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Information note

Bioenergy development and food security policy

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I. Introduction

1. Rapid economic development in Asia and the Pacific is resulting in a shift away from traditional, rural bioenergy towards fossil energy. However, higher fossil energy prices and a growing need for more environmentally sustainable energy sources have encouraged many governments in the region to adopt policies to support the development of modern bioenergy sectors. These policy choices can involve trade-offs, such as the potential for bioenergy to compete for the same natural resources that are used in food production, and therefore impact food prices and food security.

2. This paper assesses the role that bioenergy policy can play in determining the impact of bioenergy developments on food security. It will aim to demonstrate that the impact of bioenergy technologies on food security differs according to the feedstock, production system and set of supporting policies employed. This assessment will be used to identify strategies to assist policy-makers in designing more sustainable bioenergy development policies that avoid trade-offs with food security and also contribute to national and regional development goals.

II. Bioenergy overview

3. Bioenergy refers to the conversion of renewable biomass for energy. Generally, bioenergy can be further classified as either low-efficiency traditional bioenergy or high-efficiency modern bioenergy.

4. Low-efficiency traditional bioenergy refers to the combustion of fuelwood, charcoal, forestry residues and manure, often in poorer communities, for cooking and heating purposes. The average energy conversion efficiency of traditional bioenergy is between 10 and 20 percent.[1] High-efficiency modern bioenergy refers to conversion of woody and agricultural biomass for stationary heat and power generation and the production of transport fuels. The average energy conversion efficiency of modern bioenergy is 58 percent.[2]

5. Traditional and modern forms of bioenergy account for around 10.2 percent (50.3 exajoules) of global total primary energy supply (TPES).[3] Traditional bioenergy sources account for the vast majority of this share. Agricultural biomass feeds 10 percent of global bioenergy output, 30 percent of which is derived from dedicated energy crops and the rest is from residues and by-products.[4]

III. Bioenergy policies in Asia and the Pacific

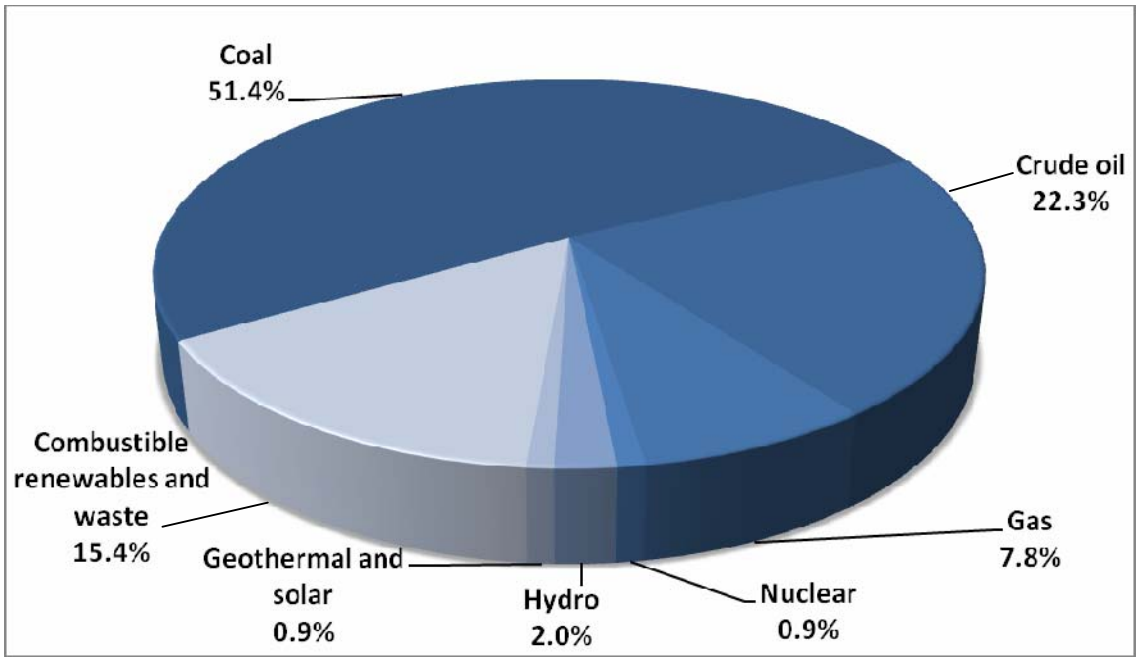
Bioenergy supply and consumption

6. Bioenergy currently accounts for roughly 15 percent of regional TPES in Asia and the Pacific (Figure 1).

7. On a national basis, the share of bioenergy supply varies according to the level of economic development, national policy settings and industrial composition and configuration (Table 1).

