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SOCIO-ECONOMIC CONSEQUENCES OF INCREASED BIOMASS DEMAND

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INTRODUCTION

A large-scale expansion of the use of biomass for energy and raw materials[1] is likely to have substantial repercussions on social and economical conditions from the local to the global level.[2] These impacts can be both positive (e.g., job creation, increased energy security, and improved health conditions) and negative (e.g., higher food prices leading to increased poverty and food insecurity). Whether deliberate or unintended, these socioeconomic consequences of increased demand for biomass and bioenergy need to be accounted for in a comprehensive assessment of biomass technologies (see Chapter 1).

The aim of this chapter is not to provide a comprehensive overview of the full set of socio-economic effects of increased biomass use, given the multitude of existing bioenergy systems and the many ways in which they interact with and effect human welfare.[3] Rather, the aim is to cast some light over some of the most frequent claimed and debated benefits and detriments of a large scale employment of bioenergy technologies: (1) its potential to increase employment and promote development, especially in rural areas, (2) the impact on agricultural commodity prices and the effect this in turn has on food security and poverty, mainly in developing countries, and (3) the extent to which increased bioenergy demand has contributed to a global rush for land, having a negative impact on local livelihoods.

1 In the following text I will simply refer to bioenergy demand, but the consequences of increased demand for biomass are the same whether used for energy purposes or as a raw material feedstock.

2 Chum, H., et al. (2011). Bioenergy. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. O. Edenhofer, et al. Cambridge University Press, Cambridge, UK and New York, USA. pp. 209-332.

3 The interested reader is referred to Chapter 2 and 9 of IPCC (2011). Special Report on Renewable Energy Sources and Climate Change Mitigation. O. Edenhofer, et al. Cambridge University Press, Cambridge, UK and New York, USA.

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A key conclusion emerging from this chapter is that the socio-economic consequences differ widely between bioenergy systems that are land intensive (e.g., crop-based biofuels) and those that are not (e.g., systems based on residue flows from agriculture and forestry), since increased demand for land is what drives the negative impacts on poverty, malnutrition and land rights. Formulating policies that account for this distinction is key if we are to realize the climate mitigation potential offered by bioenergy without concomitant adverse impacts on socio-economic development.

THE IMPACTS OF BIOENERGY ON EMPLOYMENT

A key argument for public policies aimed at supporting the use of biomass for the production of heat, electricity, and liquid biofuels—apart from climate mitigation and security of supply—has been the notion that it will increase employment and foster rural development. Especially in developed countries, where intensification of agriculture and land abandonment has led to unemployment and outmigration in rural areas, this argument has carried weight.

To understand the impacts increased bioenergy demand has on employment it is instructive to divide it into those resulting directly from the increased biomass utilization and secondary effects arising from market adjustments (*equilibrium effects*). The former includes the labour needed to produce the bioenergy and run bioenergy facilities (*direct effects*), increased employment generated through increased demand for goods and services in the bioenergy supply chain (*indirect effects*), and additional jobs generated by the consumption by those directly and indirectly employed in the bioenergy system (*induced effects*).[4] These impacts will by definition be positive and can be substantial, especially in rural areas where the primary biomass production takes place.[5]

These positive effects tend, however, to be offset by market equilibrium effects. These occur primarily as increased bioenergy production crowds out other consumption or divert capital, labour, and land away from other uses. To illustrate this point, consider the example of corn ethanol production in the US, which according to some industry estimates would generate 1 000 jobs for each 100 million gallons of production capacity. However, the estimate falls to 250 jobs if one accounts for the fact that the corn demanded for ethanol production will not come from additional production, but partly come from production that would have occurred anyway (and is merely diverted from other consumers) and partly from cropland already in production that is shifted from planting soy to corn.[6]

Four important determinants of the direction and magnitude of the equilibrium effects are (1) the economic competitiveness and (2) the relative labour intensity of a given bioenergy system, and the effect increased bioenergy demand has on (3) rural wages and (4) terms of trade.

4 Domac, J., et al. (2005). Socio-economic drivers in implementing bioenergy projects. Biomass and Bioenergy, 28(2), pp. 97-106.

5 Berndes, G. and Hansson, J. (2007). Bioenergy expansion in the EU: Cost-effective climate change mitigation, employment creation and reduced dependency on imported fuels. Energy Policy, 35(12), pp. 5965-5979.

6 Low, S.A. and Isserman, A.M. (2009). Ethanol and the Local Economy: Industry Trends, Location Factors, Economic Impacts, and Risks. Economic Development Quarterly, 23(1), pp. 71-88.

