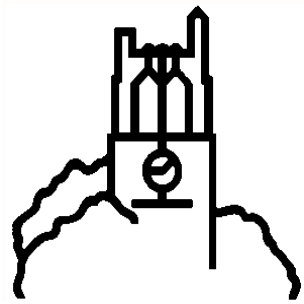
MSU International Development Working Paper

Unscrambling Africa: Regional Requirements for Achieving Food Security

by

Steven Haggblade



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UNSCRAMBLING AFRICA: REGIONAL REQUIREMENTS FOR ACHIEVING FOOD SECURITY

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EXECUTIVE SUMMARY

Africa has inherited highly arbitrary political borders that vastly complicate current efforts to accelerate agricultural growth and reduce hunger. Because Africa's inherited political borders arbitrarily partition agro-ecological zones and natural market sheds, current country 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 breadbasket zones. Feasible solutions revolve around neutralizing these deleterious effects through regional scientific networks and regional corridor development programs.

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ACRONYMS

AAMP	African Agricultural Marketing Project
AFSI	*L'Aquila Food Security Initiative*
AFTAR	The World Bank, Agricultural and Rural Development
AGRA	Alliance for a Green Revolution in Africa
ANC	African National Congress
AU	African Union
BSAC	British South Africa Company
CAADP	Comprehensive African Agricultural Development Programme
CEN-SAD	Community of Sahel-Saharan States
CFA	Congo Free State
COMESA	Common Market for Eastern and Southern Africa
DRC	Democratic Republic of Congo
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
FARA	Forum for Agricultural Research in Africa
FEWSNET	Food and Early Warning Network
GAFSP	Global Fund for Agriculture and Food Security Programs
IGAD	Intergovernmental Authority on Development
ISNAR	International Service for National Agricultural Research
MDC	Maputo Development Corridor
MSU	Michigan State University
NEPAD	New Partnership for Africa's Development
OAU	Organization of African Unity
OECD	Organization for Economic Cooperation and Development
RATES	Regional Agricultural Trade Expansion Support
RECs	Regional Economic Communities
SADC	Southern Africa Development Community
SAFEX	South African Futures Exchange
UMA	Arab Maghreb Union
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development

1. A FRACTURED INHERITANCE

Africa has inherited highly arbitrary political borders that vastly complicate current efforts to accelerate agricultural growth and reduce hunger. Consider the current map of Africa, which carves the continent into a constellation of over 50, mostly tiny countries (Figure 1). One-fourth is landlocked, while half encompass populations of under 10 million. The broad outlines of Africa's current political boundaries emerged from the Berlin Conference of 1884-85 when the European powers, with the USA in attendance, launched the scramble for Africa (Pakenham 1991). Over the hectic ensuing decades, a complex series of thrusts and counter-thrusts by European, African and Arab agents[1] 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.