[1] IPCC. Intergovernmental Panel on Climate Change, Working Group III. Special Report on Renewable Energy Sources and Climate Change Mitigation – Bioenergy. 2011. Cambridge University Press. Cambridge.
[2] Ibid.
[3] TPES is equal to gross indigenous energy production; plus energy imports; minus energy exports and reserves held in international marine bunkers; and adjustment for changes in energy stocks.
[4] IEA Bioenergy. Bioenergy – A sustainable and reliable energy source: A review of status and prospects. OECD/IEA 2009 Paris.

Figure 1: TPES in Asia and the Pacific by energy source, 2008



Source: International Energy Agency (IEA)

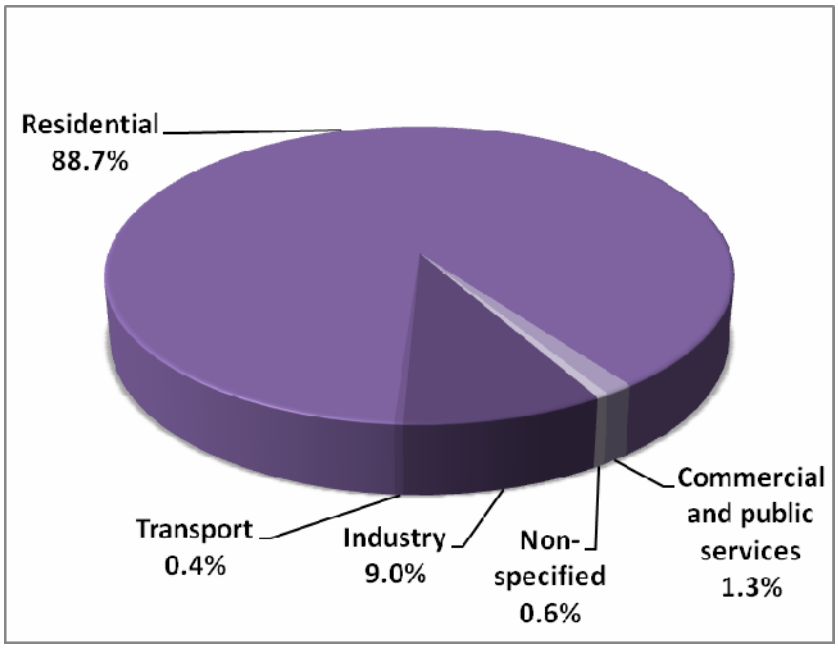
Table 1: TPES and bioenergy share in selected countries in Asia and the Pacific, 2008

Country	TPES (Mtoe)	Biomass/waste energy share of TPES
Australia	130 113	4.2%
Bangladesh	27 944	31.1%
Cambodia	5 220	69.6%
China	2 130 565	9.5%
India	620 973	26.3%
Indonesia	198 679	26.8%
Japan	495 838	1.4%
Malaysia	72 748	4.3%
Myanmar	15 669	66.8%
Nepal	9 799	86.4%
New Zealand	16 935	6.1%
Pakistan	82 839	34.8%
Philippines	41 067	18.5%
Sri Lanka	8 935	52.8%
Thailand	107 199	18.6%
Viet Nam	59 415	41.8%

Source: IEA

8. At the regional level, consumption of bioenergy is dominated by the residential sector, reflecting the high proportion of people in the region who still rely on traditional bioenergy for basic energy services such as cooking and heating (Figure 2).

Figure 2: Final bioenergy consumption in Asia and the Pacific by sector, 2008



Source: IEA

9. On aggregate, strong economic growth in the region and increasing consumer purchasing power has led to equally strong growth in the consumption of fossil energy sources such as oil, coal and gas. Over the medium term, this trend is expected to continue to meet the demands of the region's quickly developing economies.

10. However, population growth and persistent poverty, particularly in South Asia, will necessitate the continued use of traditional bioenergy to meet the basic energy needs of many. Mirroring trends around the world, the consumption of modern bioenergy is also anticipated to grow at a rapid pace with the support of favourable government policies.

