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COMMITTEE ON COMMODITY PROBLEMS

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THE MARKET AND FOOD SECURITY IMPLICATIONS OF THE DEVELOPMENT OF BIOFUEL PRODUCTION

I. INTRODUCTION

1. Driven by national objectives for greater energy security, the reduction of greenhouse gas (GHG) emissions and rural development policy, incentives supporting biofuel production have increased in recent years with a greater number of countries adopting a variety of stimulative policies. In combination with higher petroleum prices, support policies, such as consumption mandates, tax incentives, production subsidies and/or border tariffs, have induced a rapid growth in biofuel production and have affected the global distribution of production. Within the Organisation for Economic Co-operation and Development (OECD) region, the rush of new production capacity for ethanol and biodiesel, soon to come on line, means that both production and consumption will continue to increase in the next few years. In addition, many developing countries are in various stages of developing domestic biofuel production capacity in response to rising global demand.

2. *The 2008 State of Food and Agriculture* (SOFA) - *Biofuels: prospects, risks and opportunities* reported that feedstock for liquid biofuel production was the largest source of new demand for agricultural products and could be a significant factor affecting markets in the next decade and beyond, depending on the development of second-generation biofuel production. Growing demand for feedstocks will directly or indirectly influence markets of other agricultural commodities. The growth in biofuel production has affected prices of crop feedstocks used in its production, creating a potential link between the movement of petroleum and feedstock prices and, indirectly, to other agricultural commodities. In the recent commodity price cycle, rising petroleum prices induced higher prices for crops, such as wheat, maize and oilseeds, and led to increases in the retail prices of staple foods. These effects impacted a large number of countries given international trade in these commodities. Rapid price hikes pose a threat to the food security of net food buyers in urban and also rural areas.

3. However, high prices may also provide longer-term potential opportunities for agriculture and rural development. Raising agricultural supply in the medium and longer term will require new investment support to producers in the form of better access to technologies and better production techniques. A key requirement is lifting rural financial services constraints commonly prevalent in developing countries. However, other constraints may also hamper efforts to boost agricultural supply in developing in the long run.

4. The Session offers an opportunity to discuss and exchange views on the importance of the emerging biofuel sector and its implications for markets and food security as noted in the SOFA report. In light of the considerable market turbulence in the past several years, the Session may wish to provide guidance for future policy development with regard to the future development of the sector in a manner that best meets national and international policy objectives.

II. BIOFUEL MARKET TRENDS

5. Global commodity markets experienced an upward trend from 2000 to 2008, largely driven by a long period of high global economic growth. According to the World Bank's *Global Economic Prospects 2008*, this upward phase of the price cycle has been the most significant, in both amplitude and duration, of the past century. Among other effects, it has also given rise to the tremendous growth of bioethanol and biodiesel production and use, as high petroleum prices drove incentives, both public and private, to seek alternative sources of energy.

6. The production of fuel ethanol tripled between 2000 and 2007 to over 60 billion litres, with Brazil and the United States accounting for most of this growth. Biodiesel output, mostly by the European Union, witnessed an even more pronounced expansion over the same period, having grown from less than one billion litres to almost 11 billion litres. Depending on how economic conditions respond to the financial crisis of late 2008, and in particular how the petroleum prices respond over the medium term, biofuel demand will be affected by both price and policy incentives, and considerable uncertainty exists on how demand will evolve.

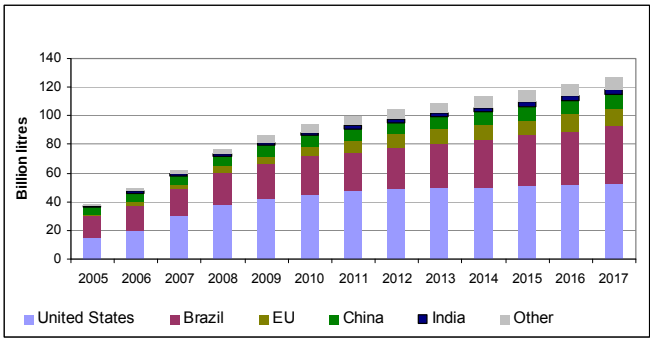
7. The basic trends noted by the *OECD-FAO Agriculture Outlook 2008-2017* remain plausible despite the recent economic downturn. Global ethanol production is still anticipated to increase rapidly and to reach some 125 billion litres in 2017, twice the quantity produced in 2007 (see Figure 1). Global biodiesel production could also double to reach almost 25 billion litres by 2017 (see Figure 2). In the United States, maize-based ethanol production has risen significantly, and may double between 2008 and 2017; if the United States mandates for ethanol production hold, this amount may be conservative. Biodiesel production is also expected to grow in the United States. In the European Union, biofuel production has been mostly biodiesel based on oilseeds, specifically rapeseed. However, ethanol production made from wheat and maize, as well as from sugar beets, is also expected to expand in the European Union.

