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Unscrambling Africa: Regional Requirements for Achieving Food Security

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Africa has inherited highly arbitrary political borders that vastly complicate current efforts to accelerate agricultural growth and reduce hunger. By partitioning agro-ecological zones and natural market sheds, current borders serve as barriers, hampering agricultural technology transfer, hindering agricultural trade and dampening incentives for farmers and agribusinesses to invest in Africa's many regional bread-basket zones. Feasible solutions revolve around neutralising these deleterious effects through regional scientific networks and corridor development programmes.

Key words: Africa, borders, food security

1 A fractured inheritance

Aftershocks from the world food crises of 2008 and 2011 have sparked new urgency in African efforts to raise farm production. Given that agriculture employs 65% of all Africans, including a majority of its poor, Africa's leaders consider investments in farm productivity to be central to broad-based economic growth and poverty alleviation (AU/NEPAD, 2003 and 2010; IFPRI, 2004).

Yet Africa has inherited highly arbitrary political borders that vastly complicate current efforts to accelerate agricultural growth and reduce hunger. The broad outlines of Africa's current political boundaries emerged from the Berlin Conference of 1884-5 when the European powers launched the final phase of their well-documented scramble for Africa (Pakenham, 1991; Katzenellenbogen, 1996). Over the hectic ensuing decades, a complex series of thrusts and counter-thrusts by European, African and Arab agents combined with a hazy understanding of African geography to partition Africa into a distinctive, irregular jigsaw puzzle of political boundaries that cut through linguistic and ethnic groups, agro-ecological zones, pastoral migration routes and natural market sheds (Asiwaju, 1985; Griffiths, 1986; Lewis, 1987; Nugent and Asiwaju, 1996; Dixon et al., 2001; FEWSNET,

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2010a; World Bank, 2008a). Today, efforts to reduce hunger founder in this dense thicket of inherited political boundaries.

Productivity growth in agriculture remains critical, both for increasing food availability and for raising the incomes and purchasing power of Africa's poor. Yet new agricultural technologies spread slowly across agro-ecological zones partitioned into multiple small countries with differing languages, phytosanitary controls and seed-certification processes. Moreover, agricultural pests and diseases – such as cassava mealy bug, trypanosomiasis and foot and mouth disease – powerfully affect agricultural productivity. Because these biotic stressors easily transit the political borders that partition agro-ecological zones, individual countries face chronic difficulties in raising farm productivity in the absence of effective regional collaboration.

Equally constraining, political borders frequently separate Africa's many surplus food-production zones from the cross-border deficit markets they would most naturally serve. They separate surplus millet and sorghum producers in southern Mali and Burkina Faso from deficit markets in half a dozen surrounding countries; surplus maize in South African silos from deficit markets throughout southern and eastern Africa; food surplus zones of northern Mozambique and southern Tanzania from intermittently deficit markets in Malawi, Zimbabwe and eastern Zambia; and livestock exporters in Mali, Mauritania and Niger from coastal markets across West Africa (RATES, 2003; Awuor, 2007; World Bank, 2008a; FEWSNET, 2010a and 2010b). Despite widespread smuggling, border controls and poor perimeter infrastructure disrupt market signals, raise transaction costs and limit market integration. The problem becomes especially acute in the 25% of African countries that partition has left landlocked.

Ultimately, achieving African food security will depend on significant, broad-based gains in agricultural productivity combined with a successful coupling of the continent's many bread-basket zones and cross-border deficit markets. Africa's current patchwork of political borders greatly complicates both core tasks.

The recent independence of South Sudan and the implosion of nearby Somalia have inspired some flexibility in thinking about African borders, historically regarded as sacrosanct (Deng, 1993; Herbst, 1996; Keller and Rothchild, 1996; Zachary, 2010). Although most students of African history conclude that partition resulted in a set of highly arbitrary political borders, discussions about appropriate remedies remain divided into three general clusters (Kapil, 1966; Sautter, 1982; Ajala, 1983; Asiwaju, 1985; Griffiths, 1986; Davidson, 1992; Nugent and Asiwaju, 1996; Clapham, 1999; Englebert et al., 2002; Adebajo, 2010). The first, including most African political leaders, considers Africa's national borders to be inviolable and largely innocuous, no more problematic than borders elsewhere (Kapil, 1966; Touval, 1985; Odugbemi, 1995; Nugent, 1996; Ottaway, 1999). This group concludes that where poor governance and failed states arise, they result not from poorly delineated borders but rather from weak internal institutions. Proposed solutions, therefore, revolve around strengthening internal governance – or, in extreme cases, trusteeship (Ellis, 2002) – without any modification of existing borders.

The remaining two groups identify significant political and economic costs arising from Africa's inherited borders. Politically, they find that Africa's arbitrary borders magnify political instability, military spending and international conflict (Zartman, 1965; Griffiths, 1986; Davidson, 1992; Bello, 1995; Englebert et al., 2002; Adebajo, 2010;

Zachary, 2010). In economic terms, they note that Africa's high density of political borders translates into an endemic small-country problem, which not only limits the scale and competitiveness of African businesses but also reduces incentives for infrastructure investment in peripheral zones, resulting in high transaction costs and economic isolation, particularly in Africa's 15 landlocked countries (Griffiths, 1986; Collier, 2007, 2009; *Independent* of London, 2009; Kojima et al., 2010; World Bank, 2010a). Proposed solutions typically fall into two categories. Some analysts suggest that redrawing political borders may prove necessary – through mutual agreement, military force, disintegration or arbitration (Griffiths, 1986; Soyinka, 1994; Bello, 1995; Herbst, 2000; Englebert et al., 2002; Zachary, 2010). Others advocate detoxification, neutralising national political borders through decentralisation, federalism or regional economic integration, both formal and informal (Asiwaju, 1985, 2005; Griffiths, 1986; Nugent and Asiwaju, 1996; Gomes, 1996; Bach, 1999a; *The Economist*, 1997; Grant and Söderbaum, 2003; Söderbaum and Taylor, 2008; Adebajo, 2010).

Currently, for the first time in a generation, African leaders and donors have united to focus priority on agricultural growth. Food riots from West Africa to Mozambique have reminded African political leaders that food security remains critical for political stability. Moreover, because the majority of Africa's poor work primarily in agriculture, investments in farm productivity offer a singularly powerful tool for lifting large numbers of Africans out of poverty (Thirtle et al., 2003; de Janvry and Sadoulet, 2009; Christiaensen et al., 2010). As a result, African leaders have launched a continental Comprehensive Africa Agricultural Development Programme (CAADP), committing to roughly double their budget allocations for agriculture, from 6% to 10% of total spending (AU/NEPAD, 2003; Fan and Sarkaur, 2008). Donors have likewise placed agricultural growth at the top of the aid agenda. After two decades of neglect, when funding agencies cut global aid for African agriculture roughly in half, the Group of Twenty (G-20) has committed $20 billion over three years for agricultural development and related efforts to reduce world hunger (GAO, 2008; G-8, 2009; G-20, 2010). As part of this global response, donors and private foundations have launched a new Global Agriculture and Food Security Program (GAFSP), increased contributions to the International Fund for Agricultural Development (IFAD) and founded the Alliance for a Green Revolution in Africa (AGRA) (Delgado et al., 2010; AGRA, 2009a).

