Bread and Stones

Co-investing in mining and agriculture in Africa

M.P. McHenry and G.J. Persley

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FOR FURTHER INFORMATION, CONTACT:

Dr Denis Blight AO FRSA
Chief Executive
The Crawford Fund
61 2 6188 4370
crawford@crawfordfund.org
www.crawfordfund.org
Twitter: @crawfordfund

Dr Mark P. McHenry
School of Engineering and Information Technology, and the Africa Research Group at Murdoch University, Perth, WA.
mpmchenry@gmail.com

Professor Gabrielle Persley AM
Research Director
The Crawford Fund
g.persley@doylefoundation.org

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BREAD AND STONES: CO-INVESTING IN MINING AND AGRICULTURE IN AFRICA

M.P. MCHENRY and G.J. PERSLEY

ABSTRACT

THE OPPORTUNITY

There is a resurgence of interest about Africa's 1 billion people as an emerging market, and the continent's agro-ecological land, water, labour, energy, and mineral resources. African countries are dynamic growing markets. For example, mobile phone ownership has grown from practically zero to around 50% in only a decade on a purely commercial basis. These improvements in connectivity in Africa are reaching remote towns and rural areas and are transforming lives, and there are similar opportunities for transformation of agriculture as a driver of economic development.

WHY WE FOCUS ON EXTRACTIVE INDUSTRY FOREIGN DIRECT INVESTMENT (FDI) IN AFRICA

FDI now rivals official development assistance and remittances as the single largest foreign financial inflow. Investors in the oil, gas, and minerals sector would have a comparative advantage in parallel investments in geographically proximal projects that may be vertically integrated into the extractive project supply chain and share infrastructure.

WHY WE SUGGEST TO DIVERSIFY EXTRACTIVE INVESTMENTS

Investors understand that local community relations are important for effective operation of a mine. Many mining companies are engaged in corporate social responsibility (CSR) programmes and also some small-scale procurement of local products. They also invest indirectly through improving infrastructure around mines, such as roads that often enable improved access to markets for local communities. The commonalities between extractive and any other investments include consideration of sovereign risk, seasonality (in tropical environments), labour demands, and growing commercial diversification opportunities to gain from economies of scale, vertical integration, and partnering (including off-take agreements for water, energy, commodities, and transport).

WHY DIVERSIFY INTO INVESTING IN AGRICULTURE?

As agriculture currently employs around 60% of all Sub-Saharan Africans, there is an emerging appreciation of the investment opportunity and political economy of the two major primary industries – mining and agriculture – to achieve mutual gain through economies of scale and cost-effective local service development. Recent estimates suggest that Africa has the potential to increase the value of its annual agricultural output from about $280 billion (in the late 2000s) to around $800 billion by 2030. Therefore, agriculture is a major focus of African governments and is of key political interest.

While the location of a mine is determined by geology, under certain favourable conditions the presence of a mineral resource is also accompanied by potentially productive agricultural land (soil fertility, rainfall patterns, growing seasons, etc.) for crop and livestock systems that are suitable candidates for FDI. We propose that mining and agricultural interests in specific countries work together to identify opportunities for pilot-scale investments. These examples can point the way to transformational FDI in the agricultural/agribusiness sector alongside the extractive sector in Sub-Saharan-Africa to help Africa realise its vision for inclusive economic growth and prosperity for its citizens.

1. African Extractive Industry Investment Transformation

1.1. BACKGROUND AND RATIONALE

'Bread from Stones' the 2013 Africa Australia Research Forum in Perth, Australia, was delivered through a partnership between universities, industry, government, and civil society[i]. The forum focused on mining, agriculture, and development, and sought to strengthen partnerships between mining companies and rural/agricultural communities. Discussions contributed to the understanding of how investments – particularly foreign direct investment (FDI) for agriculture and mining – can benefit from being geographically linked; and how such linkages can create mutual benefit for both sectors and assist economic transformation in the countries of Africa.

Around 70% of private capital invested in Africa is FDI and is overwhelmingly targeting minerals, oil, and gas projects. It is apparent that the same investors would have a comparative advantage in parallel investments in geographically proximal projects that may be vertically integrated into the extractive project supply chain and share infrastructure (roads, rail, ports, power, water). During due diligence assessments of investment risks and benefits of extractive projects the bulk of background information on politics, law, infrastructure, commodities, labour, supply chains, geography, climate, geology (etc.) is sought and considered for the single large investment. The authors assume the present lack of sectoral FDI diversification is related to a lack of familiarity with the growing wider opportunities in certain countries of Africa. This paper seeks to clarify some of the opportunities of cornerstone extractive projects partnering, co-locating, or developing parallel investments with the agricultural sector as a risk-mitigation strategy at little additional marginal cost. There are also advantages of a diversified portfolio that can smooth out volatility across all commodity pricing.