8. In Brazil, ethanol production is expected to continue its growth at increased rates, reaching some 41 billion litres by 2017, i.e. 128 percent more than in 2006. As ethanol yields per tonne of sugar cane are expected to increase, sugar cane used in ethanol production would grow less in proportional terms, but would still grow by 120 percent over the 10 years. Brazil is the leading developing country in biofuel production, and ethanol from sugar cane grown in this country is by far the cheapest biofuel today. Among the advantages of tropically sourced biofuels, sugar-cane ethanol in Brazil reportedly has the largest potential for reducing GHG emissions compared with ethanol from sugar beet, wheat or maize. Moreover, biofuels produced in tropical regions from sugar cane and vegetable oils have a considerable cost advantage over those derived from agricultural crops in temperate zones.

9. Outside of Brazil, in several developing countries, the outlook for production of biofuels holds great promise. Africa and South America have a large potential to increase biofuel production. Bioenergy production could offer new export opportunities for developing countries to the industrialized world but, perhaps more importantly, help them to use biomass to produce

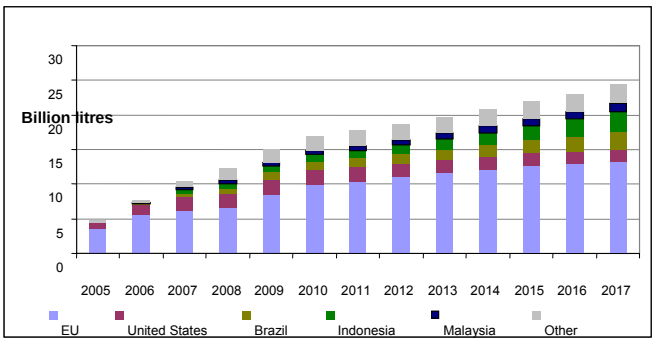
their own electricity. Biofuel production has started to grow rapidly in Asia. China is now the third largest producer of ethanol, and production is anticipated to grow by more than 4 percent per year in the next decade. In India, production of ethanol from molasses is projected to grow by over 7 percent per year, while biodiesel production from new crops, such as jatropha, is developing. Biodiesel production from palm oil is growing rapidly in Indonesia and Malaysia. Moreover, interest in bioenergy in developing countries is expanding beyond liquid biofuel, as some view the benefits of bioelectricity with domestic feedstock to be of greater economic benefit.

Figure 1: Major ethanol producers, with projections to 2017



Source: Based on data from OECD-FAO (2008).

Figure 2: Major biodiesel producers, with projections to 2017



Source: Based on data from OECD-FAO (2008).

III. IMPACT ON FEEDSTOCK DEMAND AND AGRICULTURAL PRICES

Feedstock demand

10. The significant rise in production of biofuels has had large demand effects on agricultural markets, especially grains and oilseeds. In 2007, biofuel production used some 5 percent of world cereal production, 9 percent of world oilseed production, and 10 percent of sugar-cane production. Ethanol used over 30 percent of the United States' maize crop and 50 percent of Brazil's sugar crop, while biodiesel took up 60 percent of the European Union's rapeseed crop. In 2007, about half of the global increase in world grain use (about 80 million metric tonnes or 5 percent of the total) was used by biofuels. Biofuel use of grains in the United States alone explains the vast majority of this change, up by 41 million metric tonnes, even after adjusting for distillers grains coproduced with ethanol and added to feed use. Demand for sugar cane for ethanol is also expected to surge, particularly in Brazil, with the share of the sugar-cane crop used for ethanol rising from 51 percent in 2005-2007 to 66 percent in 2017-2018.