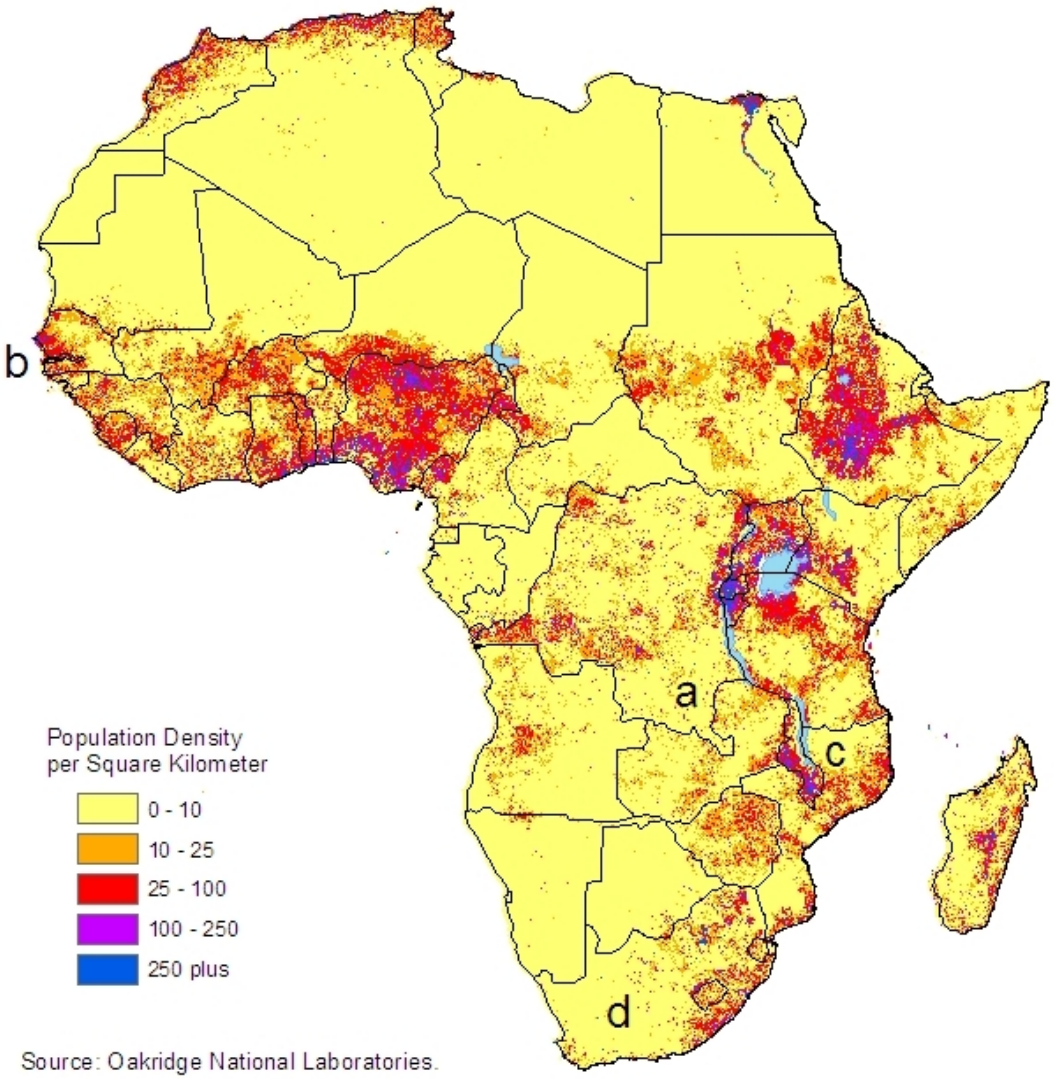
Today, efforts to reduce hunger founder in this dense thicket of inherited political boundaries. Productivity growth in agriculture remains critical, both for increasing food availability and for raising incomes and purchasing power of the majority of Africa's poor, who work primarily in agriculture. Yet new agricultural technologies spread slowly across agro-ecological zones partitioned into multiple small countries with differing languages, phytosanitary controls and seed certification processes. Equally constraining, political borders frequently separate surplus food production zones from the deficit markets they would normally 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 and bean producing zones of Uganda from deficit markets in Kenya, southern Sudan and Rwanda; food surplus northern Mozambique and southern Tanzania from intermittently deficit markets in Malawi and eastern Zambia; and livestock exporters in Mali, Mauritania, and Niger from coastal markets all across West Africa.[2] Africa's multiplicity of political borders translates into a welter of artificial impediments to trade and technology transfer that, collectively, raise costs and lower incentives for farmers in surplus zones while simultaneously reducing availability and raising consumer food prices in cross-border deficit markets.

Following the world food crisis of 2007 and 2008, agricultural growth has returned to the top of the U.S. foreign policy agenda. After two decades of neglect, when U.S. and global aid for African agriculture fell roughly in half, the G8 issued a Joint Statement on Global Food Security at their meeting in L'Aquila, Italy in July 2009, committing $20 billion over three years for agricultural development and related efforts to reduce world hunger (G8 2009). Although the l'Aquila statement explicitly recognizes the importance of "country ***and regional*** agricultural strategies" (G8 2009 paragraph 10, emphasis added), the resulting action plans formulated by the U.S. government, other donors and major foundations have emphasized "priority countries," "country-owned" plans and "country-led" processes (AGRA 2009b; USAID 2010).

If executed literally, a series of individual, country-by-country efforts led by Africa's fifty-plus tiny, convoluted geographic entities will prove, at best, painstakingly inefficient and, at worst, ineffectual. The following analysis suggests that achieving African food security effectively and efficiently will require a regional approach – to increase both agricultural productivity and trade.

[1] Lewis (1987) illustrates the complexity of the machinations and actions on the ground during the scramble.
[2] See RATES (2003), Awuor (2007), World Bank (2008a) and FEWSNET (2010).

Figure 1. Africa's National Boundaries and Population Distribution



2. FOOD SECURITY CONSEQUENCES OF CAPRICIOUS NATIONAL BOUNDARIES

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 (Figure 1a). Most modern maps refer to Katanga's southeastern protrusion as the Congo Pedicle, or "little foot."

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, Cecil 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. However, Misri refused. So Sharpe departed, persuaded that Misri would also resist overtures from King Leopold (Sharpe 1957). Indeed, Misri rebuffed the first two 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 refused Leopold's terms, Stairs hoisted the CFS flag unilaterally and sent his men to arrest King Misri. When Misri resisted, Stairs' 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 (Moloney 1893; Rotberg 1964). Twenty years later, in 1910, the Belgians combined the Congo Free State and Katanga to form the Belgian Congo, which at independence became Zaire and, later, the Democratic Republic of Congo (DRC). Ongoing boundary disputes continued until 1914 when adjudication by the King of Italy finalized the arbitrary north-south line forming the eastern boundary of the Pedicle's "little foot" (Gordon 2000). Today, because Leopold's British emissary proved more brutal than Rhodes's British emissary did, the central African copperbelt and its Bemba-speaking people remain split between the DRC and Zambia.