If bioenergy is more costly than its alternatives and is increased through subsidies, this will shift government spending away from more labour intensive consumption (e.g., health, education and other social services), leading to negative employment effects.[7] The same can be said if costlier bioenergy is introduced through, e.g., mandates, leading to higher energy costs for consumers and reductions real incomes and consumption. If, on the other hand, the bioenergy system in question is profitable, it will lead to overall savings and free up incomes for consumption of other goods, leading to general positive effects on incomes and employment.

Similarly, within the agricultural sector increased bioenergy production will have a negative employment effect if it is relatively land intensive compared to other agricultural production and cropland is scarce, as bioenergy production then will crowd out other more labour intensive production (e.g., livestock production).[8]

The two final factors that will be important in determining the overall employment effect of increased bioenergy demand both relate to the fact that increased demand for bioenergy will push up agricultural commodity prices (an issue we will examine in more detail below). If agricultural wages rise in response to higher profits in agriculture the positive employment effects tend to disappear.[9] Changes in prices also affect a country's terms-of-trade; if a country is a net exporter of agricultural goods (the price of which is increasing) or if increased bioenergy leads to a reduction of energy imports and an increase in domestic production, employment (and overall welfare effects) tend to be positive.[10]

There are two reasons to believe that most bioenergy systems are more likely to generate positive employment effects than other renewable energy technologies (e.g., solar photovoltaics): (1) the fact that many bioenergy technologies are relatively close to being economically competitive (especially at high fossil fuel prices), implying that the effects from crowding out other consumption (whether private or public) will be small, and (2) that the direct jobs created by bioenergy systems to a larger extent are for unskilled labour and in areas where unemployment often is higher.

In line with this, most studies that include the general equilibrium effects on employment still finds positive employment impacts of most bioenergy technologies, albeit smaller than those studies that only include direct and indirect effects.[11] However, given the importance of, *inter alia*, costs and labour and land intensity, forestry- and residue-based bioenergy systems are likely to have larger positive impacts given that they do not compete for land resources in the same way as cropland-based bioenergy systems.

7 Trink, T., et al. (2010). Regional economic impacts of biomass based energy service use: A comparison across crops and technologies for East Styria, Austria. Ibid., 38(10), pp. 5912-5926.
8 Ibid.
9 Trink, T., et al. (2010). Regional economic impacts of biomass based energy service use: A comparison across crops and technologies for East Styria, Austria. Energy Policy, 38(10), pp. 5912-5926.
10 Ibid. Steininger, K. and Wojan, T. (2011). Economic Impact of Bioenergy Development: Some evidence from Europe and the US. Eurochoices, 10(3), pp. 31-37.
11 Steininger, K. and Wojan, T. (2011). Economic Impact of Bioenergy Development: Some evidence from Europe and the US. Eurochoices, 10(3), pp. 31-37.

THE EFFECT OF BIOENERGY DEMAND ON AGRICULTURAL COMMODITY PRICES, POVERTY AND MALNUTRITION

Against a backdrop of nearly three decades of declining or stable food prices, the world saw a sudden and sharp increase in the price of basic agricultural commodities in the years of 2007-2008, ranging from 60% (wheat and corn) to over 120% (rice), see Figure 5.1. Taking the world by surprise, the 2007-2008 food price crisis sparked both public upheavals across the world and an intense–and sometime heated–debate on the role played by biofuel mandates in developed countries.

While the United Nation's special rapporteur on the right to food, Jean Ziegler, went as far as describing the diversion food for the production of biofuel as a "crime against humanity" and calling for a five-year ban on biofuel production, the US and EU tried to downplay the role of biofuels, with the European Commission arguing that its modest use of cereal for the production of ethanol was a "drop in the ocean" and "not something to shake the markets".[12] And although world prices dropped back to lower levels after 2008 spike, they did so to levels that were higher than those prevailing prior to the crisis, and 2011 again saw increases in agricultural commodity prices and a renewed debated about the role of biofuels in pushing up food prices.