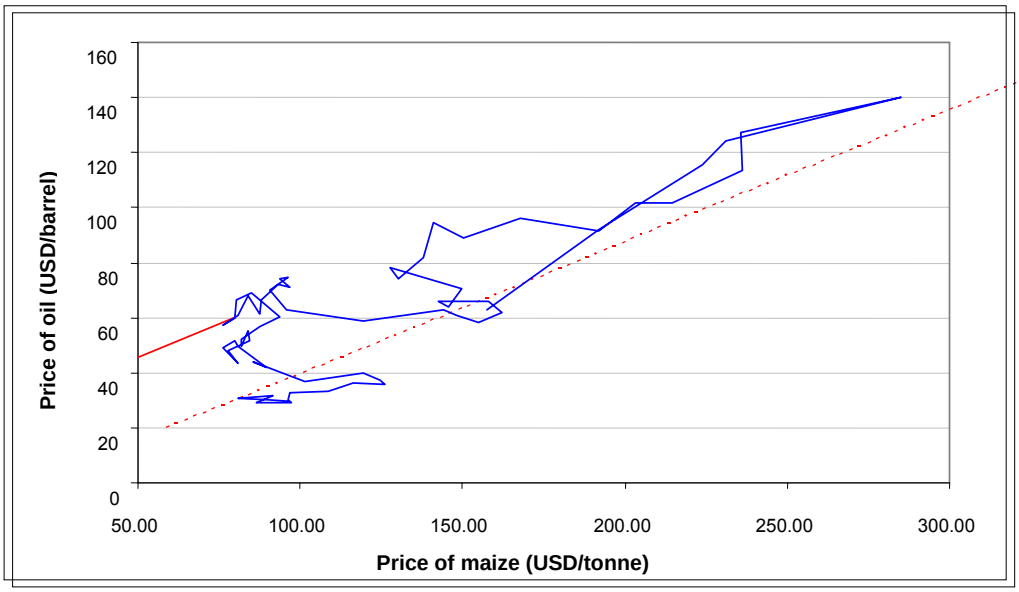
11. World vegetable oil use increased faster, between marketing years 2005 and 2007, than its production. Biofuel use of oils accounted for over half of the increased demand during this period. Outside of biofuel use, vegetable oil growth was 4 percent, roughly matching population growth over the period. Between 2005 and 2017, biodiesel use of vegetable oils is projected to account for more than a third of the expected growth in vegetable oil use.

Agricultural commodity prices

12. As biofuel feedstock use has grown, the linkage has strengthened between energy and agricultural prices. Apart from the cost of inputs that affects the supply side, now increasingly energy/petroleum prices influence the demand side. With existing technology, biofuel production will likely remain a small supplier of total energy, hence the price of energy will tend to influence agricultural feedstock prices and, indirectly, other commodities which either compete with or use feedstocks as inputs in their production process. In this sense, depending on the feedstocks' attributes, above a specific threshold price of feedstocks, petroleum prices may provide both a floor and a ceiling for feedstock prices.

13. Figure 3 shows the link between petroleum and maize prices in the United States, whereby monthly pairs of petroleum and maize prices are shown in a scatter plot. The boundary lines in Figure 3 are derived from price pairs in which ethanol production is at break-even in meeting variable costs with (the lower dotted line) and without (the upper straight line) subsidies. The figure shows that ethanol production has largely remained profitable with subsidies, but unprofitable without subsidies. It also demonstrates the link between maize and petroleum prices. A strong factor underpinning the upward shift in agricultural commodity prices stemming from rapidly increasing petroleum prices, the demand for biofuel feedstock may constitute a structural break from declining real agricultural commodity prices, creating both opportunities and risks. Aside from low agricultural productivity, the demand for biofuels could contribute to reversing the declining trend in real commodity prices that had depressed agricultural growth in much of the developing world over the last several decades. Although there is scope for production costs for biofuel feedstocks to decline as a result of improvements in technology and yields, it is not clear that such improvements will be enough to compensate for rising prices due to production factors and the pressure on prices due to rising demand for food, feed and biofuels. The future course of petroleum prices is critical in this regard.