1.2. EXTRACTIVE INVESTMENT DIVERSIFICATION

Extractive industrial investment in Africa is occurring in traditionally agricultural regions and corridors, which have had historically limited access to transport and markets. As agriculture currently employs around 60% of all Sub-Saharan Africans, there is an emerging appreciation of the investment opportunity for the two major primary industries, mining and agriculture, for mutual gain through economies of scale and cost-effective local service development. At present many mining companies are engaged in agriculture via corporate social responsibility (CSR) programmes and also some small-scale procurement of locally grown produce for their workforce. They also invest indirectly through improving infrastructure around mines, such as roads, which often enables improved access to markets for local communities. In countries where mining is an important contributor to the economy, and where agriculture is transforming from subsistence to profitable enterprises, there are major opportunities for private enterprises of various sizes to link mining and agricultural interests through partnering/co-location as a risk mitigation strategy.

Mines are usually located in remote areas and procure a range of products either locally or by importing via a contracted supplier. Investors understand that local community relations are important for effective operation of a mine, and demonstration of direct benefits to the community reduces the financial risks derived from political and social unrest and lack of transparency in government. As the vast majority of the African population are engaged in agriculture, a critical mass of active partnering and co-locating of mining investments with profitable agricultural development investments may enable mutual synergies and enhance local economic development multipliers. Partner selection is crucial, especially for first-time investors in the agriculture sector[1], and recognised agencies familiar with the sector in Africa, including consulting and management companies, are able to provide informed advice on partnering in target countries.

1.3. INVESTMENT SYNERGIES AND LEVERAGING DEVELOPMENT MULTIPLIERS

There are synergies at the local geographical level for mining and agricultural investments, including similarities between sovereign risk, seasonality of mining (in tropical environments), and farming labour demand, and growing commercial diversification opportunities to gain from economies of scale, vertical integration, and partnering (including off-take agreements for water, energy, commodities, transport). The authors seek to present the countries of Africa as increasingly sound commercial investment destinations for investment. Co-location and agglomeration of multiple primary/extractive industry investments are mutually beneficial and fundamentally improve the potential for returns from African FDI opportunities. Additionally, they generate a greater level of commercial and political economy of scale to maximise the benefits of a diversified economy to both citizens of African nations and foreign investors.

i Murdoch University, Curtin University, The University of Western Australia, International Mining for Development Centre, the Crawford Fund, the Australia-Africa Mining Group (AAMIG), Africa Down Under, and the Australian Department of Foreign Affairs and Trade.

2. African Investment Challenges and Opportunities

2.1. THE AFRICAN INVESTMENT IN CONTEXT

- **Africa is one continent with 54 different countries.** The countries and landscapes are vastly different across the continent. Many of the fastest growing global economies are in Africa.
- **Africa is a continent of young people**. For example, in a country like Nigeria, 62.5% of the population is aged 24 or under[2]. This is representative of a rapidly growing and increasingly urban African market, as young people move to the rapidly growing cities across Africa.
- **Africa is the continent where the markets are growing rapidly** for food and agricultural produce to match rapid economic growth (GDP), rising populations, and markets for higher quality nutritious food at affordable prices.
- **Yet Africa is also home to high-profile problems** of poor health outcomes and emerging zoonotic diseases; low education rates; extreme weather events exacerbated by climatic changes; food insecurity; poverty; and political instability.

There is a resurgence of interest about Africa's 1 billion people as an emerging market, and the local landscape's enormous natural endowment of suitable agro-ecological land, water, resources, labour, energy, and minerals[3-8]. Globally, the intensity of demand for food, land, water, and energy competition is expected to increase for at least another 40 years[5]. The commercial opportunities for international private sector interests in Sub-Saharan African (SSA) countries as proximal suppliers to European, north African, and Asian markets are enormous[7]. The 54 countries of Africa themselves are dynamic growing markets, dispelling many conventional stereotypes. For example, when only around 60% of Sub-Saharan Africans have access to improved drinking water[9], and 30% access to electricity[10], mobile phone ownership has grown from practically zero to around 50% in only a decade[11,12]. Despite the water and electricity access gains (largely provided by governments and international aid agencies[9-11]), many new markets, such as the telecom industry, have developed autonomously and rapidly on a purely commercial basis and, with a reach into rural and remote areas, are transforming lives.