At a time when agriculture has returned to the top of Africa's development agenda, this article extends earlier debates by examining African political borders through an agricultural lens. Given significant cross-country spillovers in agricultural technology and trade, broad-based improvements in Africa's food security will depend critically on developing successful models for managing cross-border relationships. To improve understanding of the consequences of partition for the principal livelihood of ordinary Africans, the article begins by tracing the historical origins of African political borders and examining their impact on high-potential bread-basket zones in Africa today. The ensuing sections pull together empirical evidence evaluating the impact of political borders on the two primary drivers of agricultural growth: productivity and markets. The article concludes by exploring feasible solutions for neutralising the agricultural stumbling blocks embedded in Africa's inherited political borders.

2 Food-security consequences of arbitrary national boundaries

Behind each of Africa's 100-plus bilateral boundaries lies a rich history, featuring a cast of colourful characters operating in frequently difficult circumstances (see, for example, Touval, 1966; Asiwaju, 1985; Griffiths, 1986; Lewis, 1987; Pakenham, 1991; Nugent and Asiwaju, 1996). The following four case studies have been selected from this large body of historical material to illustrate key outcomes, recurring during Africa's partition, that affect current efforts to stimulate agricultural productivity and trade. Three highlight issues arising in bread-basket zones, while one illustrates how Africa's small-country problem affects agricultural growth.

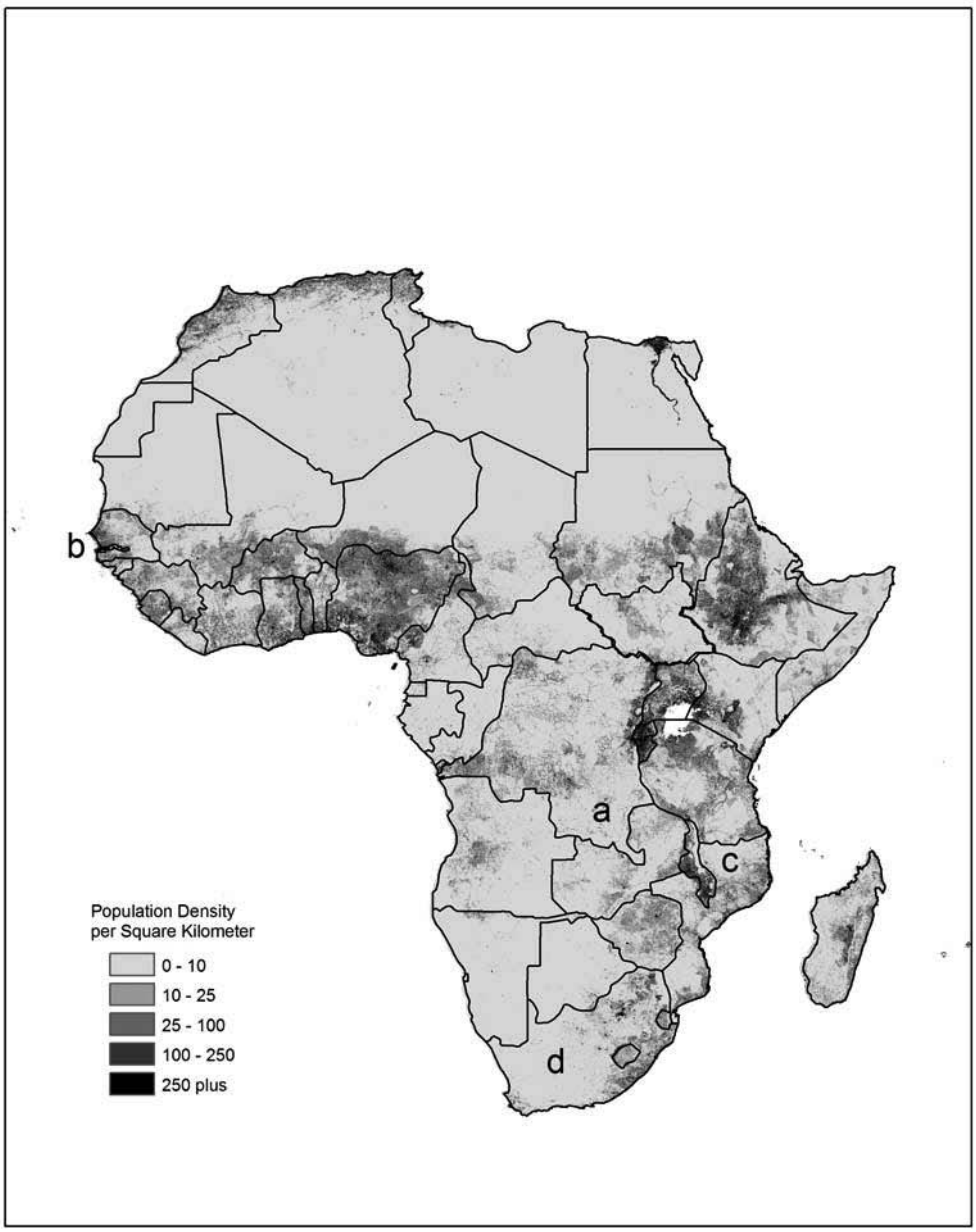
2.1 Katanga Province

Zambians refer to Katanga Province of the Democratic Republic of Congo (DRC) as a fist punching into Zambia's mid-section. Most modern maps refer to Katanga's southeastern protrusion as the Congo Pedicle, or 'little foot' (see Figure 1,a).

In the aftermath of the Berlin Conference, this 'little foot', along with the rest of mineral-rich Katanga province, became the object of a concerted tug-of-war between Belgium's King Leopold and British mining tycoon, Cecil Rhodes. Because the Berlin Conference treaty required European powers to substantiate their African land claims by establishing an effective presence on the ground – negotiating formal agreements with local rulers, setting up a local administration and enforcing order – the conference triggered a subsequent scramble among the imperial powers to negotiate treaties with African leaders as inoculation against further European intrusion. Despite recognition of King Leopold's control over most of the Congo River basin, an absence of formal agreements in what is now the Katanga region left this valuable half a million square kilometer chunk of central African real estate open to contest.

Following the ground rules laid out in Berlin, Rhodes's British South Africa Company (BSAC) sent Englishman Alfred Sharpe to Katanga in 1890 to negotiate a treaty with King Misri, the most powerful African ruler in the region. But Misri refused. He likewise rebuffed two subsequent emissaries sent from Leopold's Congo Free State (CFS) to negotiate with him. So Leopold sent a third expedition, led by a Canadian-born British citizen, William Stairs, in December 1891. After Misri again rejected Leopold's terms, Stairs hoisted the CFS flag unilaterally and sent his men to arrest King Misri. When Misri resisted, Stairs's envoys shot and killed their recalcitrant ally. A few days later, on behalf of King Leopold, Stairs signed a treaty with Misri's more compliant successor, whom he had helped to select (Rotberg, 1964). Twenty years later, in 1910, the Belgians combined the Congo Free State and Katanga to form the Belgian Congo, although ongoing boundary disputes continued until 1914 when adjudication by the King of Italy finalised the arbitrary north-south line forming the eastern boundary of the Pedicle's 'little foot' (Gordon, 2000). At independence, the Belgian Congo became Zaire and, later, the DRC. Today, because Leopold's British emissary proved more brutal than Rhodes's British emissary, the central African copperbelt and its Bemba-speaking people remain split between the DRC and Zambia.