Figure 3: Maize/crude oil price pairs, 2003-2008



Source: Adapted from Tyner and Taheripour, 2007. Crude oil prices: Brent crude, Chicago Board of Trade (USD per barrel). Maize prices: United States. Yellow No. 2, Chicago Board of Trade (USD per tonne). Prices downloaded from the CRB Web site at http://www.crbtrader.com/crbindex.

14. There is no clear consensus on the degree of linkage between prices of petroleum and those of agricultural commodities, but most agree that biofuel production played a large role in the record increase in food commodity prices from 2005 and peaking in mid-2008. Table 1 provides a survey of estimated impacts of biofuel production on commodity prices from various reports, which indicates that the median range of the contribution to the price upswing was about 30-40 percent for maize in international markets, and somewhat less for other basic commodities.

15. Interestingly, while early analyses of the petroleum and sugar price linkage showed strong correlation, market prices in the past two or three years did not support this conclusion. This result is important because sugar cane is currently the least-cost feedstock and one in which the production potential in many developing countries is high. The lack of co-movement between the petroleum price and sugar price may also be a result of the weak demand for ethanol currently in most developing countries and trade restrictions for ethanol which have limited opportunities in the global market place.

Table 1: Alternative estimates of the impact of biofuel production on market prices

Source	Estimate	Commodity	Time period
World Bank (April 2008)	75%	global food index	January 2002–February 2008
IFPRI (May 2008)	39% 21-22%	corn rice & wheat	2000–2007 2000–2007
CEA (May 2008)	35% 3%	corn global food index	March 2007–March 2008 March 2007–March 2008
OECD-FAO (May 2008)	42% 34% 24%	coarse grains vegetable oils wheat	2008–2017 2008–2017 2008–2017
Collins (June 2008)	25-60% 19-26%	corn US retail food	2006–2008 2006–2008
Glauber (June 2008)	23-31% 10% 4-5%	commodities global food index US retail food	April 2007–April 2008 April 2007–April 2008 January–April 2008

Source: FAO Secretariat

IV. THE IMPACT ON FOOD SECURITY

16. Soaring agricultural commodity prices between 2005 and the first half of 2008 have highlighted important implications for food security. The attribution of part of the increase in commodity prices to increasing biofuel demand, as noted in Table 1, implies negative implications for food security in the short term, for net food-buying countries, and particularly for low-income food-deficit countries. Moreover, net food-buying households are all negatively affected.

17. In the longer run, however, growing demand for biofuels and the rise in agricultural commodity prices stimulated by this higher demand may present an opportunity for promoting agricultural growth and rural development in developing countries. This is particularly important given agriculture's role in poverty alleviation. Furthermore, the development of environmentally friendly biofuels could promote access in rural areas to cheaper and safer energy supplies, further supporting economic growth and long-term improvements in food security. However, as demand grows for biofuels, depending on petroleum prices and technologies, the increasing linkage of feedstock and energy prices may induce another source of crop price volatility, which can affect interest in the large feedstock investments required.

18. Overall, biofuels can affect food security differently. On the one hand, biofuel-induced higher commodity prices hurt food importers, but on the other hand, higher prices may also stimulate domestic agricultural production by small farmers in developing countries. But for this to happen, developing countries, and especially low-income and food-deficit ones, need to overcome their supply-side constraints to allow small farmers to respond to the increased incentives. Hence, there are both gainers and losers from higher prices and more empirical research is needed to assess the net national effects and identify vulnerable population groups and ways to minimize negative food-security impacts.

V. THE IMPACT OF POLICIES

19. As stated above, aside from high oil prices, support policies are the main forces driving further growth in biofuel production. Policies in place to support biofuels are numerous and often difficult to identify or enumerate since they emanate at different levels of government: federal, provincial, state (or regional) or even local levels. According to a global subsidy study by the International Institute for Sustainable Development (IISD), the total OECD support for biofuels was estimated at USD 11.3 billion (US dollars) in 2006, and this is expected to have increased since then. Of that support, over USD 6.3 billion was in the United States and USD 4.7 billion in the European Union. The OECD estimates support by Canada, the European Union and the United States to their biofuel sectors to grow to USD 25 billion by year 2015.