2.2. INTERFACE OF MINING AND AGRICULTURAL INVESTMENTS IN AFRICA

The mining and agricultural sectors are both important contributors to economic development in many countries on the African continent. Agriculture typically represents 20–40% of current GDP in SSA[5]. Similarly, the mining sector in many extractive-intensive SSA countries is the largest single sectoral contributor to GDP, taxes, foreign investment, and foreign exchange[13]. Extractive industrial development is occurring in traditional agricultural regions and corridors (Figure 1), with historically limited access to transport and markets[14]. There is an emerging acknowledgement of the

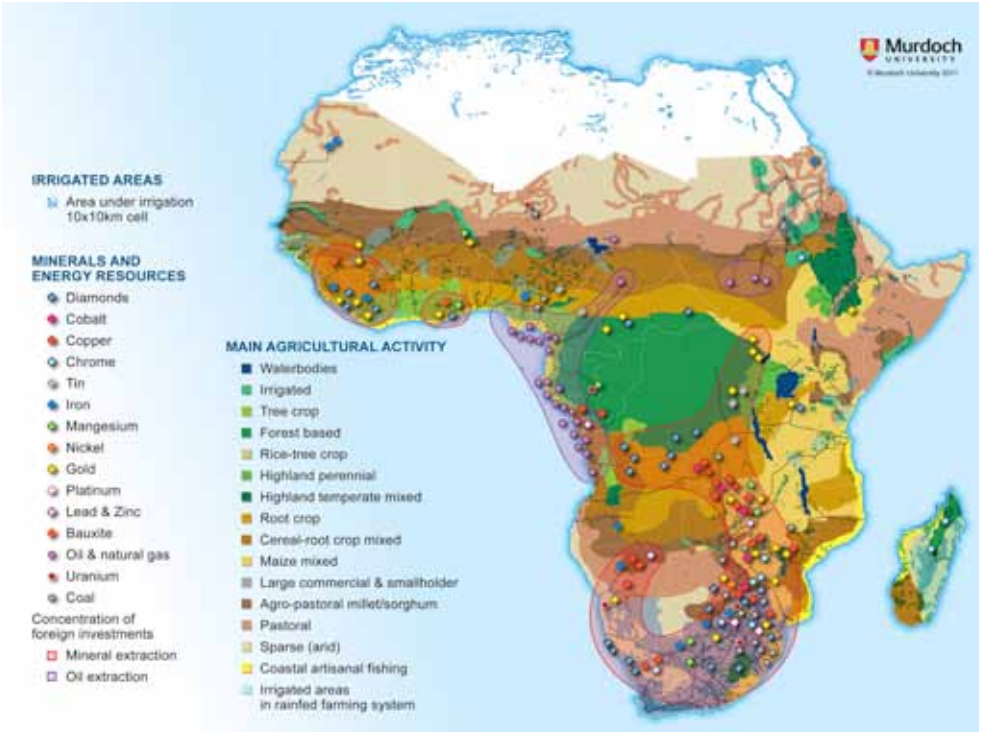

Figure 1: The Interface of Major Mineral and Agricultural Extraction and Investment in Sub-Saharan Africa.

opportunity for the two major extractive industries, mining and agriculture, to mutually gain through economies of scale to de-risk and diversify commercial and national interests into the growing economies in Africa for accelerated development. For example:

- Mining and agriculture share the same or adjacent landscapes.
- Mining and agriculture share and sometimes compete for resources
  - natural resources – notably land and water
  - human resources – workers for the mines versus farmers and other agricultural workers.
- Mining and commercial agriculture face common challenges
  - political and social volatility and instability
  - lack of transparency in government decision- making
  - workforce health – e.g. chronic diseases such as malaria; acute outbreaks of zoonotic diseases
  - food and nutritional security for mining and agricultural communities.