Figure 1: Africa's national boundaries and population density



Source: Landscan (2007).

These resulting arbitrary political borders impose very real food-security consequences, on both Zambia and the DRC. Cassava breeders from Zambia's research station in Solwezi (south-west of the Pedicle) have to travel 950 kilometers around the 'little foot' to reach their sister station in Mansa (north of the Pedicle) on Zambian roads. Alternatively, they can take the 430 kilometer direct route across the Pedicle via DRC's Katanga Province. This short cut, though it economises on fuel, requires transit through four border posts plus repeated negotiation of informal transit fees across the Pedicle. Either choice imposes unnecessary costs on the acutely limited recurrent research budget available for Zambia's second most important food staple.

Zambian farmers and Congolese consumers likewise pay a price. The mining towns of Katanga Province require food imports, which would most naturally come from the highly productive surplus commercial farms in northern and central Zambia. Indeed, this economic symbiosis leads many Zambians to refer to Katanga as Zambia's 'tenth province'. Even so, Zambia's commercial farmers and millers cannot ship truckloads of maize to the DRC without formal export permits, which the Zambian government strictly controls. Zambian regulations do, nonetheless, allow individual bags to cross the border for personal consumption (Zambia, 1966). Although this raises transportation and handling costs, bike loads and head loads of maize regularly cross the border. As a result, shipping containers and warehouses dot the landscape near Zambia's Kasumbalesa border station, on the south side of the Pedicle, fuelling an active informal cross-border trade. The high transaction costs and risk premiums associated with this clandestine trade result in lower prices for Zambian farmers and higher prices for Congolese consumers in Katanga Province (Govereh et al., 2008). This border, like many others in Africa, imposes an artificial barrier to agricultural growth and food security in a potentially high surplus region of Africa.

2.2 The Gambia

A tiny incision into the heart of Senegal, the Gambia stretches inland for about 320 kilometers. For most of this distance, it runs due east along an undulating strip of land twenty kilometers wide straddling both banks of the Gambia River (see Figure 1, b). With under two million people, the Gambia remains one of Africa's smallest countries. Senegal, with eight times the population and twenty times the land area, surrounds it on three sides.

The origins of these peculiar borders centre on the river. Many Gambians claim that colonial negotiators defined their border based on the artillery range controlled by river gunboats firing standard British naval cannons. This common belief, though possibly apocryphal, highlights the Gambia's twin links – to the river and to colonial partition (Gailey, 1965).

Historically, the Gambia River served as an important trading route linking the interior regions of what are now Senegal, Mali, Mauritania and Guinea to the West African coast. Starting in the mid-1800s, the emergence of large-scale groundnut exports fuelled long-distance regional migration from the interior to supply labour for cultivating groundnuts along the Gambia River (Swindell, 1980). As a result of these trading and migratory links, Senegal and the Gambia share common ethnic communities and similar agricultural economies. The 1889 Paris Convention between Britain and France formally partitioned the

basin into two separate political entities, excising the main Gambia River transport artery from its natural hinterland in Senegal, Mali and Guinea.

Today, this long, arbitrary border affects agricultural trade in several key ways. Different currencies, trade regimes and agricultural policies routinely lead to commodity price differentials and hence to widespread smuggling along the highly permeable but poorly serviced Gambia-Senegal border. Given generally lower import tariffs in the Gambia during the early independence years, about 10% of Gambian imports ended up informally re-exported to Senegal (Robson, 1965). During this period, when the Gambia indirectly taxed groundnut producers by paying low procurement prices, many Gambian farmers exported their groundnuts via Senegal (Sallah, 1990). Later, in the 1990s, higher cash payments in the Gambia caused Senegalese farmers to supply about 20% of Gambia's groundnut exports (Richmond, 1993). In regional cereal markets, Senegalese traders set up periodic wholesale markets that serve domestic as well as Gambian traders (Perry, 2000).

As commodities and people move around and across national borders, they incur transit and transaction costs. Denied cheap water transport inland along the Gambia River, Senegal operates a railroad from Dakar to Bamako, roughly paralleling the river and substantially raising transport costs to the interior (Reader, 1999; Hance, 1975). Senegal likewise faces logistical difficulties linking its northern and southern regions with communications, power and transport infrastructure. Travel between Dakar, in northern Senegal, and Ziguinchor, in the south, takes 12 hours when circumventing the Gambia, by ferry along the Atlantic coast or by road around the far eastern tip of the Gambia. The more direct route, across the Trans-Gambia highway, involves only half the road distance but requires 8 hours including transit of four border posts and a ferry crossing. Indeed, slow access to the Casamance region in southern Senegal has proved a routine source of friction between the Gambia and Senegal, particularly during intermittent periods of secessionist militancy in southern Senegal (Sallah, 1990).

Small size hampers agricultural research in the Gambia. With only two agricultural scientists trained to the Ph.D. level, Gambia's National Agricultural Research Institute (NARI) cannot staff a full range of specialist positions in plant breeding, molecular biology, agronomy, entymology and agricultural engineering. Nor can it pursue a full range of strategic, applied and adaptive research. Instead, the Gambia's research system largely confines its efforts to adaptive breeding of improved germplasm supplied by regional research networks (Ceesay, 2008; Stads and Manneh, 2010). The Gambia is not alone. According to a recent review of agricultural development worldwide, 'Many developing countries may be too small to achieve efficient scale in agricultural R&D, except in adaptive research.' (World Bank, 2008b:170).

2.3 Northern Mozambique

Northern Mozambique resembles a giant pincer holding Malawi firmly in its grasp (see Figure 1, c). This unusual geographical configuration emerged as the outcome of territorial struggles between the British, who dreamed of an African empire running north-to-south from Cairo to the Cape of Good Hope, and the Portuguese, who attempted to cleave an east-west transcontinental claim to counter them. As early as the 1500s, Portugal had established trading stations along Africa's east and west coasts. Using these as springboards, the first Portuguese expeditions reached the central African interior near

Katanga in the early 1800s, coming west from their Mozambican post on the Zambezi River at Tete and east from Angola, laying the basis for Portugal's claim to a broad swath of central Africa connecting Angola and Mozambique. But Portugal proved too weak militarily to defend its vast interior claims. In 1890, Britain breached a 500-year-old treaty of alliance with Portugal to impose an ultimatum instituting British rule in the disputed interior region and forcing the withdrawal of Portuguese troops, a national humiliation which led to the fall of the Portuguese government (Clarence-Smith, 1985). The resulting Treaty of London ratified British control over what is now Zimbabwe, Malawi and Zambia but also Portugal's long-standing westward incursion into what is now Tete Province, the western half of the Mozambican vice grip cradling Malawi.