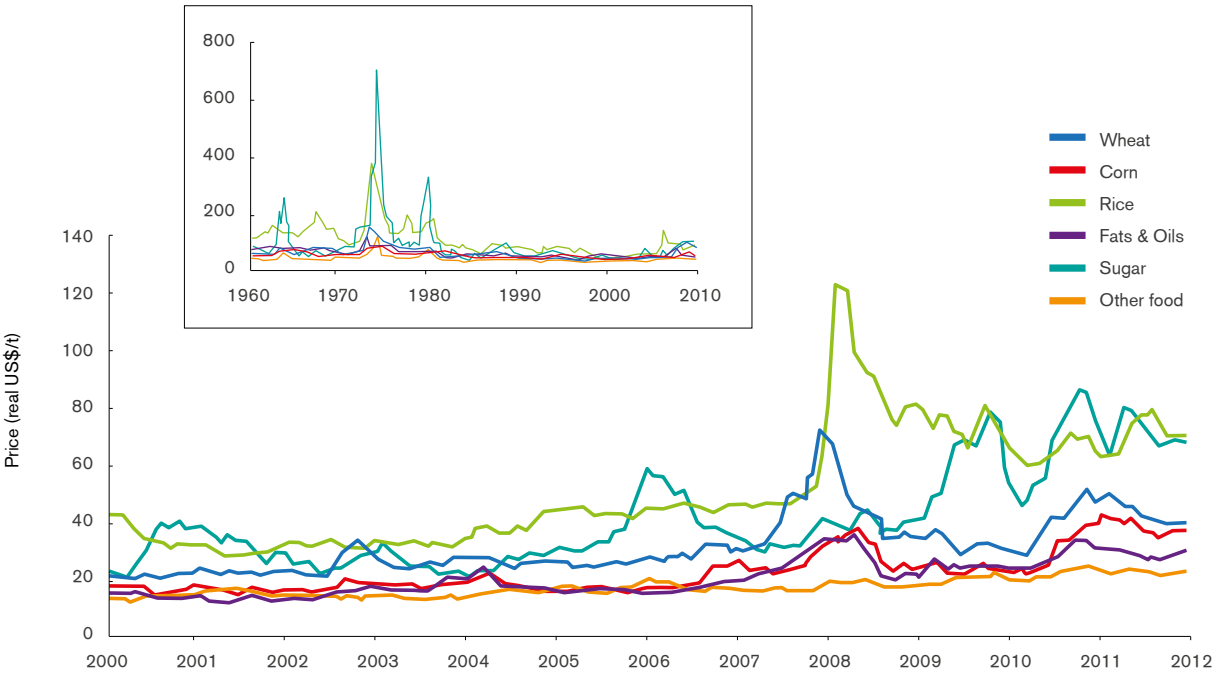

Figure 5.1 Monthly world market prices for major agricultural and food commodities in the period January 2000 to March 2012 (and in the inset from 1960-2012). Source: World Bank (2012).

Several studies have shown how the increased demand for biofuels has strengthened the integration between energy and agricultural markets, and hence the effect bioenergy demand can have on the latter.[13] The basic mechanism through which this new linkage is established is by competition for arable land; if agricul-

12 Ciaian, P. and Kancs, d.A. (2011). Interdependencies in the energy–bioenergy–food price systems: A cointegration analysis. Resource and Energy Economics, 33(1), pp. 326-348.
13 See, e.g.: ibid.; Tyner, W.E. (2010). The integration of energy and agricultural markets. Agricultural Economics, 41, pp. 193-201.

tural land resources where unlimited, increased demand for biofuels would have little effect on food prices. In the biofuels debate it is sometimes argued that the problem is that we use food (e.g., corn or wheat) to produce biofuels, and not non-food feedstocks such as cellulose. However, as long as the production of feedstock requires agricultural land higher demand for biofuels will tend to drive up food prices, whether the actual feedstock can be eaten or not.[14]

While the basic causality from increased biofuel use to welfare effects for the world's poor is relatively straightforward–i.e., higher demand for biofuels leads to agricultural land being diverted to produce biofuel feedstock, leading to lower food production and higher food prices, in turn affecting malnutrition and poverty–the are many real world complexities involved in tracing each step in this chain.[15]

Starting with the first step, the impact of bioenergy demand on agricultural commodity prices will depend on the responsiveness of supply and demand, such as the possibility to increase cropland area or increase agricultural yields or substitute feedstock crops in consumption. [16] There is a broad consensus that biofuel demand was a major, though not the sole, contributor to the 2007-2008 prices increases[17], with quantitative estimates suggesting that 30-50% of the price spike was due to increased demand for biofuels.[18]

Prices increases due to higher biofuel demand can generally be expected to be highest for the crops used directly as biofuel feedstock (e.g., corn and vegetable oils) and in the regions where the increased production of biofuel occurs. The reason for the former is that there is imperfect substitutability both for supply and demand of biofuel feedstocks. For instance, rice production in the US compete relatively little for land with other crops and therefore experience very small increases in price due to increases in demand for corn ethanol.[19]

The reason for price increases being largest where increased production takes place is that, e.g., trade barriers, transaction and transportation costs imply that prices are not perfectly transmitted to international markets. This could help shelter low- and middle-income countries from price increases due to increased biofuel production in high-income countries (e.g., EU and the US). However, agricultural markets in Latin America and Asia were generally well integrated in world markets even prior to the 2007-2008 food crisis, and although African agricultural markets historically have exhibited less than perfect integration, price transmission from world market prices during the 20072008 food crisis was high also in many parts

14 Though, if the yield of second generation feedstocks are higher, this will lessen the competition for land and hence the effect on food prices.