The importance of policy in driving future bioenergy demand

11. Unlike fossil energy, bioenergy still faces substantial non-economic barriers such as poor infrastructure to reach markets and regulatory and administrative hurdles. Perhaps the largest barrier to bioenergy development in Asia and the Pacific is significant government spending on subsidies designed to regulate the cost of fossil fuels for consumers. In 2008, Indonesia and Malaysia spent US$22 billion and US$14 billion respectively on fossil fuel subsidies.[5]

12. Government support for bioenergy aims to address this issue by improving the competitiveness and profitability of the bioenergy sector. Many countries in the region have already implemented ambitious targets and/or mandates to promote renewable energy sources, including modern bioenergy and biofuels (Table 2).

[5] IEA. 2009. Op cit.

Table 2: Bioenergy mandates and targets in selected countries in Asia and the Pacific

Country	Biofuels mandates/targets	Biomass heat & power targets
China	E10 in nine provinces; 15 billion litres of biofuel consumption by 2020	30 GW by 2020
India	B10 & E10; B20 & E20 by 2017	1 700 MW of additional biomass cogeneration capacity by 2012
Indonesia	5% biofuel consumption in transport sector by 2025	810 MW by 2025
Malaysia	B5	1 065 MW by 2020
Philippines	B10 & E10; 1 885 million litres of biodiesel by 2030	267 MW by 2030
Thailand	B3 & E10; 5 billion litres of biofuel production by 2022	3 700 MW by 2022
Viet Nam	550 million litres of biofuel production by 2020	5% (30GW) renewable energy by 2020 including biomass

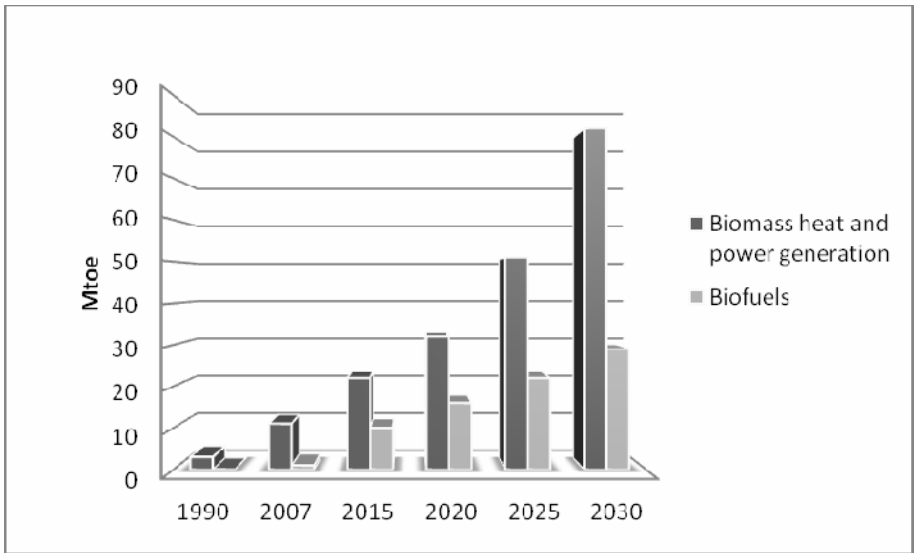
Source: Renewable Energy Policy Network for the 21st Century (REN21)

13. To complement these commitments, governments have also adopted or are considering a range of supplementary policies including price support for feedstock production, feed-in tariffs, tax advantages, capital grants and/or loans and funding for research and development.

14. The effect of these policies could be substantial. According to the International Energy Agency, over the next 20 years power generation from biomass and wastes in non-OECD Asia is projected to grow at 12.3 percent per annum, while biofuels consumption in the transport sector is projected to grow at 13.8 percent per annum (Figure 3).[6] At minimum, this will result in a tenfold increase in regional bioenergy and biofuel output by 2030.

Figure 3: Actual and projected bioenergy output in Asia and the Pacific, 1990–2030

[6] International Energy Agency. World Energy Outlook 2009. OECD/IEA 2009 Paris.



Source: IEA, 2009

IV. Key objectives underlying bioenergy support policies

Enhancing national energy security

15. The key objective underlying most of the bioenergy policies being adopted in this region is to enhance national energy security and reduce dependence on foreign fossil energy sources. Some countries in the region are already heavily dependent on imported energy sources (Table 3), and regional dependence on imported energy, particularly crude oil, is projected to increase over the next 20 years.