The food-security consequences of this geographical pincer in northern Mozambique illustrate the agricultural disincentives created by colonial borders as well as the limitations of an individual-country focus for ensuring food security. Northern Mozambique, with plentiful fertile land and less than 30 people per square kilometer, produces reliable surpluses of both maize and cassava, as well as an impressive array of cash crops, including tobacco, cotton, sesame and cashews. In contrast, Southern Mozambique remains regularly food-deficit. Despite reliable surpluses in northern Mozambique, and chronic deficits in the south, maize does not flow in appreciable volumes from northern to southern Mozambique. Transporting maize over 1,500 kilometers on poor roads between northern Mozambique and Maputo costs about $100 per ton. In contrast, purchases by rail from South Africa travel only 250 kilometers, with transport costs under $20 per ton (World Bank, 2008a: 4). No wonder Maputo and other large cities in the south find it cheaper and faster to source maize from South Africa. Given its gangly geography, a country-based approach to ensuring food security makes little sense in Mozambique.

Food-surplus northern Mozambique envelops the southern half of intermittently food-deficit Malawi, where 130 people per square kilometer crowd together on land holdings averaging one hectare per household. For this reason, Malawian maize buyers circulate regularly throughout northern Mozambique. During deficit years, such as 2002-3, regional imports account for as much as 25% of Malawian maize consumption (World Bank, 2008a: 13). Yet, the long intrusive Malawian border into northern Mozambique raises transaction costs significantly, given poor roads, phytosanitary controls and tight restrictions on maize marketing in Malawi. During 2008, when Malawi's maize price spiked well above those in surrounding countries, Malawian authorities banned private maize trade, effectively barring formal maize imports (Minot, 2010a). To circumvent border controls, traders frequently carry bag loads of maize across the border from northern Mozambique and southern Tanzania into Malawi on bicycles and by canoe, raising transport and handling costs by about 25% (Whiteside, 2003: 33). If farmers are to expand food-production capacity in northern Mozambique, one of Africa's potential bread-basket regions, they will require incentives to invest, including low-cost, reliable access to cross-border deficit markets.

2.4 Republic of South Africa

South Africa resembles a sturdy shoe heel at the southern tip of Africa, with two large holes where the Kingdoms of Lesotho and Swaziland lie (see Figure 1, d). Historically, three groups have actively contested this exceptionally rich piece of African real estate – white

settler farmers of Dutch and French Huguenot extraction, known as the Boers; British trading and mining interests; and an array of African kingdoms, most notably the Zulus. Over time, Boer farmers moved inland to evade British control in the coastal provinces. By the early 1850s, they had established two landlocked Boer republics in the Transvaal and Orange Free State. But British miners pursued them into the interior following the discovery of diamonds along the Transvaal border and gold squarely inside the Boer republic. The most famous immigrant miner, Cecil Rhodes, made his first fortune in the diamond mines of Kimberly, founding the De Beers Mining Company in 1880. Subsequently, his British South Africa Company (BSAC) received a charter from Queen Victoria to exploit mineral concessions, negotiate treaties and administer the vast area between the Limpopo River and the African great lakes on behalf of the British Crown. After defeating a British army sent to subdue them, during the first Boer War of 1880-81, the Boer government of the Transvaal built a railroad east from Pretoria to Portuguese-controlled Delagoa Bay, the site of modern-day Maputo, in order to secure an alternate outlet to the sea and with it independence from the British-controlled ports at Durban and Cape Town (*Encyclopædia Britannica*, 2010). The British responded with overwhelming military force to win the second Boer War, of 1899-1902, and force a merger of the two British coastal provinces and the two Boer republics to form the Union of South Africa in 1910. To advance their mining interests, the BSAC punched rail lines steadily north, through the British protectorate of Bechuanaland and on to Southern and Northern Rhodesia, reaching what is now the Zambian copperbelt in 1908. By 1910, the Belgian mining company running Katanga's concession completed a rail spur linking the capital of Katanga Province to Cape Town by rail (Katzenellenbogen, 1973).

This forced merger of mining and farming interests makes the Republic of South Africa a powerful platform today for improving African food security. Its modern transport infrastructure and vast wealth, generating 25% of Africa's GDP, are founded on mining (World Bank, 2010b). Its settler farmers have developed the most highly productive maize farming in Africa, producing regular surpluses, stored in modern silos along rail lines with good links to South African ports. During the apartheid era, economic sanctions limited South African trade and investment elsewhere in Africa. Since the advent of majority rule and the removal of economic sanctions in 1994, South African investors have moved rapidly to invest in supermarkets, feed companies, fertiliser production and distribution, sugar processing, brewing and other agribusinesses throughout Africa (Weatherspoon and Reardon, 2003). Equally important from a food-security perspective, the newly elected African National Congress (ANC) government liberalised domestic maize markets in 1996, triggering a rapid transformation of farmer co-operatives into large regional grain marketing companies. By 1999, the South African Futures Exchange (SAFEX) had added an Agricultural Markets Division trading maize, soya and wheat in spot market, futures and options contracts (World Bank, 2008a). As a result, South Africa's large maize surpluses, its modern storage capacity, good trading infrastructure and transparent, well-publicised SAFEX price now link South African grain traders north to Botswana, Namibia, Zimbabwe, Zambia and Katanga, east to Maputo and, via Durban, to all of coastal Africa. South Africa, home to the continent's largest bread-basket, has become the lender of first resort to a wide network of intermittently maize-deficit African countries.

3 Centrifugal forces

The European imperial powers clearly initiated the partition of Africa. But they do not bear sole responsibility for Africa's fractured political landscape.

African leaders have contributed to this political fragmentation. The Barotse and Tswana kings approached the British to request separate protectorate status for their kingdoms (Touval, 1966; Parsons, 1998). The Mali Federation lasted only three months as an independent state, when Senegal withdrew in August 1960 (Kurtz, 1970). At the request of the Mossi king, who sent two sons and 10,000 soldiers to fight for the French during World War II, France carved out Upper Volta (now Burkina Faso) from portions of Côte d'Ivoire, Mali and Niger (Ginio, 2006). Malawian and Zambian leaders opted out of the Central African Federation after a decade of political union, leaving Southern Rhodesia (now Zimbabwe) on its own (Hanna, 1965). Indeed, Africanist scholars generally conclude that African leaders frequently played an active role in the framing of Africa's current political borders (see, for example, Touval, 1966; Griffiths, 1986; Herbst, 1996).

Donors, in turn, largely reinforce this splintered political landscape. By default, bilateral diplomatic conventions favour country-to-country aid programmes. International law vests political sovereignty with national governments. So donors wishing to reward specific countries or influence United Nations votes deploy aid as one of several available instruments of international statecraft. For these reasons, aid professionals face diplomatic pressure from their own foreign ministries to align assistance programmes with individual countries. The Paris Declaration on Aid Effectiveness, endorsed in March 2005, commits donors to align aid programmes with recipient, rather than donor, priorities. Given the composition of signatories, which included 54 developing countries but no regional economic communities, the Declaration referred to aid recipients as 'partner countries' (OECD, 2005). As a result, most donor programmes developed in response to the l'Aquila commitments focus on 'priority countries', 'country-owned strategies' and 'country-led' processes (Collier, 2009; FAO, 2009; Delgado et al., 2010; USAID, 2010).