15 Headey, D. and Fan, S. (2008). Anatomy of a crisis: the causes and consequences of surging food prices. Agricultural Economics, 39, pp. 375-391

16 Naylor, R.L., et al. (2008). The ripple effect: biofuels, food security, and the environment. The Environment, 49(9), pp. 30-43.

17 Other important factors identified are declining stock-to-utilization ratios, depreciation of the dollar, rising oil prices, and–in the case of rice–export policies.

18 See a summary of studies in Höglund, J., et. al. (2013). Biofuels and land use in Sweden – An overview of land use change effects. f3 The Swedish Knowledge Centre for Renewable Transportation Fuels and Foundation, Sweden.

19 Babcock, B.A. (2011). The Impact of US Biofuel Policies on Agricultural Price Levels and Volatility. International Centre for Trade and Sustainable Development (ICTSD). 38 pp.

of this continent.[20] Moreover, market integration is higher for widely traded cereals (i.e., wheat, maize, rice)–i.e., exactly the commodities for which prices rose most in 2007-2008–than for locally produced staples (e.g., cassava, plantains, beans), oilseeds, and livestock.

How will developing countries faced with higher world prices for basic agricultural commodities fare? A first indication to the answer to that question is provided by the fact that the majority of low-income countries are net importers of food and have seen deteriorating terms of trade in food up until recently, and would thus most likely stand to lose from further food price increases.[21] Despite a downward trend, the FAO still lists 66 countries as low-income and food-deficit (i.e., being net-importers of food), the majority of which are in Africa, see Figure 5.2. Consistent with this most studies analyzing the welfare implications of biofuel mandates have found that low- and middle-income countries experiences losses from higher food prices, with the exception of prospective biofuels exporters such as Brazil and Thailand.[22]

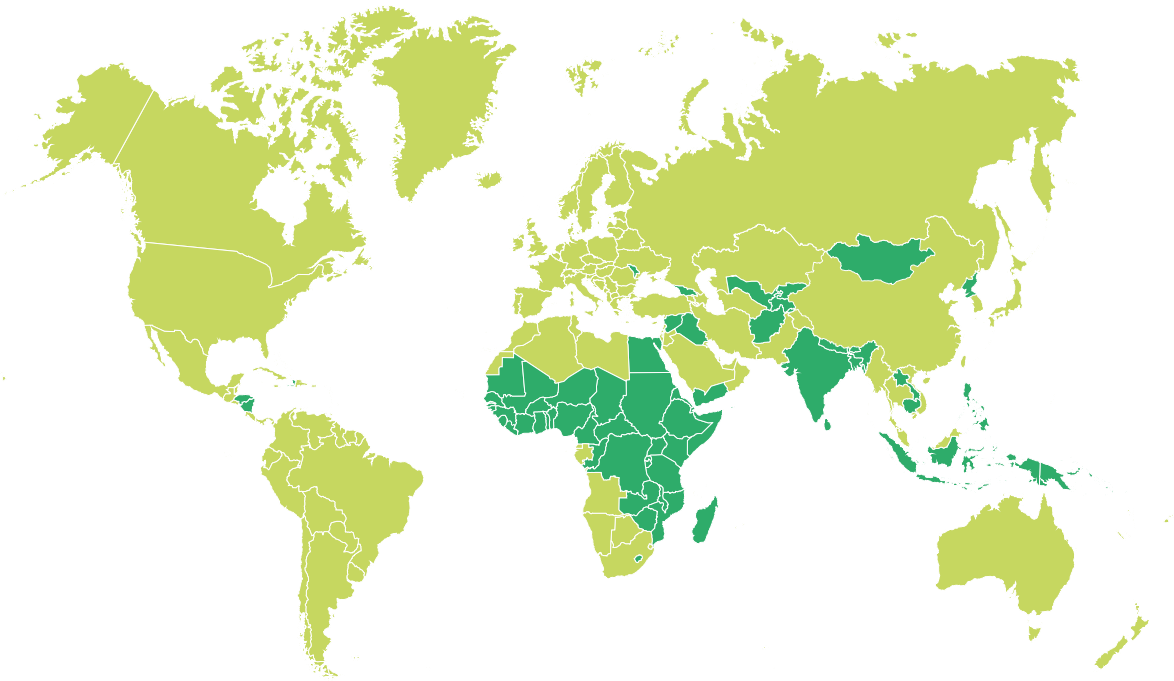

Figure 5.2 Countries in shaded dark are those defined as low-income, food deficit (LIFC). Source: FAO (2012).