2.3. GROWTH OF FOREIGN DIRECT INVESTMENT (FDI) IN AFRICA

FDI as a source of capital is increasingly important to SSA. FDI is attractive as a relatively stable form of capital inflow that is less vulnerable to short-term crises and changing market conditions[15,16]. Today, around 70% of private capital flows into Africa are in the form of FDI[16]. FDI provides the much needed capital for investments in SSA[17], and natural resource (minerals, oil, and gas) projects are the overwhelming source of FDI in African countries[8,16-24]. Fundamentally sound economies with stable governments naturally attract FDI[25]. FDI promotes host countries' ability to boost exports by: transferring technology and new products, facilitating access to new and large foreign markets, education and training provision, entrepreneurship, upgrading technical and management skills and standards, access to new technology, improving market access, lowering the cost of capital, and shift investment risk[19-21,25-28]. FDI is a key element to drive employment, technological progress, productivity, and economic growth.

The countries of SSA have not historically been major recipients of FDI flows[18,21]. However, the net impact of FDI on host country economic growth is complex, and in many cases ambiguous and dependent on the ability of the host country to extract the benefits and minimise negative impacts[18,20,29-31]. In terms of gaining efficiencies in investments, there is a growing international trend for national strategic aid, government development strategies, and trade agreements to embed themselves with large private sector commercial investments in SSA[7]. Large flows of FDI are attracted to countries with a presence of foreign aid[ii], large natural resource endowments,

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the rule of law, large market sizes, institutional agglomeration/clustering, and openness to trade[18,21,28]. FDI now rivals official development assistance and remittances as the single largest foreign financial inflow[8].

FDI inflows play a positive role in the SSA countries as foreign companies tend to be larger employers, export more, and exhibit higher productivity and growth rates. Domestic companies in direct competition within the same industry also benefit from a stronger presence of foreign firms[25]. Indeed, FDI in the poorest countries is critical to achieving the Millennium Development Goals (MDGs) and the Common African Position (CAP) on the post-2015 development agenda, as the private sector is recognised as a principal driver of growth reducing poverty and improving welfare, particularly in the least developed countries in the region[21,28,32]. The greater benefits of FDI for SSA are achieved when also aimed at non-primary industries and more towards economic integration and diversification[29].

ii. Foreign aid and FDI are commonly correlated on a national basis, i.e. FDI and aid from a single country are commonly associated with one another, whereas multilateral aid and FDI are not.

2.4. RISK AND PERCEPTION OF RISK FOR INVESTING IN SUB-SAHARAN AFRICA

The continent of Africa is perceived as an inherently risky investment, and as 'one big country', with investment decisions commonly guided by inferences from neighbouring SSA countries rather than the fundamentals of the country in question[17]. FDI in SSA has increased in absolute terms due to policy reforms, but has declined on a relative basis vis-à-vis Asia and South America due to a relative paucity of reform relative to other regions[28]. For example, the global African annually averaged share of FDI inflow from 1980–2009 was around 2.5%, whereas the Asian region averaged 17.5% of global FDI inflows over the same period[18]. Therefore, targeted information instruments regarding each national approach to FDI and associated national characteristics are needed to change simplistic perceptions of perceived risks for investing in many SSA countries[17,21,28,33]. For example, development finance institutions can work with the private sector to balance perceptions to the actual risks related to investment[16]. Quite apart from the economic fundamentals of an individual investment or project, the level of multinational FDI flows into a region are based on government stability, social stability, basic human and democratic rights, quality of the government administration, and law and order[15,21].

2.5. LAND INVESTMENTS IN SUB-SAHARAN AFRICA

One common point of discussion is related to achieving secure land tenure and land rights for investments in SSA, and can be a major political issue in some SSA states[6,34.] Land leases (as opposed to outright purchase) are more common in SSA FDI, with present leases associated with little monetary cost due to perceived low opportunity costs, and lack of well-established land markets[35]. Yet, economic development in Africa is viable under various co-existing land tenure systems between freehold and customary/communal land laws[36]. SSA land tenure systems are known to be redistributed within groups over time, and variously defined by place, time of year, and by crop/enterprise activity[34,37]. The variety of common land-use rights in SSA include passage, hunting, mineral extraction, water use, grazing, cultivation of crops (permanent or annual), disuse (either for future options or fallow), and even bush material collection[37]. Under customary land laws, each successive generation inherited successively smaller parcels of land through subdivision[36,38]. Through this complexity and often large numbers of people with land tenure and land rights in a given area, FDI in land for mining and agriculture necessitates national governments and investors ensure local and customary land rights are observed[35].