Donor funding for agriculture, consequently, remains heavily concentrated in individual country programmes, leaving little support for regional activities. Among bilateral donors, the United Kingdom's Department for International Development (DfID) allocates a relatively high percentage of its African agricultural funding to regional activities, directing 30% to regional programmes compared with 70% for country-focused agricultural projects.[1] In contrast, recent US government aid for African agriculture has designated less than 10% for regional activities (Taylor and Shiferaw, 2009; Shiferaw, 2010). Although some US agencies, such as the Agency for International Development (USAID), allocate a higher share for regional agricultural programmes, others such as the Millennium Challenge Corporation (MCC) provide no support for regional activities, focusing instead solely on country-specific programmes.

1. These figures summarise DfID aid flows to African agriculture and livestock over seven years, from 2002-3 to 2008/9. Calculations are based on detailed breakdowns supplied by DfID's statistics department. Inclusion of forestry, fishing and rural development – along with agriculture and livestock – lowers DfID's regional agricultural aid share to 18% and raises country-specific allocations to 82%.

Among multilateral donors and foundations, support for regional agricultural programmes in Africa ranges from 20% of recent funding by the Alliance for a Green Revolution in Africa (AGRA)[2] to zero by the new Global Agriculture and Food Security Program (GAFSP) (G-20, 2010; GAFSP, 2012).

Focusing on the problem of Africa's landlocked countries, Paul Collier concludes that the 'massive move among the donor community toward this so-called "country ownership" … is a big mistake'. As he explains, 'If so much aid goes to Uganda, which Uganda controls, and so much aid goes to Kenya, which Kenya controls, then Kenya will underspend on the transport that Uganda needs … . What is needed instead is to take a slice of aid to Uganda and Kenya before the governments of Uganda and Kenya get any of it and assign that to a transport corridor.' (Collier, 2009:35).

The political splintering of Africa – fostered by the colonial scramble, furthered by African leaders and facilitated by many donors – poses serious obstacles to achieving food security. Diseconomies of scale result when a constellation of separate small countries has to administer, equip and staff individual national research and agricultural education systems (Table 1). Potential technology spillovers are dissipated when multiple small countries partition common agro-ecological zones into individual silos within which each must invest in new technology development and from which differing varietal testing requirements, foundation seed regulations and phytosanitary controls limit transmission of agricultural breakthroughs (Table 2). Moreover, Africa's political borders frequently separate major deficit markets from the surplus zones best positioned to supply them (Figure 2). The resulting high transaction costs and poor perimeter infrastructure restrict trade flows and reduce farmer incentives to expand food production in bread-basket regions, as the examples above from Katanga and northern Mozambique illustrate.

Table 1: Dimensions of Africa's small-country problem

	% of Africa's 54 countries
Population	
under 5 million	35
under 10 million	49
Landlocked	27
Electricity generation less than 200 megawatts	39
Fertiliser consumption under 25,000 tons	46

Sources: Gregory and Bumb (2006); World Bank (2008b, 2010a, 2010b).

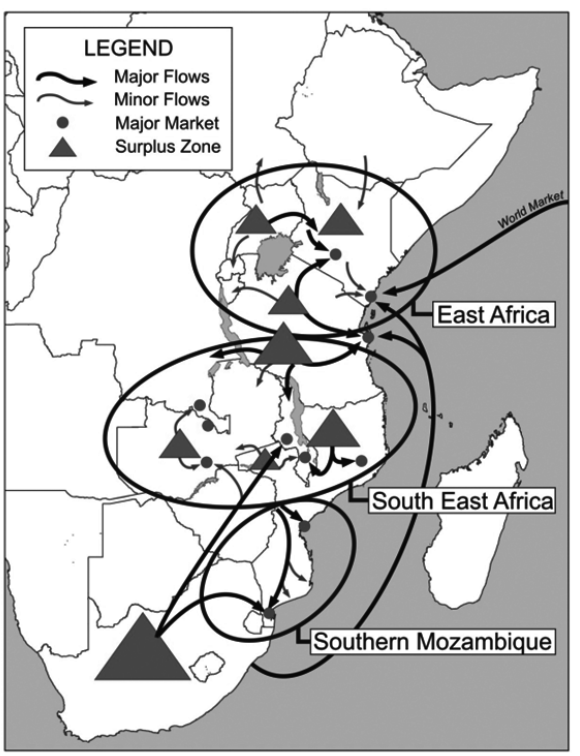
2. In 2008, AGRA spent 60% of its $45 million portfolio on country-specific agricultural programs in Africa (AGRA, 2009a). The following year, in 2009, AGRA allocated 87% of its $150 m. budget to country-specific programmes, leaving 13% for regional programmes (AGRA, 2009b). Summing these budget allocations results in an 80% allocation for country-specific agricultural programmes and 20% for regional efforts over this period.

Table 2: Political partitioning of African agro-ecological zones

Farming System Zones	Number of countries included, by region					Total
	West Africa	East Africa	Southern Africa	Central Africa	North Africa	
Root crop	10	3	2	2	0	17
Cereal-root crop mixed	12	2	3	5	0	22
Maize mixed	0	4	5	1	0	10
Millet, sorghum, ago-pastoral	7	2	4	1	0	14
Highland	0	5	0	0	0	5

Sources: Computed from Dixon et al. (2001).

Figure 2. Maize market sheds in Eastern and Southern Africa



Source: Govereh et al., 2008.

4 Regional counterweights

4.1 Cross-border agricultural trade

Regional trade and collaboration in agricultural sciences offer prospects for overcoming these costly centrifugal forces. Regional trade in food staples and farm inputs stimulates farmer incentives in bread-basket zones and moderates consumer prices in cross-border deficit markets. Yet poor infrastructure and a high density of border controls contribute to exceptionally high transport costs in Africa, roughly four times higher per ton/kilometer than in other developing regions (World Bank, 2010a: 5). These high transaction costs, in turn, reduce farm-gate prices, raise input costs and increase consumer prices in cross-border markets. Despite widespread smuggling, border-induced transaction costs disrupt market integration (Aker et al., 2010). Africa-wide simulations suggest that improved maize productivity, when coupled with improved transport and regional trade, results in 25% higher farmer income and lower consumer prices than when the same new technology is introduced into the current, high transactions-cost marketing system (Diao et al., 2008). Regional trade also helps to lower costs in farm input markets by reducing transaction costs and enabling economies of scale in procurement and distribution. Economies attainable from bulk fertiliser imports, regional logistics platforms and intra-Africa regional trade can reduce farm-level prices of imported fertiliser by as much as 30% to 50% (Gregory and Bumb, 2006; Morris et al., 2007; Bumb, 2010).