20. Policies include direct subsidies, tax incentives, blending mandates and tariff or trade restrictions. For direct subsidies, the main intervention instruments can be divided into: (i) subsidies to the production of feedstocks for biofuels, (ii) subsidies for processing biofuels and by-products, (iii) subsidies for marketing, distribution and trade, and (iv) subsidies for consumption. Tax incentives such as tax credits are also used for biofuel production or blending with gasoline. Blending mandates, increasingly used by many markets, create a guaranteed market, and they are key drivers in the development and growth of most modern bioenergy industries, especially liquid biofuels for transport.

21. There has been criticism of these policies for creating an artificial market and for being inefficient instruments for meeting the stated goals. According to the IISD study, mentioned above, biofuel subsidies are not a cost-effective way of reducing reliance on imported fossil fuel from unstable regions of the world as biofuels themselves suffer from their own sources of insecurity (from droughts, feedstock crop disease) and they are costly as measured by the transfers (subsidies) per unit of energy produced (above USD 0.45 per litre of gasoline or diesel equivalent in most countries). Measured in terms of fossil fuel displaced, the per-unit transfer is even higher owing to the significant use of fossil fuel in many biofuel production systems. The IISD study also found that supporting first-generation biofuels may not be a cost-effective way of reducing GHG emissions, with reported costs ranging from USD 150 to over USD 1500 per metric tonne of CO2-equivalent avoided. It would be much cheaper to vigorously promote efficiency standards by encouraging alternative options for carbon emission reduction at a social cost below USD 50 per tonne of CO2-equivalent avoided.

22. Another argument by the proponents of biofuel subsidies is the supposed lessening of the distortionary effect of farm subsidy programmes. According to this view, biofuels offer a new domestic market for agricultural products that could stimulate demand and push up prices, thus ultimately reducing the level of farm subsidy payments. The markets for biofuel feedstocks (crops) were already distorted by subsidies, high tariffs and other trade barriers. Governments have added new off-farm subsidies for biofuel production and consumption. However, experience has shown that once in place, subsidies and other protective measures have proved extremely difficult to alter.

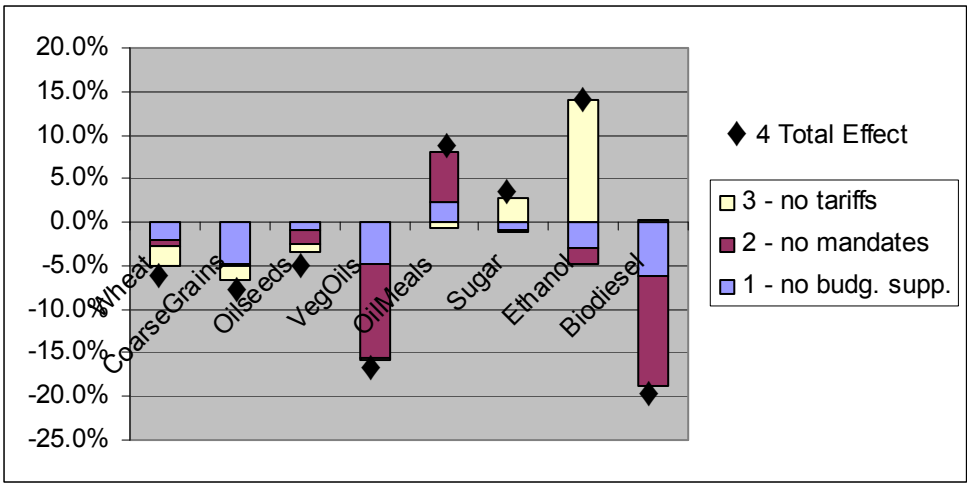
23. Growth prospects of bioenergy and feedstocks from developing countries, combined with rising demand in OECD countries, can open new opportunities for trade in biofuels and feedstocks. Currently, tariffs and production subsidies are used to restrict trade and limit

competition from imports. The leading OECD countries producing ethanol apply import tariffs that add at least 25 percent to the cost of imports. Mainly as a result of these distortions, current trade is only about 10 percent of the world's biofuel consumption. The only significant trade flows in biofuels are from Brazil to the European Union and the United States. Because of expanded biofuel mandates in the European Union and the United States, international trade in ethanol is expected to grow rapidly from current levels.