Table 3: Net energy imports of selected countries in Asia and the Pacific, 2008

Country	Net energy imports (Mtoe)	Net energy imports as a share of TPES
Australia	-167 021	-128.4%
Bangladesh	4 930	17.6%
Cambodia	1 612	30.9%
China	210 425	9.9%
Japan	418 891	84.5%
India	157 888	25.4%
Indonesia	-147 335	-74.2%
Malaysia	-17 608	-24.2%
Myanmar	-7 292	-46.5%
Nepal	1 138	11.6%
New Zealand	2 930	17.3%
Pakistan	20 214	24.4%
Philippines	18 804	45.8%
Sri Lanka	4 237	47.4%

Thailand	46 235	43.1%
Viet Nam	-10 629	-17.9%

Source: IEA

Note: Exports are considered to have a negative value when calculating net energy imports.

16. By 2030, net imports of oil to China and India are projected to account for 74 and 92 percent respectively of total national demand.[7] In the Association of Southeast Asian Nations (ASEAN), dependence on imported oil is projected to grow dramatically from less than 30 percent in 2008 to over 70 percent in 2030. Over this period, annual expenditures on oil imports by ASEAN member countries are projected to grow from US$32 billion to US$164 billion.[8]

17. Bioenergy is attractive for policy-makers because it is often a domestic source of energy that can diversify national energy supplies and partially reduce energy import bills. For example, the United States Department of Agriculture (USDA) has estimated that China saved about US$1 billion in oil imports in 2009 by using domestically produced fuel ethanol.[9] Unsurprisingly, the increasingly oil import-dependent and biomass-rich countries of ASEAN have been some of the quickest in the region to adopt bioenergy support policies in the hope of realizing similar benefits.

Reducing emissions and tackling climate change

18. Another common objective of national bioenergy policies is to reduce emissions from the energy sector as a means to tackle climate change. On a regional basis, Asia and the Pacific is the largest emitter of greenhouse gases in the world. Since 1960, CO_2 emissions per capita have grown by an average rate of 3.2 percent per annum. Total regional emissions of CO_2 are projected to increase by almost 80 percent between 2007 and 2030.[10]

19. The latest evidence confirms that most bioenergy production chains emit considerably less greenhouse gas emissions than their fossil counterparts.[11] Generally, using bioenergy in heat and power generation is a more cost- and land-efficient way to reduce greenhouse gas emissions than producing biofuels for the transport sector, particularly if coal is the fuel replaced.[12]

20. Capturing emissions benefits from bioenergy systems is highly dependent on feedstock and avoiding direct and indirect land-use changes. For example, research conducted by FAO in Thailand has demonstrated that ethanol produced with cassava that required land-use change away from pastureland or crop change away from sugar cane or rice results in greater greenhouse gas emissions per unit of fuel than fossil gasoline.[13]

Fostering rural employment and development

21. Governments have also supported bioenergy because of a widely held belief that modern bioenergy systems create employment and development in rural areas. Recent studies indicate that bioenergy has a larger positive impact on job creation in rural areas than other energy sources.[14] However, whether the jobs created represent a net gain for rural employment depends on the type of bioenergy system.

22. In the case of bioenergy derived from purpose-grown biomass, the employment benefits that result from the bioenergy system depend on the relative labour intensity of the feedstock crop that was

[7] IEA. 2009. Op cit.
[8] Ibid.
[9] USDA Foreign Agriculture Service. GAIN Report: Readout from Sino-U.S. Advanced Biofuels Forum. GAIN Report Number: CH10035. 2010. Beijing.
[10] IEA. 2009. Op cit.
[11] IPCC. 2011. Op cit.
[12] IEA Bioenergy. 2009. Op cit.
[13] FAO. 2010 (a). BEFS Thailand – Key results and policy recommendations for future bioenergy development. Rome.
[14] IPCC. 2011. Op cit.

previously grown on the same land.[15] For example, if the bioenergy feedstock is less labour-intensive then the previous crop or land-use regime, the bioenergy system will result in a net reduction in employment at the farm level.

23. Successful small-scale, community-based bioenergy systems in Asia – such as biogas digesters, improved cook stoves and micro-scale biofuel production – have demonstrated that the construction, marketing and maintenance of small-scale bioenergy systems, sometimes with government support, can also create jobs in rural communities.