Table 3: Bread-basket zones supplying cross-border markets

Surplus food production zones	Cross-border markets they serve
southern Mali and Burkina Faso *(millet, sorghum)*	Mauritania, Niger, northern Mali, Burkina Faso, Ghana, Côte d'Ivoire
Burkina Faso *(cowpea)*	Mali, Ghana, Côte d'Ivoire, Togo
northern Niger, Burkina Faso, Mali and Mauritania *(livestock)*	coastal West African markets, from Senegal to Nigeria
northern Nigeria *(millet, sorghum, cowpea)*	Niger, Chad, northern Benin
Somalia, Ethiopian lowlands *(livestock)*	Ethiopian and Kenyan highlands, Gulf States
southern Sudan *(livestock)*	Uganda, DRC, Kenya, northern Sudan
Uganda *(maize, beans)*	central Kenya, southern Sudan, Rwanda

Sources: RATES (2003); Awuor (2007); World Bank (2008a); FEWSNET (2010a).

Predictable trade and pricing policies are particularly important, because Africa's political borders separate many of the continent's major bread-basket zones from the deficit markets they would most naturally serve (Table 3). The resulting national political pressure to control food supplies in times of uncertainty has led to a spate of domestic controls and export bans on key food staples (RATES, 2003; Chapoto and Jayne, 2010; Minot, 2010b). These marketing controls, and the uncertainty they engender, in turn diminish incentives for

the on-farm and trader investments necessary to boost productive capacity in Africa's high-potential agricultural zones. After Malawian authorities unexpectedly released government maize stocks early in the harvest season of 2003, maize prices collapsed, inflicting losses on farmers in northern Mozambique (Tschirley et al., 2006; Whiteside, 2003). In response, many shifted away from maize in the next season to produce tobacco and cotton for export. More generally, cross-country comparisons suggest that countries adopting predictable, open-border trade policies experience less food-price volatility and faster growth in cereal production (Chapoto and Jayne, 2010).

4.2 Technology spillovers

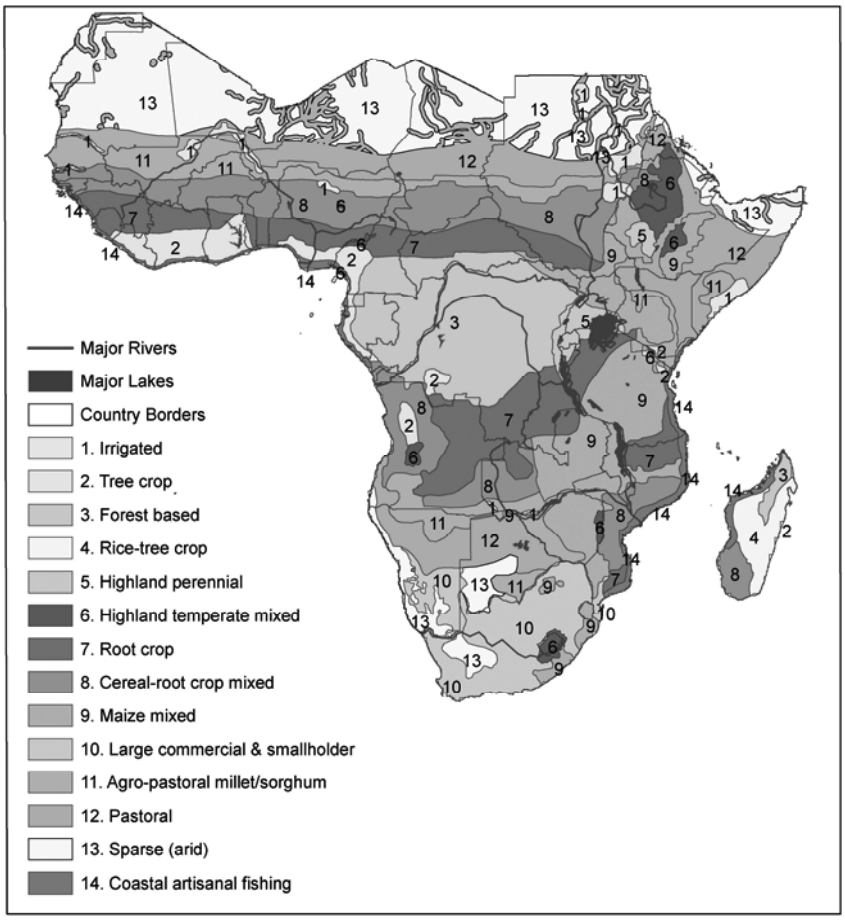
Regional research programmes amplify productivity gains by facilitating cross-country technology spillovers. As a rule of thumb, international research suggests that technology spillovers can roughly double the impact of agricultural research investments (Alston, 2002). In Africa, where multiple small countries partition common agro-ecological zones, the potential for cross-country spillovers looms even larger (Figure 3). West Africa's millet belt crosses seven countries while its coastal rootcrop zone crosses ten (Table 2). Studies from East Africa estimate that potential cross-border income spillovers from agricultural research range from 25% to over 150% depending on the commodity (Abdulai et al., 2006).

Agricultural pests and diseases, likewise, move readily across borders. Livestock diseases – such as trypanosomiasis, rinderpest and foot and mouth disease – cross international borders along with infected wildlife and domesticated animals. Hence effective responses require regionally co-ordinated research and control programmes (Gerard, 1996; Scott, 1996). Plant pests and diseases cross borders with similar ease. The wind-borne cassava mealybug moved rapidly across the entire breadth of Africa's cassava belt during the 1970s and 1980s, reducing yields of the continent's second most important food staple by up to 80% (Norgaard, 1988). Because pests and diseases so powerfully affect agricultural productivity, and because disease-carrying insects, viruses, bacteria and fungi move easily across borders, effective efforts to raise and sustain farm productivity in Africa will require ongoing regional collaboration.

Regional common resources similarly require collective management. Africa encompasses over 60 trans-boundary river basins as well as seven great lakes bordering two to four countries each (World Bank, 2010a). To effectively ensure the long-term productivity of these shared water and fish resources requires regional governance systems.

Economies of scale offer prospects for significant efficiency gains through regional agricultural research. Under regionally co-ordinated agricultural research and education networks, the sharing of genetic material, standardised certification protocols and investments in specialised staffing and equipment all become possible (Byerlee and Traxler, 2001; Maredia et al., 2004; World Bank, 2008b; Beintema and Stads, 2011). For Africa's many small countries, 'Very often, the only viable – and efficient – solution is regional collaboration.' (Beintema and Stads , 2011:28).

Figure 3: Farming system zones in Sub-Saharan Africa



Source: Dixon et al. (2001). Shape file data downloaded from: http://www.fao.org/geonetwork/srv/en /metadata. Design layout by Steve Longabaugh.

4.3 Regional economic integration

Outside of agriculture, economies of scale beckon as well. More than twenty African countries consume less than 200 megawatts of electricity, far below the minimum efficient scale for power generation (Table 1). As a result, they generate electricity using small-scale diesel generators at double the cost of larger hydro-electric and coal-fired generating systems. Regional power pools, with large-scale generators, international transmission lines and tariff agreements offer prospects for halving electricity costs across much of sub-Saharan Africa (World Bank, 2010a). Similar economies of scale emerge in banking, insurance, transport, communications, petroleum refining, manufacturing, agro-processing, and fertiliser distribution (Morris et al., 2007; World Bank, 2009; Kojima et al., 2010;

Bumb et al., 2011). As Sudanese billionaire Mo Ibrahim said in November 2009, 'Who are we to think that we can have 53 tiny little countries and be ready to compete with China, India, Europe, the Americans? It is a fallacy… We need scale and we need that now.' (*Independent* of London, 2009; Onyango-Obbo, 2010).