Notably, the transfer of land to investors seeking speculative profit, to supply non-food markets, or to simply export to other countries is a contentious issue and has been managed poorly in many regions by individual countries. Similarly, commercial agriculture and mine land acquisitions and leases can often be viewed through the same lens as a transfer of rights and displacement of local smallholders or artisanal miners to international companies. There is a notable and often dichotomised social and political tension of whether these larger investments are in the 'national interest', if suitable prices and compensation are realised, and if benefits may flow to the local community. What is clear is that there are numerous benefits of engaging local populations in the investment activity (i.e. employment, upstream and downstream input/output linkages and procurement, etc.) that lead to local economic diversification, which in turn leads to the creation of more attractive livelihoods and opportunities.

3. African Mining Sector Investment Trends and Opportunities

3. OBSERVATIONS OF THE MINING SECTOR IN AFRICA

- Mines are usually located in remote locations.
- Mining companies need to provide food for their workforce. This food may be imported via a contracted supplier, procured locally, or both.
- Mines in remote locations can have poor access to health care in the event of emergencies due to accidents or disease outbreaks.
- Community relations are important for the effective operation of the mine, including demonstrating direct benefits to the local community (e.g. through CSR programmes).
- Environmental risks are associated with mining (e.g. threats to soil and water quality). There is a need to minimise environmental damage and to restore the mine area to an environmentally safe area after the completion of the mining activity, thus minimising long-term negative environmental impacts.
- Financial risks to investment in mining include the risks stemming from political instability and social unrest, and lack of transparency in government.

3.1. DIVERSIFYING INVESTOR PARTNERSHIPS FOR BENEFIT ALIGNMENT

As new investment is central to the development of SSA[39-44], an active and critical focus on a balance for private and public partnerships is essential[1,39]. Generating an appropriate level of public and private sector investment to accelerate sustainable rural development in SSA has been a major challenge[42]. Attracting private sector investment to facilitate broad-based development requires coordination between private investors, pan-African and international governments, ODA donors[45], and development banks. Indeed, in SSA it is now becoming expected that international companies (in addition to their primary business) also build regional capacity, identify best practices, transfer knowledge, and facilitate effective public-private partnerships prior to, during, and after an individual project's operational lifespan[46,47]. Yet most private companies are unable to adopt higher standards voluntarily unless there is a clear commercial advantage[48].

International governments and their private (national or international) industries recognise an alignment of resources will gain efficiencies and scale in engaging commercially and politically in SSA[49]. New and medium/small international private industry entrants to the SSA region will be well advised to gain from accessing existing knowledge, networks, and experience of networked companies, governments, and institutions that have had long-term Sub-Saharan involvement[7,41,50]. With the diversity of disaggregated polices and development strategies in existence in the region[4,21,44,51], it is necessary to understand numerous networks and policy nuances to avoid misallocating resources[46].

3.1.1. MINING INVESTMENT GEOGRAPHICAL CLUSTERING AND AGGLOMERATION

Institutional agglomeration or clustering in the same geographical region has a strongly significant correlation with FDI in Africa[18,33]. Although mining is unpredictable on the spatial pattern of economic impact, there is a growing level of awareness of the benefits that a greater level of economic linkages between mining and the immediate precincts, to regional service towns, and to major economic hubs, particularly when a critical level of mining activity is sustained in a region over time[20]. There are numerous advantages of capturing the wider benefits of mining investments by engaging local upstream and downstream linkages leading to economic diversification[20-22]. Research commonly points to FDI benefiting the host country's current account payments and enhanced foreign exchange earnings, particularly in relation to exports[20]. Enclave capital-intensive developments with few linkages to the local wider economy may result in less indirect benefits of FDI[30]. As an example approach for wider sectoral engagement, the African Mining Vision and the associated Action Plan prescribe a practical approach to achieving equitable and efficient natural resource governance and transparency[23]. There are several evolving governance-related frameworks that the mining industry can adopt to engage with stakeholders during each phase of a mine[52].

3.2. EXTRACTIVE INVESTMENTS AND PRODUCTIVITY ENGAGING IN ECONOMIC DEVELOPMENT AND DIVERSIFICATION

Traditionally, multinational mining companies in SSA have been resistant to deepening their engagement with local or national economies beyond the bare minimum, and national governments commonly only discuss taxes and royalties, letting other opportunities pass by[20]. The mining sector itself has long taken a mono-sectoral approach, not actively seeking to link with the broader economy up and down the resource sector supply chains, or to be a catalyst to other economic sectors or broader regional development objectives[53].