24. In rural areas with limited or no access to electricity, small-scale bioenergy can generate additional benefits for rural development. Improved access to clean and efficient bioenergy reduces opportunity costs associated with feedstock collection and respiratory health problems associated with traditional bioenergy cooking. Poor access to electricity is still a major issue in Asia and the Pacific: in 2008, over 800 million people in Asia lacked access to electricity. This number is projected to decline by 2030, but the number of people without access to electricity in the region is still projected to remain above 500 million.[16]

V. Bioenergy and food security

25. Because government resources are limited, policy choices such as those outlined above involve trade-offs. Government action to promote bioenergy may limit other strategies to achieve similar development objectives. Also, because of information gaps, bioenergy policies designed to achieve one set of development objectives can result in unintended consequences. Perhaps the clearest and most serious example of the trade-offs associated with bioenergy development is its potential to influence food prices and food security.

Bioenergy's impact on food security

26. According to FAO's Bioenergy and Food Security (BEFS) Analytical Framework, bioenergy affects food security primarily through two channels. First, bioenergy competes for resources used in food production such as land, water and labour.[17] Competition between the food and bioenergy sectors for these resources will invariably increase the cost of food production and food prices, at least in the short term.

27. For example, biofuels produced from agriculture crops have been identified as one of a number of factors driving up global food prices over the past decade. While the overall use of agriculture crops for biofuel production on the global level is relatively small, the sector's current focus on a small number of key feedstocks (e.g. maize and palm oil) has raised the possibility that world market prices of these products are higher than if biofuels were not produced.[18] Eventually this situation can also affect product substitutes not used as biofuel feedstock (e.g. wheat) as they may be substituted to satisfy demand in consumption or replaced as a result of the competition for land and other inputs.[19]

28. Growing financial trade in energy and agricultural commodities and, to some extent, increased biofuel output also have created a situation in which agricultural prices at the global level are increasingly influenced by movements in energy prices.[20] This growing bond between global food and energy markets is expected to lead to global food prices remaining higher over the short to medium term than they were in the decade before 2007.

29. In general, higher food prices will pose an immediate threat to the livelihoods and food security of poor net food buyers who spend a very large share of household expenditures on food.

[15] FAO. 2008a. The state of food and agriculture in Asia and the Pacific 2008. Bangkok.
[16] IEA. 2009. Op cit.
[17] FAO. 2011. Bioenergy and food security: The BEFS analytical framework. Rome.
[18] FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and the UN HLTF. Price volatility in food and agriculture markets: Policy responses. 2011. Rome.
[19] Ibid.
[20] World Bank. 2010. Placing the 2006/08 commodity price boom into perspective. Washington.

Higher food prices will also drive more households into poverty, creating further negative implications for food security. The ADB has recently estimated that a 10 percent rise in domestic food prices in developing Asia could push an additional 64.4 million people into poverty.[21]

30. The second channel by which bioenergy interventions can impact food security is through changes in agricultural productivity, biomass utilization and other factors that influence food security, such as economic growth and employment.[22]

31. For example, if higher food and agricultural prices motivate governments, the private sector and donors to increase investment in agriculture and biomass collection and distribution networks, there is potential for bioenergy development to result in gains for agriculture output and food security. Investment that increases agricultural output per unit of input and encourages the sustainable utilization of food system resources could benefit rural communities and food security.[23] These impacts generally manifest themselves over a longer time horizon.

Regional dimensions of bioenergy and food security

32. In regions such as Asia and the Pacific, where some countries have committed to significant growth in bioenergy output, it is also important to consider the potential implications of these policies for food security at the regional level.

33. Differences in national natural resource endowments and biomass production capacity may require that some countries trade biomass feedstock or bioenergy to support their national policy commitments. For example, the magnitude of China's expected future demand for ethanol and restrictions on biofuel produced from grain have prompted plans for a series of cassava-based feedstock and biofuel production operations in the Mekong region.

34. Trade in bioenergy and feedstock implies the use of one country's land and water resources to produce fuel and energy for another. While trading natural resources between countries in the form of food crops can have significant benefits for regional food security, particularly in low-income food-deficit countries, the implications of increasing trade in these resources to meet growing regional energy demands is not as clear.

35. If not properly managed, a future scenario where bioenergy replaces larger and larger shares of fossil energy could intensify regional competition to secure renewable biomass feedstock. There is also a risk that bioenergy feedstock producers in one country looking to take advantage of favourable bioenergy policies in another may engage in unsustainable practices that will affect the quality and stock of a country's natural resources, leading to longer-term issues for local food security.