24. In a detailed study of the impact of biofuel support policies on markets, the OECD found that such policies are critical to production and trade over the next decade (see *Biofuel support policies: an economic assessment,* 2008). This study, which did not include the impact of recent policy decisions by the European Union's Directive on Renewable Energy and the United States' Energy Independence and Security Act (2007), reported that elimination of global support policies for biofuel would reduce global ethanol production by over 10 percent and world biodiesel production by a full 60 percent. Market price impacts are shown in Figure 5, indicating that current policies actually depress traded ethanol prices by about 9 percent, but support biodiesel prices by some 18 percent. The results clearly point to the fact that policies significantly affect markets and the opportunities for biofuel development on a global basis.

25. More research on the effects of liquid biofuel subsidies is needed. This would require detailed information about biofuel subsidies by governments and the cost of transfers and revenue foregone. Otherwise, proper evaluation of the cost-effectiveness of current and proposed policies will be difficult. Given that significant capital continues to pour into the industry and huge shifts in land use are under way, understanding the consequences of these changes is of utmost urgency.

Figure 5: Impact of biofuel support removal on world commodity prices



Source: Biofuel support policies: an economic assessment (2008), OECD. p 67. Results from scenario compared to 2013-17 average. Allocation of results depends on order of reduction in the scenario.

VI. AREAS FOR POLICY ACTION

26. The evidence clearly demonstrates the growing impact of biofuel production on agricultural markets and its possible implications for food security and agricultural development. It also points to increasing national policy support, not always harmonized in terms of policy objectives versus outcomes, as well as the potential for international policy failure where the policies of some countries affect the sectoral development in others. This situation calls for collective and coherent response in several areas.

Protect the poor

27. Recent years have shown the potential for high energy prices to initiate or exacerbate the impact of energy market price volatility on agricultural commodities, and hence on food security.

Safety nets are required to protect poor net food buyers either through food subsidies, food distribution, or targeted cash transfers via social programmes. During these situations, exporting countries should also refrain from using export restraint or taxation programmes which exacerbate market price peaks. In the medium to longer terms, the effort should be an increasing investment and production and productivity in developing countries, notably in low-income food-deficit countries (LIFDCs).

Take advantage of opportunities

28. Biofuel demand is the largest source of new demand for agricultural commodities and developing countries, in particular, should be well-positioned to respond. Whether for production of biofuels, or in response to increasing market opportunities under higher prices, policies should focus on improving rural infrastructures and access to required services, strengthening the research and development systems boosting public investments in agriculture and providing incentives for the private sector to invest. Policy changes should enable increasing access of poor farmers to modern inputs and services, as well as to natural resources, such as land and water.

Lowering trade barriers to biofuels

29. Border protection, mainly in the form of tariffs on ethanol, has provided a protective barrier local producers and affected farmers in their countries. Brazilian exporters, in particular, face tariffs that add at least 25 percent to the price of their product in the United States, and over 50 percent in the European Union. Furthermore, some governments have granted exemptions from fuel excise taxes that are available only to domestic biofuel producers. Biofuels also benefit from exemptions from sales taxes in several Canadian provinces and parts of the United States.

Ensure environmental sustainability

30. Increased biofuel production may require the expansion of agricultural production on marginal land. Improved technologies and yield increases will prove critical to reduce stress on the natural resource base. At the same time, it must be ensured that rapid expansion of biofuel production provides a positive contribution to climate-change mitigation. Further research is needed to verify the environmental benefits for each biofuel production pathway, feedstock and location. Consumption mandates may be unsustainable – they still target ambitious biofuel-based energy market shares without an in-depth understanding of what is a sustainable production level and from where the biofuel could be supplied. The recent European Union decision to lower biofuel mandates underlies such concerns. However, some argue that blending mandates should be eliminated outright and replaced with technology-neutral policies such as a carbon tax. Finally, increased resources should be devoted to more research and development of second-generation biofuels and their feedstocks. Compared to current generation biofuels, cellulosic ethanol is far more advantageous from a GHG point of view, because it is nearly carbon neutral (i.e. removes as much CO2 from the atmosphere as it emits). The cost for reducing greenhouse gases from these advanced biofuels may be lower than today's economic cost of using grain crops in OECD countries. Research on biofuels from other feedstocks, such as cellulose and other biomass, should be accelerated. From an analytical and projections perspective, international organizations should consider both first and second-generation biofuels in their assessments of energy futures. From an analytical perspective, and to provide a more complete assessment of the future energy options, international organizations should also consider scenarios with or without second-generation biofuels recognizing their current pre-commercial status but also the significant amounts of research and development resources devoted to their development.