Europe resolved a similar small-country problem through economic integration. With the Treaty of Rome, in 1957, Europeans acknowledged that they could not compete in world markets as individual small states. Over the ensuing fifty years, they introduced a customs union, a common external tariff and ultimately opted for full economic integration, permitting unrestricted regional mobility of labour, capital and commodities. Ironically, this transition from a nationalist to a regionalist governance model was begun in the same year as Ghanaian independence launched a wave of European-inspired nation-states[3] in Africa (Asiwaju, 2005). Following the end of the Cold War, Europe has increasingly facilitated moves towards regional autonomy within nation-states along with expanded transnational economic integration, eroding the primacy of the nation-state from above and from below (Keller and Rothchild, 1996; Nicol and Townsend-Gault, 2005). Europe has adopted a pan-European solution to its self-inflicted small-country problem. Africa aspires to a similar transition.

Indeed, African leaders have pledged to seek full economic integration across the continent. With the creation of the African Union (AU) in 2002, they established the political apparatus for implementing a gradual transition to a continental customs union, beginning with the formation of regional economic communities (RECs)[4] and using these as designated building blocks (Mbeki, 2002; McGroarty, 2011).

4.4 Performance of Africa's regional organisations

Both advocates and sceptics correctly note that many of Africa's RECs face serious capacity constraints and, consequently, offer a highly mixed performance record (Bach, 1999a; IFPRI, 2005; Asante, 2007). While the East African Community (EAC) has made important gains in trade and investment liberalisation as well as regional agricultural programmes, other RECS, such as the Southern African Development Community (SADC), have performed poorly. The RECs have managed the Comprehensive African Agricultural Development Programme (CAADP) for the AU's New Partnership for African Development (NEPAD), albeit with varying degrees of success (AU/NEPAD, 2003; IFPRI, 2005; Wambo, 2009).

In general, specialist regional organisations with narrowly focused, technical mandates have performed best (Bach, 1999a; World Bank, 2010a). The nine-member regional

3. The Treaty of Westphalia, which ended Europe's Thirty Years' War in 1648, established the political right of a nation-state to exercise exclusive sovereign control within its borders. Centuries later, during its imperial expansion, Europe exported the nation-state concept around the world, where it subsequently became the cornerstone of the international political order (Blake, 2005). Recent concerns in Africa, about the fragility of politically failed nation-states, have led to increasingly open questions about alternative models of sovereignty and accountability (Deng, 1993; Gomes, 1996; Herbst, 1996; Keller and Rothchild, 1996; Ellis, 2002).
4. Africa's eight RECs include the Arab Maghreb Union (UMA), the Common Market for Eastern and Southern Africa (COMESA), the Community of Sahel-Saharan States (CEN-SAD), the East African Community (EAC), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Intergovernmental Authority on Development (IGAD) and the Southern Africa Development Community (SADC). For an overview of their structure and often overlapping membership, see IFPRI (2005), Asante (2007) and Wambo (2009).

grouping of Sahelian states, the Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS), established in response to the Sahelian drought of the early 1970s, has played an effective role in developing regional early-warning systems and harmonising regional responses to food-market pressures in the region. The Pan-African Rinderpest Campaign, launched by the OAU's Inter-African Bureau on Animal Resources (IBAR) in 1986, led ultimately to the eradication of the continent's deadliest livestock threat. A similarly broad alliance of international and African agricultural research scientists across 20 countries in Africa's cassava belt developed a successful biological control programme for countering the deadly cassava mealybug (Herren and Neuenschwander, 1991). Their identification, mass rearing and distribution of a predator wasp brought the mealybug under control, saving cassava production valued at $2.2 billion with a $15 million investment (Norgaard, 1988). Regional breeding programs for major food staples – such as maize, cassava, sorghum, bananas, cowpeas and beans – have resulted in widespread productivity gains across their respective agro-ecological zones (Manyong et al., 2000, 2003; Hassan et al., 2001; Evanson and Gollin, 2003; Nweke et al., 2002; Maredia et al., 2004; Kimani et al., 2005). Given heightened commitment to agricultural growth in Africa, two areas for regional collaboration merit special attention.

5 A two-pronged regional strategy

Recent research examining episodes of superior agricultural performance in Africa comes to the conclusion that sustained agricultural growth has historically occurred where two key conditions converge: (i) a steady stream of productivity-enhancing agricultural technology; and (ii) favourable market incentives for farmers and agribusinesses (Haggblade and Hazell, 2010). Both require regional collaboration.

5.1 Regional scientific networks

Because African agro-ecological zones spill across multiple political jurisdictions, new technology developed in one location does not automatically become available to farmers in neighbouring countries. To facilitate productivity spillovers, agricultural researchers need to collaborate early in their research process to identify strategic regional priorities, ensure timely testing of improved genetic material and harmonise technology release and foundation-seed protocols across the full range of countries straddling a given production ecology range. Strategic breeding and variety registration offer particularly significant efficiency gains from regional consolidation (Maredia et al., 2004). During the colonial era, regional programmes dominated agricultural scientific research, but these atrophied following independence, particularly in anglophone Africa (Eicher, 2009). As a result, francophone Africa has operated some of the continent's most effective regional research networks. Of the six major cotton varieties released in Mali since 1960, only one emanated from Malian research stations; the other five came from sister institutes across West and Central Africa (Tefft, 2010).

Over the past several decades – in response to the high fixed costs of modern biological research, Africa's acute small-country problem, and the need to maximise spillovers across common agro-ecological production zones – regional agricultural research programmes have gained renewed attention across Africa (Byerlee and Traxler, 2001; InterAcademy Council, 2004; Maredia et al., 2004; Montpelier Group, 2011; Beintema and

Stads, 2011). In response, Africa has established three sub-regional research organisations (SROs), the Southern African Centre for Co-operation in Agricultural Research and Training (SACCAR) established in 1984, the West and Central African Council for Agricultural Research and Development (WECARD/CORAF) founded in 1987 and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), founded in 1994 (Beintema and Stads, 2006; Elliot, 2011). In 2002, these regional agricultural research organisations founded the Forum for Agricultural Research in Africa (FARA) to provide an institutional umbrella for promoting regional agricultural research and associated national research programmes.

5.2 Regional trade corridors

Looking ahead, projections suggest that domestic food markets will provide the most rapidly growing agricultural markets in Africa over the coming decades (Diao and Hazell, 2004). Given the peculiar configuration of Africa's political borders, regional trade flows will become increasingly important for maintaining farmer incentives in high-potential zones. Regional trade in farm inputs promises similar efficiency gains in agricultural input markets.