And just as countries who are net importers of food will tend to lose from higher prices, so will households in those countries that are net consumers of food. That this is the case for the vast majority of urban households is hardly surprising, but

20 See, e.g.: Brown, M.E., et al. (2012). Country and regional staple food price indices for improved identification of food insecurity. Global Environmental Change(in press). Minot, N. (2011). Transmission of World Food Price Changes to Markets in Sub-Saharan Africa. International Food Policy Research Institute (IFPRI), Washington, D.C. 44 pp.

21 Ng, F. and Aksoy, M.A. (2008). Food price increases and net food importing countries: lessons from the recent past. Agricultural Economics, 39, pp. 443-452. Schmidhuber, J. (2007). Biofuels: An emerging threat to Europe's Food Security? Impact of an Increased biomass use on agricultural markets, prices and food security: A longer-term perspective. Notre Europe. 40 pp.

22 See, e.g.: de Hoyos, R.E. and Medvedev, D. (2011). Poverty Effects of Higher Food Prices: A Global Perspective. Review of Development Economics, 15(3), pp. 387-402. Timilsina, G.R., et al. (2010). The Impacts of Biofuel Targets on Land-Use Change and Food Supply: A Global CGE Assessment. World Bank, Washington, D.C. 71 pp.

the fact is that household surveys from developing countries consistently find that the major share of the population even in rural areas are net consumers of food and would lose from higher food prices, at least in the short run.[23] In the longer run wages for rural labor and crop yields may increase in response to higher prices, reducing the negative impacts, though the limited empirical evidence there is these effects suggest that they are rather modest.[24]

There are two reasons why consumers in developing countries are more vulnerable to increases in agricultural commodity prices. The first is that food expenditures make up a larger share of the total household budget in developing countries. For instance, in Sri Lanka and Bangladesh food accounts for over 60% of total consumption; the corresponding figures for Swedish and American households are 13% and 10%, respectively.[25] The second is that a larger share of the average food basket in developing countries is made up of basic agricultural commodities (e.g., grains). This implies that a given increase in the price of these commodities will have larger impact on food inflation in developing countries than in high-income countries where the cost for the basic commodities accounts for only 20-35% of the final retail price of food (due to a larger share of processed food whose price is determined to larger extent by other inputs such as wages, energy, transport, and storage).[26]

Poor households can respond to higher food prices in three main ways: by reducing the amount of food purchased, by switching to cheaper but less nutritious food, and by reducing other consumption, in all cases reducing welfare. Evidence from a number of developing countries collected by the World Food Programme (WFP) during the 2007-2008 food crisis show widespread evidence of reductions in both the quality and quantity of food consumed (having a direct impact on hunger and malnutrition), as well as weak evidence of household coping by reducing expenditures on health and education, or sale of economic assets (having long-term impacts on poverty).[27]

Different studies have tried to quantify the effect of the 2007-2008 food price hike on poverty, using both simulation models and survey data, most of them indicating that in the order of a 100-200 million people would have been lifted out of poverty and food insecurity if prices had remained stable.[28] However, measuring the effect of the food crisis solely in terms of number of people pushed below a given

23 See, e.g.: Bryngelsson, D.K., et al. (2012). The effect of food-price movements on African households. International Journal of Agricultural Resources, Governance and Ecology, In press. Jayne, T.S., et al. (2010). Principal Challenges Confronting Smallholder Agriculture in Sub-Saharan Africa. World Development, 38(10), pp. 1384-1398.

24 See, e.g.: Ravallion, M. (1990). Rural Welfare Effects of Food Price Changes under Induced Wage Responses: Theory and Evidence for Bangladesh. Oxford Economic Papers, 42(3), pp. 574-585. Thiele, R. (2003). Price Incentives, Non-price Factors and Agricultural Production in Sub-Saharan Africa: A Cointegration Analysis. African Development Review, 15(2-3), pp. 425-438.