These arbitrary political borders impose very real food security consequences, on both Zambia and DRC. Cassava breeders from Zambia's research station in Solwezi (south-west of the Pedicle) must 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 road via DRC's Katanga Province. This short cut, though it economizes 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, commercial farms and millers cannot ship truckloads of maize to DRC without formal export permits, which the Zambian government strictly controls. Zambian regulations however, do allow individual bags to cross the border for personal consumption (Zambia 1966, CAP 421.5.2b). Although this raises transportation and handling costs, bike loads and head loads of maize regularly transit 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, fueling 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 to Congolese consumers in Katanga Province. This border, like many others in Africa, imposes an artificial barrier to agricultural growth and food security in a potentially highly prosperous region of Africa.

2.2. The Gambia

A tiny incision into the heart of Senegal, the Gambia stretches inland about 320 kilometers. For most of this distance, it runs due west along an undulating strip of land twenty kilometers wide straddling both banks of the Gambia River (Figure 1b). With fewer than two million people, 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 center on the river. Many Gambians claim that colonial negotiators defined their border based on the artillery range covered by river gunboats firing standard British naval cannons. This common belief, though possibly apocryphal, highlights 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 fueled long-distance regional labor migration from the interior to supply labor for cultivating groundnuts along the Gambia River (Swindell 1980, 1985). As a result of these trading and migratory links, Senegal and 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 Gambia, about 10% of Gambian imports end up informally re-exported to Senegal (Robson 1965). In the early independence years, when Gambia indirectly taxed groundnut producers by paying low procurement prices, many Gambian farmers exported their groundnuts via Senegal (Sallah 1990). Later, in the 1990's, higher cash payments in 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 (Martin 1990; 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 logistic difficulties linking its northern and southern regions with communications, power, and transport infrastructure. Travel between Dakar, in northern Senegal, and Ziguinchor, in the South, requires 12 hours when circumventing the Gambia, by ferry along the Atlantic coast or by road around the far eastern tip of Gambia. The more direct route, across the Trans-Gambia highway, covers only half the road distance but requires 8 hours including transit of four border posts, a ferry crossing, and 20 kilometers of potholed roads while driving with wrong-side steering. Indeed, slow access to the Casamance region in southern Senegal has proven a routine source of friction between Gambia and Senegal, particularly during intermittent periods of secessionist militancy in southern Senegal (Sallah 1990).

Small size hampers agricultural research in Gambia. With only a handful of trained agricultural scientists and an agricultural research budget under $300,000 per year, Gambia cannot fully staff core plant breeding, agronomic and pest management functions. Instead, Gambia's research system largely confines its efforts to adaptive breeding of improved germplasm supplied by regional research networks (Ceesay 2008). Gambia is not alone. Forty percent of agricultural research systems in Africa employ less than five full-time equivalent researchers (Beintema and Stads 2006).

2.3. Northern Mozambique

Northern Mozambique resembles a giant pincer holding Malawi firmly in its grasp (Figure 1c). This unusual geographic 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 1500's, 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 east from their Mozambican post on the Zambezi River at Tete and west from Angola, laying the basis for Portugal's claim to a broad swath of central Africa connecting Angola and Mozambique. However, 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 that led to the fall of the Portuguese government (Hammond 1966; Clarence-Smith 1985). The resulting Treaty of London ratified British control over what are 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 geographic 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 maize surpluses in northern Mozambique, and chronic maize deficits in the south, maize does not flow in appreciable volumes from northern to southern Mozambique. Transporting maize over 1,500 kilometers between northern Mozambique and Maputo over spotty roads 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 2008b). 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 2002/03, regional imports account for as much as 25% of Malawian maize consumption (World Bank 2008b). 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). To maintain farmer incentives in northern Mozambique, one of Africa's potential breadbasket regions, will require 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 now lie (Figure 1d). 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 various African kingdoms, most notably the Zulus. Over time, the Boer famers moved inland to evade British control in the coastal provinces. By the early 1850's, they had established two landlocked Boer republics in the Transvaal and Orange Free State. However, 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 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 sovereign. 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 ensure independence from the British-controlled ports of 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 provinces and 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 the 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, today, a potentially powerful platform 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 that are 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, in 1994, South African investors have moved rapidly to invest in supermarkets, feed companies, fertilizer 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 liberalized domestic maize markets in 1996, triggering a rapid transformation of farmer cooperatives 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 2008b). As a result, South Africa's large maize surpluses, its modern storage capacity, good trading infrastructure and transparent, well-publicized SAFEX prices 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, the continent's largest breadbasket, has become the lender of first resort to a wide network of chronically and intermittently maize-deficit African countries.

3. CENTRIFUGAL FORCES

European imperial powers clearly initiated the partition of Africa. However, 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).