Enabling African farmers to meet the continent's food-security needs will require puncturing the continent's dense network of political borders with a series of strategic trade and development corridors. The Presidents of South Africa and Mozambique launched the first of Africa's development corridors in 1995 to stimulate regional trade and investment-led economic growth along the Maputo Development Corridor (MDC). Linking Johannesburg and Maputo, this initiative modernised the commercial infrastructure and trade protocols first established by the Transvaal Republic to outflank the British in the 1880s. Within a decade, the MDC had attracted over $5 billion in private-sector investments (Jourdan, 1998; Söderbaum and Taylor, 2008; TransFarm Africa, 2009). Since the launching of the MDC, an array of African regional organisations, foundations and donors has undertaken three dozen corridor studies across Africa (Jourdan, 2008; Buys et al., 2010). Related investigations have examined early experience and design options likely to improve the distributional impact and spread effects of these regional corridors (Koch et al., 1998; Kepe, 2001; Söderbaum and Taylor, 2001, 2008; Kleynhans, 2007; Jourdan, 2008; TransFarm Africa, 2009). This evidence suggests that commercial viability generally requires anchoring infrastructural trunk lines at major mineral deposits. With the addition of feeder roads, land allocation for commercial farming clusters and associated communication and financial services, many natural-resource corridors can also serve to catalyse private investments in agriculture, agro-processing and trade. The studies also suggest that inclusive governance and communication systems – involving provincial, private and civil-society representation – and early attention to agricultural development objectives increase the potential for broad-based economic spillovers.

As a management tool, development corridors provide a means of co-ordinating tri-partite agreements that marry together infrastructure financing and price risk insurance[5]

5. Call options or futures contracts on the SAFEX exchange offer tools for capping import prices and guaranteeing food import quantities, thereby protecting African governments as they expand trade in politically

(funded by donors) with trade-policy reforms (by national governments) and investments in agricultural production and trade (by farmers and agribusinesses). In essence, the trade corridor strategy mimics the accidental historical model embodied in the Union of South Africa: rooting infrastructure investments at major mining sites and ports, while parallel private investments in agricultural productivity enable high-potential agricultural zones to use this infrastructure to serve regional food markets.

6 Bridging barriers to regional collaboration

6.1 Regional scientific research

Financing, not conviction, poses the primary challenge to regional agricultural programmes in Africa. African agricultural specialists recognise the importance of regional research networks for increasing technology spillovers, reducing shared specialist costs and successfully controlling agricultural pests and diseases (Beintema and Stads, 2011). Despite the formal commitment by African Heads of State to raise budget allocations for agriculture to 10% of national spending, only a handful of African governments have met this goal (Fan and Saurkar, 2008). Having failed, for the most part, to meet their internal funding targets for national agricultural programmes, few African governments feel able to expend the political capital necessary to extract additional domestic financing for regional activities.

As a result, most successful regional agricultural programmes have relied on donor funding (Byerlee and Alex, 1998; Pardey et al., 2006; Eicher, 2009). But many donors now find themselves inadvertently boxed into country programmes by the 'country-led' mantra they have adopted as short-hand for the Paris Declaration agreement to respect recipient priorities. Some donors, nonetheless, have more experience in regional agricultural programming than others. Together with regional and international researchers, they have helped to construct a series of multilateral trust funds and sub-regional organisations to provide funding conduits and governance structures for developing shared priorities, co-ordinating regional inputs and ensuring technical oversight (Beintema and Stads, 2006; Elliot, 2011). Ultimately, even donors focused on country-specific agricultural programmes will benefit by recognising that success at the country level often hinges on opening up regional markets for new seeds, farm inputs and growing surpluses from the bread-basket farming zones they are trying to promote.

6.2 Regional trade

Trade policy proves more contentious. In the face of spiking world prices, many governments in Africa and elsewhere have succumbed to short-term political pressure to close borders for food exports (Christiaensen, 2009). The pressures they face are very real and surprisingly persistent. Describing the situation in Zambia during the middle 2000s, Dorosh et al. (2009: 362) report, 'During deficit years, farmers lobby for import controls to keep prices high, over the objections of traders, consumers and millers. During surplus

sensitive food markets (Dana et al., 2006).

years, millers and consumers advocate export controls to keep domestic prices low, to the detriment of farmers.' As a result, 'government policy makers face conflicting pressures to control borders in both good harvest years and in bad.'

Over time, reciprocal trade bans weave an insidious social trap, in which the pursuit of short-run self-interest leads to long-term collective damage.[6] Policy-makers erect trade barriers in the short run to protect domestic constituencies, knowing they will impose costs on their neighbours. When those neighbours retaliate in kind, domestic farmers and consumers lose out in the long run as farmers and agribusinesses underinvest in food production and distribution. If the Republic of South Africa were to mimic the trade bans imposed by many of its neighbours or reduce the private-sector investments that enable its regular agricultural surpluses, the repercussions for African food security would prove severe. Ironically, trade barriers intended to help improve national food security in the short run often end up retarding agricultural growth and compromising national food security in the long run – and sometimes in the short run as well (Mwanaumo et al., 2005, Dorosh et al., 2009; Tschirley and Jayne, 2009; Chapoto and Jayne, 2010).

Looking ahead, newly available tools may make trade in food commodities politically feasible even during drought years when open borders matter most. Futures contracts and call options, available on the SAFEX commodity exchange in Johannesburg since 1999, now enable governments to purchase a form of price-risk insurance by setting ceiling prices and locking in import contracts and transport costs that are triggered when market prices exceed their pre-determined comfort level. Donors will probably need to finance the required insurance premiums initially to enable governments to gain experience with these contracting instruments, as the World Bank has done in Malawi (Slater and Dana, 2006). In return, African governments would need to agree to abide by regional trade agreements and retain open borders for agricultural commodities. Donor-financed trade infrastructure and price-risk insurance provide key building blocks for constructing a politically feasible pathway enabling governments to maintain open borders. Fluid trade flows, in turn, are necessary to make it economically attractive for farmers and agribusinesses to invest in Africa's many bread-basket zones.

7 Conclusion

A food-security perspective offers unambiguous responses to the two broad questions posed in the literature on African political borders. Clearly, Africa's national boundaries arbitrarily partition agro-ecological zones and natural market sheds. As a result, these inherited borders constrain agricultural growth and reduce food security by hampering technology transfer, hindering agricultural trade and dampening incentives for farmer and agribusiness investment in Africa's many regional bread-basket zones. Feasible solutions revolve around neutralising these deleterious effects through regional scientific collaboration, infrastructure investment and associated trade-policy reforms. In the agricultural sector, regional scientific networks and corridor development programmes offer modern instruments for repairing the fractures inflicted 125 years ago in Berlin.

6. I am grateful to Michael Morris for highlighting the link between trade bans and social traps.

Regional programmes offer the potential to stimulate agricultural growth far more efficiently than an isolated collection of individual country programmes, because regional platforms deliver the two fundamental pre-requisites – more productive technologies and improved market incentives – more effectively and at lower cost. If the international community wishes to improve African food security durably and efficiently, then donors, like African leaders, will need to embrace regional solutions for unscrambling Africa.

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