25 Organisation for Economic Co-operation and Development (OECD) and United Nation's Food and Agriculture Organization (FAO) (2008). OECD-FAO Agricultural Outlook 2008-2017 (p. 36)

26 Dewbre, J., et al. (2008). High food commodity prices: will they stay? who will pay? Agricultural Economics, 39, pp. 393-403.

27 Brinkman, H.-J., et al. (2010). High Food Prices and the Global Financial Crisis Have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health. The Journal of Nutrition, 140(1), pp. 153S-161S.

28 de Hoyos, R.E. and Medvedev, D. (2011). Poverty Effects of Higher Food Prices: A Global Perspective. Review of Development Economics, 15(3), pp. 387-402.B Headey, D. (2011). Was the Global Food Crisis Really a Crisis? Simulations versus Self-Reporting. International Food Policy Research Institute Ivanic, M. and Martin, W. (2008). Implications of higher global food prices for poverty in low-income countries. Agricultural Economics, 39, pp. 405-416. Shapouri, S., et al. (2009). Food security assessment, 2008-2009. Economic Research Service, United States Department of Agriculture, Washington, D.C. 58 pp. Tiwari, S. and Zaman, H. (2010). The Impact of Economic Shocks on Global Undernourishment. World Bank, Washington, D.C.

poverty or hunger threshold reduces the welfare impact to single dimension. For instance, studies also show that higher food prices tend to increase the poverty gap, pushing the already poor deeper into poverty.[29] Some also argue that biofuel mandates have contributed to increases in price volatility, which also can have large welfare implications, especially for the poorest.[30]

HIGHER AGRICULTURAL COMMODITY PRICES AND THE GLOBAL RUSH FOR LAND

In the late 19th century USA experienced a boom of land acquisitions as settlements expanded west, fuelled by a newly constructed transcontinental railway and prospects of economic riches, displacing Native American populations and causing author and humorist Mark Twain to famously exclaim "Buy land, they're not making it anymore!". In much the same way, the first decade of the 21th century saw a global rush for land, with deals for the outright purchase, lease, or concessions of land in developing countries totalling over 200 million hectares (Mha) worldwide, or close to five times the area of Sweden.[31] Over half of this area was in Sub-Saharan Africa.

The increased global demand for bioenergy (primarily biofuels) has contributed to this development, both directly and indirectly. Directly, as the production of biofuel feedstocks accounts for the largest share of land acquisitions–40% of the area for deals where the purpose of the land use is known–see Figure 5.3. Indirectly, as the underlying driver of the land rush has been an expectation that a tightening global market for agricultural commodities–driven by increasing populations, incomes, and biofuels demand–will drive up future returns from arable land. Symptomatically, between October 2008 and August 2009 alone–in the wake of the global food crisis–close to 50 Mha of large-scale land acquisition deals were struck.[32]

The changing outlook for agricultural markets has had implications not only for governments that seeks to safeguard the food security of their populations, but also for global agribusiness. Falling agricultural prices throughout much of the 20th century squeezed economic margins in farming and caused agribusiness to focus on upstream (i.e., fertilizer, seeds, machinery) and downstream (i.e., processing and distribution) markets. As higher, and more volatile, agricultural commodity prices have increased the risks for downstream processers and distributors and boosted farm incomes, agribusiness has shifted back to a greater involvement in primary production.[33]

29 de Hoyos, R.E. and Medvedev, D. (2011). Poverty Effects of Higher Food Prices: A Global Perspective. Review of Development Economics, 15(3), pp. 387-402. Ivanic, M. and Martin, W. (2008). Implications of higher global food prices for poverty in low-income countries. Agricultural Economics, 39, pp. 405-416.

30 Babcock, B.A. (2011). The Impact of US Biofuel Policies on Agricultural Price Levels and Volatility. International Centre for Trade and Sustainable Development (ICTSD). 38 pp. FAO, et al. (2011). Price Volatility in Food and Agricultural Markets: Policy Responses. World Bank, Washington, D.C. 68 pp.

31 Due to the lack of transparency the exact scale of this phenomenon is difficult to gauge. This number, which refers to deals reported in media or research reports and complied by the Land Matrix project up until November 2011, is likely to be an underestimate. Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp.

32 Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp.

33 Cotula, L. (2012). The international political economy of the global land rush: A critical appraisal of trends, scale, geography and drivers. Journal of Peasant Studies, 39(3-4), pp. 649-680.