Donors, in turn, largely reinforce this splintered political landscape. By default, bilateral diplomatic conventions favor country-to-country aid programs. International law vests political legitimacy with national governments. Therefore, 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 programs with individual countries.[3] Indeed, in recent years U.S. government aid for African agriculture has allocated over 90% for country-specific programs and less than 10% for regional activities (Taylor and Shiferaw 2009; Shiferaw 2010). Similarly, over the past two years, the Alliance for a Green Revolution in Africa (AGRA) allocated 80% of total resources for country-specific programs and 20% for regional efforts.[4] Following this same general tendency, the new Global Fund for Agriculture and Food Security Programs (GAFSP), established by the G8 in response to the world food crisis of 2008, has allocated 100% of its initial 2010 allocations for country-specific agricultural programs and none for regional activities (G20 2010).

The political splintering of Africa – fostered by the colonial scramble, furthered by African leaders, and facilitated by donors – poses serious obstacles to achieving food security. The high transaction costs that result among multiple small countries with differing administrations and poor perimeter infrastructure restrict trade flows and reduce farmer incentives to expand food production in breadbasket regions. Diseconomies of scale result when a constellation of separate, small countries must administer, equip, and staff individual national research and agricultural education systems. Potential technology spillovers dissipate 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 languages, phytosanitary, and seed certification protocols limit transmission of agricultural breakthroughs.

[3] The Paris Declaration on Aid Effectiveness, endorsed in March 2005, commits donors to align aid programs with recipient, rather than donor, priorities. Given the composition of signatories, which included 54 developing countries but no regional economic communities, the Paris Declaration referred to aid recipients as "partner countries". This, in turn, led to language advocating support for "partner country strategies" and "partner country priorities" (OECD 2005). As a result, most donor programs developed in response to the l'Aquila commitments focus on "priority countries", "country-owned" strategies and "country-led" processes. New funding for agriculture, consequently, remains heavily concentrated in individual country programs, leaving very little support for regional activities.

[4] 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 budget to country-specific programs, leaving 13% for regional programs (AGRA 2009b). Summing these budget allocations over both years results in an 80% allocation for country-specific agricultural programs and 20% for regional efforts.

4. REGIONAL COUNTERWEIGHTS

Regional collaboration in agricultural science and trade offers prospects for overcoming these costly centrifugal forces. Regional trade in food staples stimulates farmer incentives in breadbasket 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). These high transaction costs, in turn, reduce farm-gate prices. 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 under the current, high-transactions-cost marketing system (Diao, Headey, and Johnson 2008).