31. Besides an increased interest in the cost-effectiveness of biofuels, future support for biofuels is likely to be assessed against sustainability criteria. Some countries have taken an interest in the environmental sustainability of the products they would like to import (e.g. the proposed European Union directive on sustainable biofuels). Trade discrimination on sustainability criteria inevitably comes up against the existing WTO rules which are not easily reconciled with the use of non-product-related processes and production methods (PPMs) as a

basis on which to discriminate. Moreover, the development of standards that are acceptable to exporting nations will not be easy and may take time. Sustainability standards for other products (e.g. forest and fishery products) have taken years to develop, and even now the proportion of trade covered by them remains small. However, in those cases, the demand for the products concerned was driven by the market. In the case of biofuels, demand is driven largely by government mandates and subsidies.

Review existing biofuel policies

32. Open-ended production-stimulating subsidies for biofuels are costly and inefficient; they also inflate the value of fixed factors of production. There is an urgent need to review existing policies in light of the emerging knowledge about the implications of increasing biofuel production. Such a review, country by country, should be based on the effectiveness of policies in achieving their objectives, as well as consideration for their transnational impacts. Governments should ensure that any plans for biofuel support policies must be cost-effective, environmentally defensible and minimize negative spillover effects on other markets. Differentiated taxes or subsidies on the basis of levels of CO2 emissions might be appropriate to reflect the lower emissions of atmospheric pollutants produced from biofuels and their (generally) lower life-cycle emissions of greenhouse gases compared with unleaded petrol and low sulphur diesel. Nevertheless, the differential taxes or subsidies are likely to be smaller than the current support levels.

33. Production and consumption biofuel mandates adopted by many governments have many drawbacks. While mandates create certainty for investors, they simply transfer market risks to other sectors and economic agents. In addition, mandates are blunt instruments for reducing net petroleum use and GHG emissions, and they do not differentiate among biofuels according to their net energy or environmental performance. Mandates can be risky when the supply potential of biofuel feedstocks that can be sustainably produced is unknown, or when second-generation biofuels have yet to pass the “commercial proof of concept test”. Overall, the inflexible nature of mandates, coupled with heavy subsidies, makes it likely that they would result in significant distortions in related markets.

Enhance international system support to sustainable development

34. International trade rules should be made more conducive to an efficient and equitable allocation of resources. The playing field is currently not even, and biofuel development should enhance opportunities for developing countries in line with their comparative advantages. There is a need for an international forum in which sustainability criteria can be determined without creating unnecessary barriers to trade, and where assistance in capacity building to manage sustainable bioenergy activities can be provided. There is urgent need for certification of biofuels that must be global and must entail GHG emission reductions. Certification of biofuels is useful for promoting sustainable practices, but is not yet tested for its potential effectiveness or its economic and environmental viability under conditions in developing countries. However, to be effective, certification must be mandatory and must result from a multilateral requirement to avoid potential market segmentation and displacement of unsustainable practices to domestic markets or markets not requiring certified biofuels. The WTO can also play an important role in helping the development of WTO-compatible certification and sustainability schemes for biofuels that help foster trade in sustainably produced biofuels anywhere. Certification of biofuels could be designed using criteria that combine GHG emission reduction regulations. Preferential tax treatments could be addressed by WTO.

VII. CONCLUSION

35. With the prospects of higher energy requirements in the longer term and the need for reducing GHG emission, biofuel production could be an important source of sustainable energy supply although it will only represent a small proportion of total energy consumption.

Nevertheless, its growth, determined by both energy prices, research investments and public policies, may contribute to higher and possibly more volatile prices of agricultural commodities. It is important that negative consequences for food security be contained, while opportunities for development are seized. While biofuel benefits should reach the poor, any policy or decision on biofuels must take into consideration food security aspects and the needs of the poor, in order to be sustainable. Delegates may wish to comment on the policy actions prescribed in Section VI and affirm their support for the development of coherent national and international approaches to biofuel development.