To diversify beyond natural resources such as mining and agriculture into secondary and tertiary economic activities, SSA nations can foster the development of appropriate local service sectors[54]. However, this is difficult when multinational private entities' involvement in mining and exploration in SSA commonly apply traditional global corporate procurement systems, from the design, construction, operational, and decommissioning phases. This approach effectively excludes SSA service

sectors from the major contracts, even from mature extractive service centres in South Africa[13]. Interestingly, in contrast to multinational resource projects, even legal and illegal artisanal mining has long created a range of diverse economic benefits to a local region as it is generally well integrated into the local communities[20].

Economic integration of projects is a win-win for both foreign investors and host countries[8,55], and the nascent mining and wider economic linkages in SSA need to be accelerated and deepened[20]. Such deepening can have parallel benefits for investors and nation states, and include opportunities for technical colleges to supply the mining sector[20]. Environmental rehabilitation, mine decommissioning activities, and social health programmes (for the direct mine workforce and local communities) are new added elements of value a mining supply chain brings to a region[20]. Many mining companies have contributed to their region by actively developing skills and capacities in a range of sectors outside traditional mining activities[47,52]. However, such investments tend to have long lead time horizons[40], and a corresponding long-term perspective (>20 years) is necessary to reap the benefits that such investments can provide[3].

3.3. STRATEGIC MEANINGFUL CORPORATE SOCIAL RESPONSIBILITY AND SOCIAL LICENCE ACTIVITIES

Resource development conflict over the distribution of benefits and negative impacts are of increasing focus socially and politically in SSA[56]. These include growing criticisms of mining sector contribution to social and economic development in Africa, as well as environmental credentials[47,53]. Extractive companies operating in developing countries are increasingly requiring project finance to displace equity and borrowing, and financial institutions are requiring higher standards of operation[47]. This provides an opportunity to transfer best practice procedures from the international mining community that can be customised to the needs of African countries[iii], with private sector investment enabled and/or incentivised to assist the transfer of best practice[7].

While CSR programmes are usually associated with philanthropy[48], commercial justifications for investing in social programmes are often necessary[57]. Such programmes often involve external institutional building, capacity strengthening, education and training, regional health, and local infrastructure development[42,47]. This requires companies to extend their primary mandate to meet broader economic and social needs beyond simple direct employment, business opportunities, royalties, taxes, and community sponsorships[52]. While CSR programmes can provide a strategic response to the operating risks associated with mining in a developing country[53], another approach to community engagement and sharing benefits of mining with the community is a 'social licence'. This can be as important as a regulatory licence, yet draws in a larger scope of resource sector participants and paradigms[56]. A social licence involves the local community and other stakeholders, such as individuals who can influence decisions (governments, non-government organisations, financial institutions, media, etc.)[52]. Concepts of social interest include national regulation, land tenure, employment and training, labour relations, multilateral agreements, regional development, and productivity, etc.[56].

3.4. MAJOR OPPORTUNITIES FOR MINING INVESTMENTS TO DIVERSIFY INTO THE AGRICULTURAL AND RURAL SECTORS

3.4.1. THE INVESTMENT GROWTH FOR COMMERCIAL MINING AND AGRICULTURAL PARTNERSHIPS

Africa is on a growth trajectory that has enabled it to become the world's fastest-growing continent. Human development in Africa has made enormous advances, and Africa's growth acceleration has resulted not just from a resource boom, but also from government actions aimed at improving macroeconomic conditions, bringing about political stability, and creating a better business and investment climate[58,59]. Africa's collective long-term growth prospects are strong, with several countries formulating credible development plans and delivering on GDP growth targets. At the same time melding CSR, social licence, economic diversification, best practice, health, and infrastructure (etc.) with commercial investment imperatives in Africa is a formidable yet achievable challenge that will require new and effective models of partnerships to succeed.

3.4.2. COMMERCIAL PARTNERSHIPS BETWEEN MINING AND AGRICULTURAL INVESTMENTS

Agriculture-related FDI can benefit significantly from being co-located with even medium-scale mining activity. At the same time, careful country and regional selection is required. While the location of a mine is determined by geology, under certain favourable conditions the presence of a mineral resource is also accompanied by potentially productive agricultural land (soil fertility, rainfall patterns, growing seasons, etc.) for crops that are suitable candidates for FDI. Just because there is a mine, does not mean that the area should be expanded for commercial agriculture. Even if there is agricultural production, it

iii One example is the mine closure legislation recently developed by the Western Australian Department of Mines and Petroleum. This legislation may be appropriate as best practice in mine rehabilitation through a dedicated financial security mechanism that manages existing mining operations, and also provides a ring-fenced industry-funded pool to rehabilitate the large historical legacy of derelict, ownerless, and abandoned mines in Western Australia. This creative policy-making has some promise for African countries in ensuring the social, financial, and environmental legacies of mining activity are positive.

does not mean that it is suitable for FDI-based expansion. But the opportunities for co-investments in mining and agriculture should be explored.