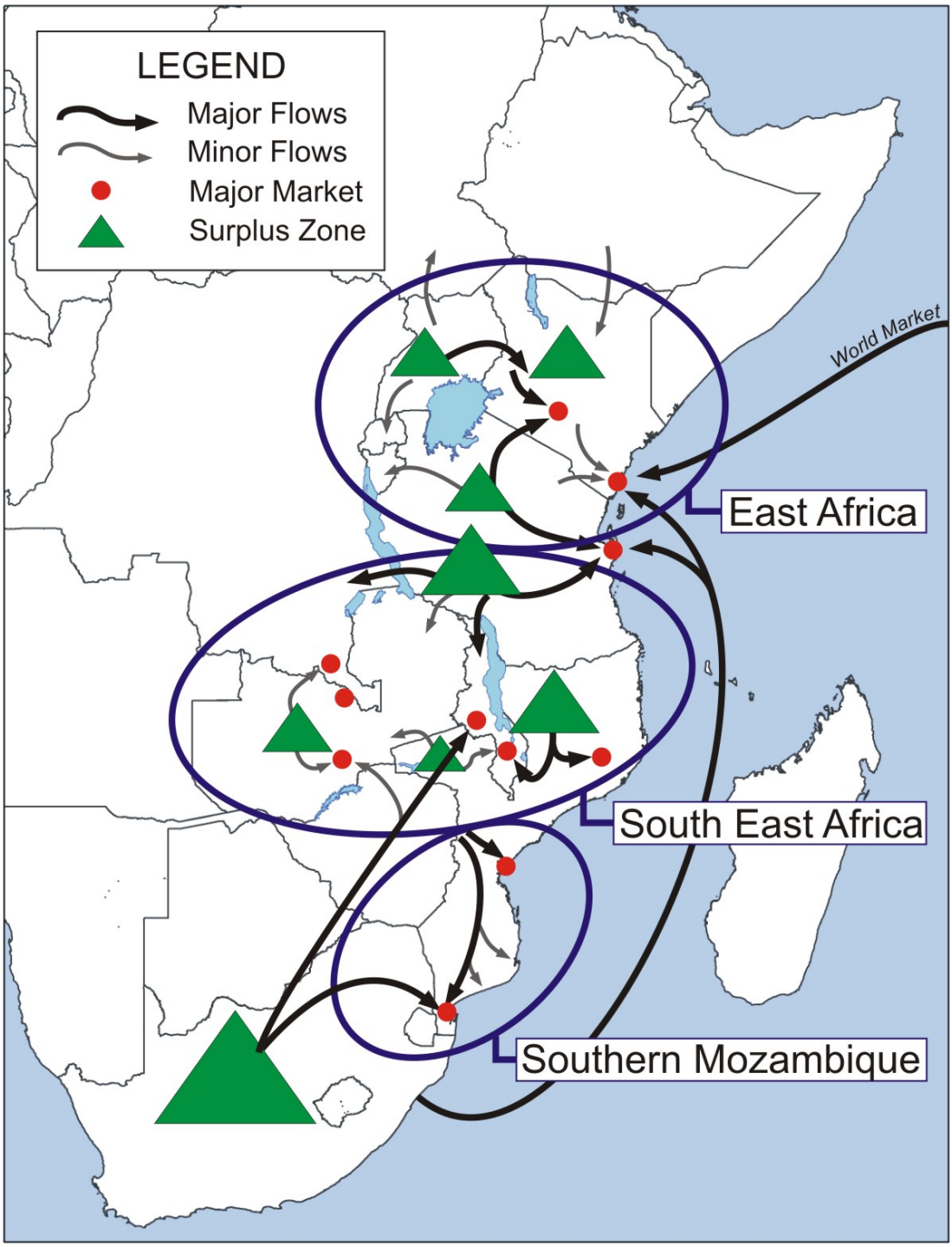
Predictable trade and pricing policies are equally important. Because of highly arbitrary political borders, many of Africa's major breadbasket zones lay across international borders from the deficit markets they would most naturally serve (Table 1, Figure 2). As a result, political pressure to control food supplies in times of uncertainty has led to a spate of export bans on key food staples (Minot 2010b). These marketing controls, and the uncertainty they engender, in turn, diminish incentives for onfarm and trader investments necessary for boosting productive capacity in these surplus zones. After Malawian authorities unexpectedly released government maize stocks early in the harvest season of 2003, maize prices collapsed, inflicting heavy losses on farmers in northern Mozambique (Tschirley et al. 2006; Whiteside 2003). The next season, in response, many shifted from maize to produce tobacco and cotton for export. Predictable policies, improved regional infrastructure, and reliable access to regional markets provide necessary incentives for farmers and agribusinesses to invest in Africa's breadbasket zones.

Table 1. Breadbasket 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, Ghana, Ivory Coast
• Burkina Faso (cowpea)	Mali, Ghana, Ivory Coast, Togo
• northern Niger, Burkina, 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
• southern Tanzania (maize)	Malawi, eastern Zambia, Democratic Republic of Congo (DRC)
• north-central Zambia (maize)	DRC, Zimbabwe
• northern Mozambique (maize, cassava)	southern Malawi, eastern Zambia, Zimbabwe
• eastern South Africa (maize)	southern Mozambique, Zimbabwe, Botswana, Namibia, Angola, Zambia, DRC (by road and rail); Tanzania, Kenya (by sea)

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

Figure 2. Maize Market Sheds in Eastern and Southern Africa



Source: Govereh et al. (2008).

Regional research programs amplify productivity gains by facilitating cross-country technology spillovers. 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, Johnson, and Diao 2006). 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-

Table 2. Political Partitioning of African Agro-Ecological Zones

	Number of African Countries Included, by Region					
Farming system zones	West	East	Southern	Central	North	Total
Root crop	10	3	2	2	0	17
Cereal-rootcrop mixed	12	2	3	5	0	22
Maize mixed	0	4	5	1	0	10
Millet, sorghum, agro-pastoral	7	2	4	1	0	14
Highland	0	5	0	0	0	5

Source: Dixon, Gulliver, and Gibbon (2001).

ecological zones, the potential for cross-country spillovers looms even larger (Table 2). Evidence from West Africa bears this out. 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).

Agricultural pests and diseases, likewise, move readily across borders. The devastating cassava mealybug, imported accidentally to Africa in the early 1970's, moved rapidly across the entire breadth of Africa's cassava belt, reducing yields of the continent's number two food staple by up to 80%. This threat triggered a decade of intensive international collaboration resulting in the successful identification, mass rearing, and release of a natural predator wasp across twenty countries in Africa's cassava belt (Herren and Neuenschwander 1991; Norgaard 1988). Livestock diseases – such trypanosomiasis, rinderpest, and foot and mouth disease – similarly transit international borders along with infected wildlife and domesticated animals. Because pests and diseases so powerfully affect agricultural productivity, and because these biotic stressors move easily across borders, effective efforts to raise and sustain farm productivity in Africa will require ongoing regional collaboration.