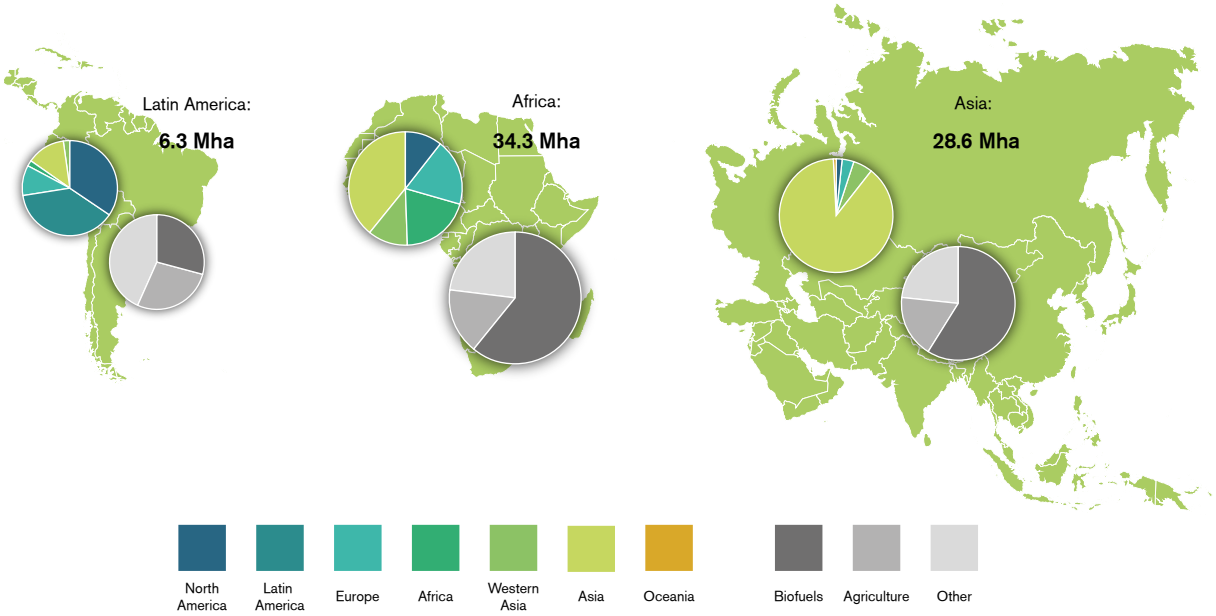

Figure 5.3 Distribution of land acquisitions between different investor regions and between different planned uses of the land (other includes forestry, industry, mining, tourism and other). The data present here pertain to a subset of all reported large-scale land deals, not solely relying on media reports but cross-referenced from different sources. Source: Anseeuw et al. (2012).

Consequently, while much media attention has focused on large-scale acquisitions by land (or water) scarce countries like South Korea or Saudi Arabia or emerging economies like China and India, reality is more nuanced. Private entities (companies and investment funds) account for the major share of land deals and national elites (politicians, civil servants, local business people) making investments targeted at domestic, rather than export, markets plays an important role (see also Figure 5.3).[34]

Given the urgent need for investment in agriculture in many developing countries, notably in Sub-Saharan Africa, if well managed these investments presents an opportunity to instigate broad-based rural development by creating employment opportunities, providing smallholders access to technology and markets, and providing funds for public goods (e.g., infrastructure) and social services (through revenues from leasing or selling land, as well as from increased tax revenues).[35]

However, there is overwhelming evidence that these positive effects have failed to materialise, and instead the recent race for land has lead to widespread loss of access to land and other vital resources (e.g., water and housing) for local communities, with insufficient or non-existent compensation, and with women being disproportionally hard hit.[36]

34 Ibid.

35 Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp.

36 See, e.g.: Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp. Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp. German, L., et al. (2011). Contemporary processes of large-scale land acquisition by investors. Case studies from sub-Saharan Africa. CIFOR Occasional Paper.

There are a number of reasons for this. First, acquisitions often claim to target "marginal" or "unused" land, but in reality not much land fits that description and for obvious economic reasons most acquirers have prioritised land that is highly suitable for agriculture (i.e., fertile, well-watered or with good rainfall) with access to infrastructure and consumer markets (see Chapter 4 regarding assessments of potential for biomass production on marginal lands). Even in the cases when such land is not already under cultivation, it is likely to be collectively owned and used by local communities for grazing, hunting, shifting cultivation, harvesting of forest products, or shifting cultivation. Such lands often constitute the major asset of rural communities and its appropriation can have seriously adverse impacts on livelihoods, especially for the poorest households, pastoralists and forest dependent communities. [37]