What then are the criteria for triggering such FDI investment in agriculture where mining activity is a catalyst for creating interest? Quite simply, it is based on the degree and extent of upgrading of infrastructure (the primary barrier to entry for FDI-scale agriculture). This in turn leads to the potential for the creation of an agricultural value chain, making the delivery of inputs practical and commercially viable and resulting in the parallel creation of markets for products (at the local level, as economic activity increases and people's ability to pay for food increases, and, within transport corridors, sourcing other external markets). This will become more attractive with the presence of reliable power infrastructure for refrigeration and processing, and also diesel distribution infrastructure for trucking transport (or in some circumstances rail infrastructure).

The presence of mining is usually not sufficient to catalyse commercial agriculture. This is why large or larger-scale agricultural activity is not a usual outcome of mining activities. As an example relating to infrastructure, a mine planner would calculate the power needs of the mine and support infrastructure only, and deploy generators and pumps (etc.) to match the mine site's need (with a certain buffer level) with fuel bunkers designed accordingly (typically grid connection is not possible and on-site power is stand-alone diesels). It would not be in their remit to ask the additional question: 'What if we increase our power supply to enable local off-take – to be paid for/underwritten by a third party – for the establishment of a tomato-processing plant, or a feed mill, or refrigeration for horticulture crops, or a slaughter-house ...?' This is where a coordinated investment strategy is essential for significant co-linkages to be developed and maximum benefit obtained by the presence of mining; including the presence of economic activity that drives infrastructure investment. Specifically in the case of the establishment of a processing plant, such an investment for the mine planners and their investors can be presented not as an investment in agriculture at all, but as a cost-reduction of a shared resource through agglomeration. As typically, larger generators produce electricity more economically than smaller generators, the off-take agreement for the power by the 'tomato processor' (or other similar agricultural processor) is backed by FDI, or even the same investors involved in the mining activity; then the willingness to increase the rating of the generator is a sound commercial decision. There is a theoretical additional benefit accrued to the mining activity in this example. Agriculture is a significant employer, while mining typically employs relatively few people (based on FDI/labour ratios). If agriculture expands significantly due to the direct presence of mining activity, then community expectations regarding associated local positive benefits are met or exceeded. Therefore, this may be achieved on a commercial basis that at the same time delivers savings to the mining enterprise (in the form of lower power and agricultural/forestry/fishery input costs, and also non-agricultural inputs).

3.4.3. THE IMPORTANCE OF AGRICULTURE TO AFRICAN ECONOMIES

At this time agriculture is the predominant source of employment and livelihood and a way of life for the majority of Africa's citizens. For several countries, agriculture is also the single most important foreign exchange earner (Table 1). The growth linkages in agriculture – upstream to suppliers of inputs, equipment and services, and downstream in assembling, processing, warehousing, marketing and consumption - are greater than in other sectors. Judicious investment in agriculture is an important lever for combating food

Table 1: Agriculture in Africa – key statistics.

Agriculture as share of GDP	30–40%
Employment in agriculture as share of total workforce	60% (SSA)
Female employment in agriculture as share of total rural workforce	50% (SSA)
Contribution of agriculture to the income of the rural workforce	50%
Agricultural export earnings as share of total export earnings	40%
Agricultural produce loss to poor post-harvest management system	30–40% of total production
Average food import bill per year in the 2000s	US$20 billion
Annual growth rate of agricultural GDP (in real terms), 2002-2007	5.5%
Irrigated land as a proportion of potential	7%[a]
Use of fertiliser per hectare in SSA	13kg[b]
Use of fertiliser per hectare in North Africa	73kg[c]
SSA farm power sources as a percentages (other developing regions)	Hand: 65(25), Animal: 25(25), Engine: 10(50)

[a] In comparison 29% of lands in East and South-East Asia are irrigated and 41% in South Asia..

[b] This is only 7% of the average for East Asia.

[c] This is only 38% of the average for East Asia.