Regional common resources require collective management. Africa encompasses over 60 transboundary 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. In 2000, forty percent of African national agricultural research systems employed less than five full-time equivalent scientific staff, handicapping efforts to staff key specializations and achieve critical mass (Byerlee and Traxler 2001; Beintema and Stads 2006). Under regionally coordinated agricultural research and education networks, the sharing of genetic material, standardized certification protocols and investments in specialized staffing and equipment all become possible. Highly productive cotton research collaboration across francophone West Africa demonstrates the potential effectiveness of regional research networks (Fok 1997; Tefft 2010).

Outside of agriculture, economies of scale beckon as well. Over twenty African countries consume less than 200 megawatts of electricity, far below the minimum efficient scale for power generation (Table 3). As a result, they generate electricity using small-scale diesel generators at double the cost of larger hydroelectric 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 fertilizer distribution.[5] 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." (Ibrahim November 15, 2009; Onyango-Obbo 2010)

Europe resolved a similar small-country problem through economic integration. Two waves of European nation building, the consolidation of small principalities during the mid-1800's and the partitioning of Eastern Europe after World War I, resulted in a patchwork of many tiny and some large European economies. Several generations later, 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 labor, capital, and commodities. Europe has adopted a pan-European solution to its self-inflicted small-country problem. Africa requires 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 provided the political apparatus for implementing a gradual transition to a continental customs union, beginning with the formation of regional economic communities (RECs)[6] and using these as the designated building blocks (OAU 1991; OAU 2000; Mbeki 2002). The RECs have, likewise, managed the Comprehensive African Agricultural Development Programme (CAADP) process for the AU's New Partnership for African Development (NEPAD), albeit with varying degrees of success (AU/NEPAD 2003). The relative strength of staffing, financing, and leadership varies widely among the RECs, as does their overall performance in managing programs of common interest and the pace of economic integration. Given heightened commitment to agricultural growth, and given the obvious regional spillovers and complementarities required for achieving food African security, agricultural programs provide an impetus as well as a practical platform for advancing the AU's vision of African regional economic integration.

Table 3. Dimensions of Africa's Small Country Problem

	Percent of Africa's 54 countries
Population	
under 5 million	35%
under 10 million	48%
Landlocked	26%
Electricity generation less than 20 megawatts	39%
Fertilizer consumption under 25,000 tons	46%
Agricultural research systems under 5 FTEs*	40%

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

[5] See, for example, Gregory and Bumb (2006) and Kojima, Matthews, and Sexsmith (2010).

[6] 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 a good overview of their structure and often-overlapping membership, see Wambo (2009).

5. A TWO-PRONGED REGIONAL STRATEGY

Rapid agricultural growth has historically occurred in Africa where two key conditions converge: a) a steady stream of productivity-enhancing agricultural technology; and b) favorable market incentives for farmers and agribusinesses (Haggblade, Hazell, and Kisamba-Mugerwa 2010). This experience suggests that accelerating agricultural growth and improving African food security will require two broad strategic thrusts, both of which benefit from a regional approach.

