend on a number of factors. Where sugar is consumed at levels far beyond the 10 percent mark, the necessary downward adjustment in domestic consumption would reduce domestic prices and revenues for beet or cane growers. More affected would be countries where natural growing conditions limit the shift towards alternative crops and where exports would have to be placed onto an already depressed world market. These difficulties would be much reduced under conditions of a liberalized sugar market characterized by lower protection of sugar production in Organization for Economic Co-operation and Development (OECD) countries. For many developing countries, a freer international sugar market could therefore open an important channel for otherwise unprofitable production and exports. In all importing countries, higher world market prices brought about by freer

> trade could dampen the demand for sugar.
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> The intricacies of the world sugar markets (e.g. complex policy structures, regional trade links, and numerous preferential agreements) do not allow a simple quantification of the impacts. However, the dimensions of possible adjustments can be estimated from an examination of current consumption levels. If all of the 93 developed and developing countries where sugar consumption presently accounts for more than 10 percent of total energy supply were to reduce intake to the target level, the implied reduction in world consumption of sugar would be about 15 percent. On the other hand, if all 85 countries where consumption is below the 10 percent mark were to increase consumption, the implied increase would more than compensate for the reduction in the "above 10 percent" countries (FAO/COAG 2004, 7).

In the recommendations for food-processing technologies and marketing systems, the report states, "Low fat, salt, or sugar products are probably the most visible response to changing needs" (page 10). Under "Specific Areas of Consideration," the report points that "FAO has responsibilities for informing and protecting food consumers as well as promoting the welfare of small-scale food producers and farmers" (page 11). The representative of the International Union of Nutritional Sciences (IUNS), representing the global nutrition science community, said that dietary limits for sugar were needed and that the FAO/WHO guidelines signaled an exciting opportunity for citrus fruit and vegetable farming: "Adopting the joint report's recommendations for increased consumption of fruit and vegetables could stimulate significant new production increases, particularly benefiting developing countries" (Reuters 2004).

Despite the controversy raised at FAO, the World Health Assembly, where member countries are represented by their health ministers, approved the WHO global strategy on diet, physical activity, and health in April 2004. This strategy includes the recommendation to restrict sugar intake to less than 10 percent of total energy intake and to reduce salt and saturated fat intake. This strategy is being implemented to varying degrees by governments, led by ministries of health, in order to cope with the increasing problem of obesity and related chronic diseases.

As mentioned, the potential decrease in sugar production of between 8 and 20 million metric tons of sugar if countries restrict consumption of added sugars to 10 percent of total calories creates an opportunity for agricultural production to shift from sugar cane to more productive crops, such as fruits and vegetables. Fruits and vegetables are much healthier than sugar and provide greater added value to farmers. They have been shown to have a positive effect in preventing chronic diseases, in particular cardiovascular diseases and some forms of cancer. The potential for fruit and vegetable production is of particular importance for developing countries that presently have problems competing with the heavily subsidized sugar produced by developed countries and the tariffs these countries impose on imported sugar.

The Brazilian example offers one potential solution to the sugar controversy by pointing the way to a new market with potential greater profitability for sugar producers. Early in the process, the Ministry of Health was working to implement the sugar recommendation of the WHO global strategy but met objections from the Ministry of Agriculture, since Brazil is an important producer of sugar cane. Presently, however, Brazil is using sugar cane as an alternative energy source, replacing almost 40 percent of imported gasoline with ethanol and exporting ethanol to several countries. Brazil used economic incentives and innovative programs, such as "biofuel clusters." The government provided grants and economic incentives for the development of industrial ethanol-processing technologies and for early adoption of ethanol as an alternative fuel. This support helped car producers, for example, incorporate carburetors that could easily shift between fuel options in cars. This policy helped create an efficient and competitive industrial base for producing ethanol as an alternative fuel. Currently, more than 70 percent of new vehicles produced in Brazil run on an ethanol-gasoline mix or on pure or almost pure (85 percent) ethanol (Koonin 2006).

In the United States ethanol is produced mainly from corn starch. The environmental consequences

of ethanol production from corn have also been examined recently, considering that petroleum prices have risen faster than ethanol prices. In fact, the production of ethanol from industrially farmed and processed corn requires the burning of more carbon to achieve the same energy than petroleum production does. If in the future, however, the raw material used to produce ethanol is residual cellulose from sugar cane or young trees, there would be a net benefit in carbon sequestration because agricultural production of these crops fixes carbon in greater amounts and demands less fossil fuel energy. As the prices of fossil fuels rise, the price differential with ethanol, adjusted by the energy output, continues to narrow. In terms of both actual costs and environmental consequences, the benefits of ethanol obtained from farming are likely to continue to grow. Thus, limiting sugar in the diet, and in particular, restricting high-fructose corn syrup from beverages, may not lead to economic problems for farmers, since there is an emerging and growing demand for sugar cane as a raw material to produce ethanol as an environmentally friendlier biofuel (Somerville 2006).

Assignment

Your assignment is to recommend a position in the sugar controversy to the government of a developing country that faces not only rapidly increasing overweight, obesity, and associated chronic diseases, but also dependence on sugar exports for foreign exchange.

Additional Readings and Recordings

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