The impacts of different systems

36. Finally, when considering bioenergy's impact on food security, it is important to remember that some bioenergy systems imply more or less competition for resources used in food production. As a result, the final impact of bioenergy on food security will, to some extent, depend on the types of bioenergy systems that are adopted.

37. As noted above, bioenergy produced from agricultural commodities and residues such as biofuels have the strongest links to agricultural markets and the greatest potential to impact food production and prices. Bioenergy produced from purpose-grown forest plantations and advanced bioenergy derived from lignocellulosic biomass may have fewer direct links to food production systems, but could still compete for land and water resources in feedstock production.

38. In contrast, bioenergy produced from forestry residues and municipal and industrial wastes will result in little competition for agriculture resources. Similarly, small-scale bioenergy systems have

[21] Asian Development Bank (ADB). 2011. Global food price inflation and developing Asia. Manila.
[22] FAO. 2011.Op cit.
[23] FAO. 2010a. Op cit.

been found to have no discernible impact on local food security.[24] Some small-scale bioenergy systems aim to create additional benefits for local food and energy security by integrating food and energy production. These integrated food and energy systems (IFES) facilitate the simultaneous production of food and energy through sustainable crop intensification and improved resource efficiency.[25]

VI. Strategies to avoid trade-offs between bioenergy and food security

39. As outlined above, the impact of bioenergy on food security may be positive or negative, depending on conditions prevailing at the local, national and regional levels and on the chosen feedstock production system and technology pathways. As a result, policy-makers' choices regarding the structure and composition of bioenergy sector policies will influence national and possibly regional food security.

40. The following strategies should be considered to avoid potential trade-offs between bioenergy development and food security.

1. Ensure policies are based on a detailed assessment of the trade-offs involved.

41. Bioenergy can only represent a sustainable alternative energy source if natural resources are managed responsibly; biomass yields from the agriculture and forestry sectors increase substantially; and risks to food security are moderate. To meet these challenges, bioenergy development policies being considered or adopted should be based on a solid understanding of the potential trade-offs involved.

42. Assessing these trade-offs will require access to a range of data and information that shows the many varied consequences of bioenergy development on food security, poverty reduction and rural development in specific country contexts. For example, with BEFS, FAO is able to produce a range of data, information and analysis using a number of established tools and methodologies such as the FAO commodities simulation forecasting model (COSIMO), land suitability assessment, virtual water footprint analysis, life cycle assessment and computable general equilibrium modelling.

43. Access to this type of information will strengthen government capacity to assess the impact of planned bioenergy developments and better manage the potential trade-offs involved.

2. Protect the poor and vulnerable against food insecurity.

44. As noted above, the world is entering a new era of higher food prices, and some bioenergy developments, supported by government policies, are contributing to this trend. Food security should be the ultimate priority of country governments in the region. This priority needs to be reflected in national bioenergy policies – either through measures to limit competition for food system resources or to mitigate the potential for higher prices to worsen the food security situation of poor and vulnerable groups.

45. At a minimum, policies to support bioenergy development should be accompanied by efforts to identify groups of poor and vulnerable people and design appropriate safety nets to preserve and/or improve their food security position. Specific measures could include direct food distribution, targeted food subsidies and cash transfers and nutritional programmes such as school feeding.[26]

46. In some cases, such as when biofuel production results in direct competition with food system resources, more drastic action should be considered. In a recent submission to the G20 on price volatility in food and agriculture markets, a group of multilateral agencies, including FAO, suggested that removing provisions which artificially stimulate demand for biofuels is the best way to avoid

[24] FAO. 2009. Small-scale bioenergy initiatives: Brief description and preliminary lessons on livelihood impacts from case studies in Asia, Latin America and Africa. Rome.
[25] FAO. 2010b. Making Integrated Food-Energy Systems Work for People and Climate - An Overview. Rome.
[26] FAO. 2008b. The state of food and agriculture 2008 – Biofuels: Prospects, risks and opportunities. Rome.

policy-driven conflict between food, feed and fuel.[27] However, devising measures that will allow the flexibility to suspend bioenergy subsidies or mandates necessitate complicated policy levers that could present significant design challenges for governments.

3. Avoid harmful environmental impacts.

47. Bioenergy systems that avoid harmful environmental impacts and encourage efficient resource utilization will ensure the long-term productive capacity of a country's stock of natural resources for both food and energy production.