5.1. Regional Research Networks

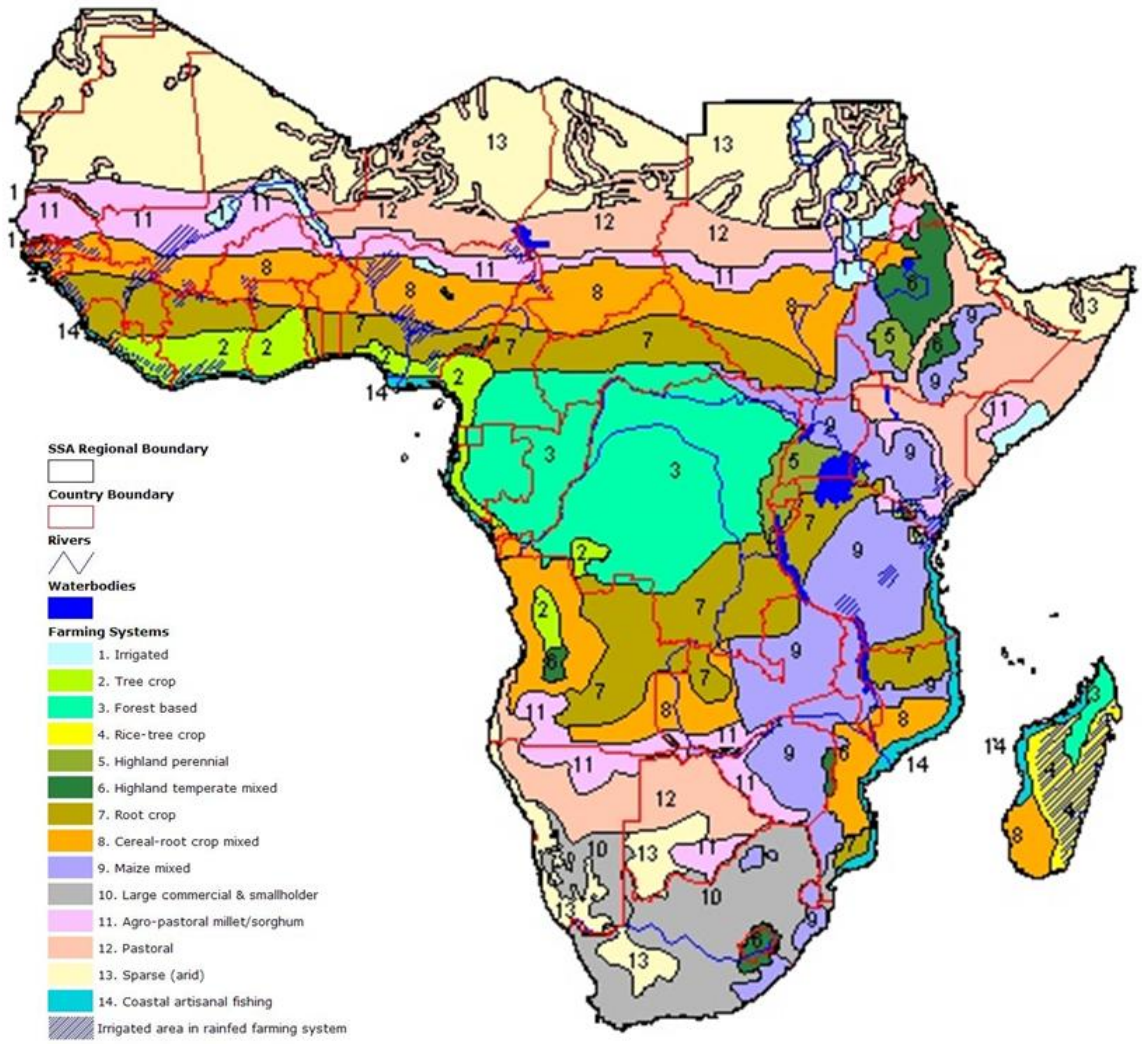
The first thrust revolves around raising agricultural productivity. Improved productivity works on the supply side of Africa's food markets by increasing food availability and lowering both food price and production cost. It works simultaneously on the demand side of food markets by increasing the purchasing power of Africa's poor, the majority of whom work primarily in agriculture. Because of its broad reach, agricultural productivity growth offers an unusually powerful lever for reducing poverty in Africa.[7]

A regional approach to agricultural technology improvement maximizes productivity spillovers, facilitates management of agricultural pests and diseases, and captures scale economies in agricultural research. Because African agro-ecological zones cut across multiple political borders, technology spillovers will not necessarily result from investments focused in any single country. West Africa illustrates this problem most clearly, with countries running largely north-south while the agro-ecological zones, which follow rainfall patterns, run mostly east-west (Figure 3). As a result, West Africa's millet belt crosses seven countries, while its coastal rootcrop zone transits ten (Table 2). To enable productivity spillovers, researchers in a given agro-ecological zone need to collaborate across countries at the start of the research process in order to ensure timely varietal testing and harmonized phytosanitary, quarantine and seed release protocols across the full range of countries transecting a given production ecology range.

Regional scientific networks and programs provide the tool for enabling agricultural productivity spillovers, and hence maximum impact from a given research investment. During the colonial era, regional programs dominated agricultural scientific research, though these atrophied following independence, particularly in Anglophone Africa (Eicher 2009). 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 maximize spillovers across common agro-ecological production zones – regional agricultural research programs have returned to prominence across Africa (InterAcademy Council 2004). Since 2002, the Forum for Agricultural Research in Africa (FARA) has provided an institutional umbrella for supporting regional agricultural research networks and their participating national programs. Geographically, regional research programs typically follow the contours of Africa's agro-ecological zones.[8]

[7] See, for example, AU/NEPAD (2003), Diao, Heady and Johnson (2008), and World Bank (2008a).
[8] The InterAcademy Council's review of Agrican agricultural science and technology refers to this recommended strategy as a "production ecological approach" (InterAcademy Council 2004, p.211).

Figure 3. Farming System Zones in Africa



Source: Dixon, Gulliver and Gibbon (2001).

5.2. Regional Trade Corridors

The second strategic thrust centers on establishing the market incentives necessary to expand regional trade in food staples. Improvements in regional transport infrastructure combined with harmonized trade policies lower transaction costs, diminish price volatility, and reduce market risk. As a result, these changes help to attract private agribusiness and onfarm investments that expand food production and enable them to link food-surplus and food-deficit zones. Because improved access to regional markets reinforces incentives for farmers and traders to invest in Africa's many breadbasket zones, these two regionally focused strategic efforts reinforce one another.