Second, many planned investments where not technically viable or investors lacked sufficient expertise, leading to many projects failing or falling far behind schedule. As a consequence "local people had often suffered asset losses but received few or none of the promised benefits".[38] In yet other cases, e.g., in Nepal and Uruguay, acquisitions were purely speculative and solely served to fuel land price inflation.[39]

Finally, developing country governments were either incapable or unwilling of harnessing the potential positive force of investments to further strategic development plans and instead have offered acquirers land for little or no rent in an ad hoc manner, largely bowing for investor interests.[40]

The underlying reason why the renewed interest in developing country agriculture has failed to translate into long term investments benefiting rural communities and instead resulting in wholesale land grab can be found in the existing power structure and lack of functioning institutions in many host countries. Weak democratic governance and legislative frameworks at both national and international level that favours investor interests and large-scale commercial agriculture enterprises, has contributed to the neglect of land rights of rural poor and a sidelining of smallholder involvement in agricultural development.[41]

DISCUSSION

Judging from the above overview of the main socio-economic consequences of expanded use of bioenergy to date, it seems obvious that the scales tip heavily towards the negative side; while positive employment effects have not been as

37 Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp.
38 Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp. (p. xxxiii)
39 Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp.
40 Ibid. Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp.
41 Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp. Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp.

large as anticipated, increases in food prices, and the associated impacts on poverty, malnutrition and the land access for the rural poor, that can be tied to increased bioenergy demand have been substantial. And this as the result of a relatively modest increase in demand for bioenergy; biofuel feedstock production today accounts for roughly one percent of global cropland, but future projections for bioenergy plantations put the figure between 20-60% of global cropland area (see Chapter 4).[42]

Does this mean that we should abandon the endeavour to substitute fossil fuels for biobased energy and raw materials? No, not necessarily. It does, however, have some important implications for how to manage that transition in order to minimise negative socio-economic consequences.

Firstly, as is evident from the discussion in this chapter, the socio-economic consequences from different bioenergy sources and technologies can differ widely. Directing the short-term expansion of biomass use primarily towards the utilization of residues streams from agriculture, forestry, and municipal waste offers a win-win situation as it has been shown to have the largest positive local employment benefits while at the same time avoids the indirect, negative global impacts on poverty, malnutrition, and land rights.

Secondly, while bioenergy has been a major contributor to increased demand for land and the concomitant negative consequences, the other factors (increased populations, income induced diet shifts, other land demands, and a shrinking resource base due to cropland degradation) implies that the negative effects of higher demand and prices for land will not disappear even if we abandoned biomass-based energy and raw materials completely. We still need legislative and institutional reforms that support the rural poor and harness the positive development potential that bioenergy proponents, correctly, have identified could arise from the increasing value of arable land. This implies strengthening the resource rights of rural people (e.g., through legal recognition of land rights, including over common lands), empowerment of smallholder producers (e.g., through contract farming arrangements with land investors), and by making land use decision making more transparent, inclusive and accountable.[43]

Until there is considerable progress on these issues we should be very cautious about expanding the use of land-based biomass for energy and materials. Note that this may entail introducing policies that restrict or discourage the demand for land-based biomass, as higher fossil energy prices in conjunction with pricing of carbon emissions is poised to make bioenergy increasingly profitable.[44] The recent reversal of the EU position on the issue of crop-based biofuels is an example of a step in this direction. We also need to consider other options for curbing the

42 Berndes, G. and Hansson, J. (2007). Bioenergy expansion in the EU: Cost-effective climate change mitigation, employment creation and reduced dependency on imported fuels. Energy Policy, 35(12), pp. 5965-5979.
43 Anseeuw, W., et al. (2012). Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. International Land Coalition, Rome, Italy. 84 pp. Deininger, K., et al. (2011). Rising global interest in farmland: Can it yield Sustainable and equitable benefits? World Bank, Washington, D.C. 264 pp. Jayne, T.S., et al. (2010). Principal Challenges Confronting Smallholder Agriculture in Sub-Saharan Africa. World Development, 38(10), pp. 1384-1398.
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global demand for land; for instance by increasing agricultural productivity in many developing countries (closing the yield gap), by reducing food wastage that currently leads to losses of more than a third of global agricultural production, and by shifting diets away from land-intensive meat consumption (e.g., through pricing the greenhouse gas emissions from production).[45]

45 See, e.g., Foley, J.A., et al. (2011). Solutions for a cultivated planet. Nature, 478(7369), pp. 337-342. {Godfray, 2010 #493} Wirsenius, S., et al. (2011). Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. Climatic Change, 108(1), pp. 159-184.