48. The environmental impact of bioenergy systems is highly dependent on whether land-use or crop changes are involved in the biomass feedstock production process and the extent to which the system affects the volume and quality of local water resources. In particular, high-risk areas, such as those rich in biodiversity or at risk from water scarcity, need to be identified and protected from bioenergy developments.

49. Measures to improve natural resource governance techniques, such as agro-ecological zoning, are suitable strategies to maximize the productivity of natural resources and avoid negative environmental impacts.[28] However, many governments in the region do not yet have the technical capacity to adopt such data-intensive planning tools. FAO has been working with country governments through initiatives such as BEFS to design tailored resource planning solutions that accommodate these capacity limitations.

4. Invest in lifting agricultural productivity.

50. Any bioenergy policy framework that aims to avoid trade-offs with food security depends on raising agricultural productivity to meet demand from the food and energy sector. Realizing productivity growth in the agriculture sector will necessitate investment in long-neglected areas such as research, extension, agricultural and general infrastructure along with credit and risk management instruments.[29]

51. Investment to improve the yields of bioenergy feedstock production per unit of natural resources will also have the added benefit of reducing pressures to expand the area designated for bioenergy feedstock production and the risk of harmful land-use changes.

5. Ensure smallholders and rural communities will benefit.

52. Smallholder farms still account for a significant proportion of agricultural output in Asia and the Pacific. Measures to better integrate smallholder farmers into national bioenergy policies and production chains can work to strengthen their resilience to higher food and energy prices. To facilitate their involvement in bioenergy production chains, governments, and to some extent donors, need to enhance smallholders' access to extension and financial services and ensure their access to natural resources.[30]

53. Small-scale bioenergy systems should be encouraged as a supplementary investment in the food security, health and productive capacity of rural communities. Successful deployment of small-scale bioenergy technologies requires investment in technology selection, local technical capacity and maintenance and support networks. A number of governments in Asia have already made these types of investments in small-scale bioenergy systems with positive, observable benefits for rural communities, such as with the national biogas programmes in Cambodia, the Lao People's Democratic Republic, Nepal and Viet Nam.

[27] FAO, IFAD, IMF,OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and the UN HLTF. 2011. Op cit.
[28] IPCC. 2011. Op cit.
[29] FAO. 2008b. Op cit.
[30] FAO. 2008b. Op cit.

6. Encourage integrated food and energy systems (IFES).

54. IFES offer an innovative, resource-efficient strategy to address food security and rural development. IFES can operate at different scales and configurations involving either the production of food and bioenergy feedstock crops on the same land using multiple-cropping or agroforestry systems; or the adoption of agro-industrial technologies, such as biogas digesters, that allow for the maximum use of all wastes and by-products.[31]

55. FAO has identified and documented a range of successful IFES projects in Asia and the Pacific.[32] Learning from these experiences, raising awareness of their potential benefits and leveraging increased national and donor support will be essential in realizing the significant potential of this innovative approach to enhance local food and energy security and rural development.

7. Prepare to adopt advanced bioenergy technologies.

56. Advanced bioenergy produced from lignocellulosic biomass and photosynthetic organisms such as algae could lessen competition for land with food and feed production and provide even greater greenhouse gas emissions benefits than existing bioenergy technologies. However, significant technological and financial challenges still remain in bringing these energy sources to market. The most optimistic estimates anticipate that the commercial production of advanced bioenergy will commence around 2020.[33]

57. Governments with significant modern bioenergy sectors should look to encourage investments in adapting existing infrastructure to accommodate advanced bioenergy development. Some governments in the region, such as Australia, China, India and Thailand, have already incorporated support for research and development of these technologies into national bioenergy policies, including assistance to demonstrate these technologies in existing bioenergy production facilities.

58. However, limited financing possibilities and a lack of skilled labour and suitable infrastructure will restrict the ability of other countries in the region to adopt such proactive strategies. Strengthening national bioenergy sectors will constitute the best strategy for governments looking to take advantage of advanced bioenergy technologies. The presence of existing facilities and infrastructure will allow for the fast adoption of these technologies as they become available.

8. Develop regionally agreed criteria and standards.

59. Regionally agreed sustainability criteria and standards for biomass feedstock and bioenergy production should be considered as a means to encourage more sustainable and efficient use of natural resources and biomass to produce energy. Establishing regionally agreed standards and monitoring mechanisms also will work to mitigate the risk that poorly coordinated national bioenergy commitments will lead to unsustainable competition for biomass resources with downside risks for regional food security.