To increase regional trade in food staples will require puncturing Africa's dense network of political borders with a series of strategic 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 modernized the commercial infrastructure and trade protocols first established by the Transvaal Republic to outflank the British in the 1880's. Within a decade, the MDC had attracted over $5 billion in private sector investments (TransFarm Africa 2009). Since the launching of the MDC, an array of African regional organizations, foundations and donors has undertaken three dozen corridor studies across Africa (Jourdan 2008; Buys, Deichmann, and Wheeler 2010). To ensure commercial viability, most proposed corridors anchor infrastructural trunk lines at major mineral deposits. With the addition of feeder roads and associated densification efforts, many can potentially catalyze spillover investments in agriculture, agro-processing and trade. In essence, the trade corridor strategy mimics the inadvertent historical model embodied in the Union of South Africa: rooting infrastructure investments at major mining sites and ports, while subsequent investments in agricultural productivity enable high-potential agricultural zones to serve broad regional food markets.

From a food security perspective, effective development corridors require three key ingredients:

- improved infrastructure for regional transport, energy and communications;
- policy reforms that guarantee reliable access to cross-border markets; and
- private sector investment in onfarm production, agro-processing, storage and logistics.

Price risk insurance instruments, such as call options on the SAFEX exchange, may serve a complementary role in enabling wary African governments to open up trade in politically sensitive food markets (Slater and Dana 2006; Dana 2007). As a management tool, development corridors provide a means of marrying together infrastructure financing and price risk insurance (funded primarily by donors) with trade policy reforms (by national governments) and investments in agricultural production and trade (by farmers and agribusinesses). Geographically – unlike regional agricultural research programs – trade corridors typically cut across agro-ecological zones (Figures 2 and 3).

6. FINANCING REGIONAL PROGRAMS

Despite their potential effectiveness, regional programs pose special challenges for developing feasible financing, operational, and incentive structures (Pardey et al. 2007). Skeptics correctly note that many of Africa's regional organizations face serious capacity constraints and, consequently, offer a highly mixed performance record. But so, too, do many national agricultural programs. As a result, African leaders and the donors who support them will have to make hard-nosed assessments to identify effective partners and organizational frameworks for harnessing regional collaboration.

Financing regional agricultural programs poses a particular challenge. Despite the formal commitment by African heads of state, at the 2003 African Union summit in Maputo, 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 programs, few African governments feel inclined to expend the political capital necessary to extract still more financing for regional activities. As a result, most successful regional agricultural programs have relied on donor funding.[9]

Indeed, regional programs offer an effective vehicle through which donors can finance international public goods – such as regional infrastructure and new farm technologies applicable across broad production ecology ranges – that complement and amplify the impact of the in-country spending to which African governments have committed. In the current environment, with donor commitments at l'Aquilla many multiples of past funding for agriculture, absorptive capacity looms as a serious problem. Regional programs offer an effective, though generally neglected, means of absorbing projected rapid increases in donor spending on African agriculture.

How long can Africa count on donor support? Ideally, given the long timelines required in biological research, donors should, provide agricultural support in decennial increments. Consider the case of Africa's two most important food staples, maize and cassava, where key breakthroughs required over 25 years of active breeding (Nweke, Spencer, and Lynam 2002; Smale and Jayne 2010). In practice, donor time frames have rarely matched the decades-long staying power required to maintain upward trajectories in Africa's complex biological systems (Eicher 1999, 2009).

Given the current short-term burst of donor enthusiasm for African agriculture, inspired by the recent world food crisis, the question becomes how to avoid a sugar high. How can Africa channel a short-term infusion of resources into constructive long-term support? Regional scientific networks offer prospects for building scientific capacity, professional relationships, harmonized seed release protocols and breeding spillovers that may endure long after current donor enthusiasm wanes. Research endowments offer a vehicle for sustaining these interactions and productivity gains over time. Complementing these productivity-enhancing investments, short-term donor funding – for infrastructure that pierces African borders and for financing modern risk management tools – provides incentives for African governments to harmonize regional trade policies that, in turn, encourage private investments in agriculture and trade. If a short-term burst of donor funding helps to puncture Africa's artificial borders, then it will generate a lasting contribution to regional integration and to agricultural growth in Africa.

[9] See Byerlee and Alex (1998), Pardey et al. (2006), and Eicher (2009).

7. CONCLUSIONS

Africa's past, in the 50 years since independence, has centered on 50-plus mostly tiny nation states. Africa's future will require regional economic integration, in agriculture as well as other economic spheres. To ensure competitiveness in international markets, including cross-border markets within Africa, will require regional integration and the consequent productivity gains resulting from economies of scale in production, processing and distribution. To accelerate agricultural productivity growth and improve food security, Africa's major breadbasket regions will require access to the cross-border deficit markets they would most naturally serve. In the agricultural sector, regional scientific networks and corridor development programs offer modern instruments for repairing the fractures inflicted 125 years ago in Berlin.

Regional programs offer the potential to stimulate agricultural growth far more effectively than an isolated collection of individual country programs, because regional responses address Africa's twin structural problems – of small countries and arbitrary borders – at source. If the international community wishes to improve African food security durably and efficiently, then it must look to regional solutions for unscrambling Africa.

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