60. There are a number of recent developments that governments in the region could build on to develop regionally agreed standards for bioenergy.

61. Under the direction of ASEAN energy ministers, the Economic Research Institute of ASEAN and East Asia (ERIA) has undertaken a sustainability assessment of biomass utilization based on a set of environmental, economic and social criteria. Also, in May 2011, 45 countries and 22 international organizations under the Global Bioenergy Partnership (GBEP) reached agreement on 24 indicators for practical, science-based, voluntary sustainability indicators for bioenergy. These indicators cover issues such as food prices, water quality, greenhouse gas emissions and energy access, and they offer an invaluable guide for policy-makers to enhance the environmental and social sustainability of the bioenergy sector.

[31] FAO. 2010b. Op cit.
[32] FAO. 2010c. IFES Assessment in China and Viet Nam - Final Report. Rome.
[33] IPCC. 2011. Op cit.

VII. Conclusions

62. In conclusion, modern bioenergy development in Asia and the Pacific is expected to grow substantially in the near to medium term with the support of government policies. These policies have been enacted to achieve a range of national development objectives, including energy security, improved environmental performance and rural employment and development.

63. Because of competition for natural resources and biomass feedstock, certain bioenergy systems can impact food prices and food security, particularly in poorer communities. Bioenergy policies could also create competition for food system resources at the regional level.

64. To avoid trade-offs between bioenergy and food security, a range of strategies should be considered. The most important element is a comprehensive assessment of the bioenergy sector and the natural resources that underpin food and bioenergy feedstock production systems. This assessment should be used to trigger strategies that will safeguard the food security of the poor and vulnerable, avoid harmful environmental impacts, realize complementary opportunities for agricultural investment and smallholder inclusion and investigate pathways to adopt advanced bioenergy and regionally agreed bioenergy indicators.

65. Through BEFS, FAO has already developed the tools necessary to assist member countries conduct national level bioenergy assessments and identify suitable strategies to ensure sustainable bioenergy development at national and regional levels.

VIII. Recommendations

66. The Conference may request FAO to further assist member countries in the following areas:

- **Develop capacity to assess existing or future bioenergy policies at the national level.** This includes developing capacity with BEFS tools and methodologies; implementing BEFS in collaboration with national governments and local and regional technical organizations; and developing recommendations for sustainable bioenergy development.
- **Implement a regional-level assessment of planned bioenergy developments on food security.** This includes developing a regional methodology to assess the implications of national bioenergy policies for regional food security and improved inter-government dialogue on regional bioenergy policy and trade issues in collaboration with established regional bodies such as ASEAN and SAARC. It also includes developing recommendations for regional measures to avoid regional conflicts between bioenergy and food security.
- **Promote regional bioenergy indicators to safeguard food security.** This includes facilitating a regional dialogue to select suitable regional indicators and methodologies for bioenergy development that are consistent with existing programmes, such as GBEP, and establishing consensus regarding a process to adopt regionally accepted bioenergy indicators and pilot test indicators to ensure suitability and applicability to the regional context.
- **Identify pathways for member countries to more rapidly adopt advanced bioenergy technologies.** This includes assessing feasible advanced bioenergy feedstock and likely advanced bioenergy production pathways in the regional context and specifying strategies to assist countries in rapidly integrating into advanced bioenergy production chains.
- **Promote small-scale bioenergy and IFES to enhance local food and energy security.** This includes disseminating FAO's considerable body of research on small-scale bioenergy, IFES and partnership with regional governments and relevant technical organizations to scale up existing small-scale bioenergy systems and IFES in the region.

67. The Conference may request member countries to:

- **Seek assistance to ensure that national bioenergy policies are harmonized across relevant government agencies and do not conflict with food security.** This includes developing official government requests seeking technical assistance from FAO to conduct national

bioenergy policy assessments and establishing or reinvigorating appropriate multiagency bioenergy groups.

- **Develop national positions on key elements for regional bioenergy indicators.** This includes identifying key indicators and criteria that should be considered and national requirements to adopt regional bioenergy indicators.
- **Promote small-scale bioenergy investments, including IFES, as a means to increase energy access, reduce health costs and improve rural development.** This includes national and regional promotion activities highlighting the benefits of existing small-scale bioenergy investments to coincide with 2012 International Year of Sustainable Energy for All.