PHOTO: ACIAR

insecurity and contributing towards broader social and economic development. Moreover, Africa has land, water, and human resources to feed itself, and can also contribute towards meeting the growing global demand for both food staples and higher value added foodstuffs. Recent estimates suggest that Africa has the potential to increase the value of its annual agricultural output from about US$280 billion (in the late 2000s) to around US$800 billion by 2030[59]. Therefore, agriculture is a major focus of African governments and is of key political interest to be engaged with and play a role in the sector's rapid development.

3.4.4. OPTIONS AND LEVELS OF PARTNERSHIP ENGAGEMENT

In summary, there are at least three levels of engagement possible between mining and agricultural interests and investments in Africa which would build on and expand current engagements:

- **Level 1: CSR and social licence programmes** Targeting improved agricultural productivity in the vicinity of the mines, with a high level of community engagement in the design and implementation.
- **Level 2: Direct procurement of food from local sources** Enhancing market opportunities, especially for small and medium enterprises.
- **Level 3: FDI in the agricultural sector and related infrastructure** Irrigation, power, roads, rail, etc.

3.5. AGRICULTURE–MINING–WATER–ELECTRICITY INFRASTRUCTURE INTERFACE

It is usually the case that there is too much water in mining – requiring significant 'de-watering' to lower the watertable to achieve safer mining operations. Many mines use only around 5% of the extracted waters for mine dust suppression, processing, and other uses[60]. To prevent the often contaminated or saline mine water impacting on the surrounding physical and biological environment[61], the excess is treated or discharged to dams, the ocean, or rivers[60]. In well-integrated economies large industrial consumers of water can be co-located with mine sites for downstream usage[62]. For example, combined cycle gas power plants evaporate around 0.6 litres (L) for each kilowatt hour (kWh) of electricity produced, and black or brown coal usually consumes between 1.5 and 3.5 L per kWh[63]. Thus, a theoretical 400 Megawatt electrical (MWe) of combined cycle gas or coal power plant capacity with an annual capacity factor of 80% would annually consume around 1.7 gigalitres (GL) and 4.2 – 10 GL, respectively, while using many more GL in the cooling process[62].

There are also major opportunities for irrigation. Agriculture in SSA has a very low surface water utilisation (2–3%)[39], and endures massive water insecurity issues, including water storage deficiencies[43]. World-class water infrastructure investments can open up a further 5–7 million hectares (ha) of agro-ecologically and economically viable lands for small-to-medium irrigation schemes[43,66], with a further 1.4 million ha amenable for large schemes that include hydropower options[43,66]. However, to date around 1.7 million ha of previously irrigated land has fallen into other uses due to infrastructure maintenance issues[43]. This is despite the higher profitability of irrigated lands: around 25% of the value for SSA agricultural production is produced from only 3.5% of cultivated lands[66]. Experience has shown that

irrigation infrastructure decision-making should be as decentralised as possible and focus on economically sustainable operators able to install and maintain water infrastructure. Economic irrigation-water distribution component costs are around US$2,000–$3,000 per irrigated hectare for small and large-scale operators, respectively[66,67]. Higher value crops and horticultural production are necessary to cover irrigation costs[66].

3.6. AGRICULTURE–MINING–TRANSPORT INFRASTRUCTURE INTERFACE

Mining investments commonly have a core element of infrastructure provision as part of the investment, and can both provide and stimulate use of and investment in additional infrastructure, particularly if aligned with concentrations of populations[22]. Rural population growth tends to cluster around services and markets near highways and other crucial physical and economic infrastructure[39,40,42,68]. Roads in SSA have improved in recent decades, with 80% of the arterial roads being in good or fair condition[69]. However, the quality of a trunk road is often not the primary constraining factor for rural transport; feeder roads often have a disproportionate bearing on transport costs[70]. Basic all-weather feeder roads dramatically improve rural areas on a cost versus poverty-reduction basis[16]. Prioritisation of feeder roads would be beneficial in connecting rural areas with high agronomic potential with large populations and routes[68-70].

3.7. AGRICULTURE–MINING–BIOENERGY INVESTMENTS

Bioenergy and food security have been presented as direct competitors for inputs and land[4], but in practice the net impact of bioenergy on food insecurity and poverty is dependent on crop species, land use, technologies employed, and the influence of the bioenergy supply chain on existing chains[4]. Biofuel developments generally take place near good infrastructure, goods and services, processing and storage facilities, and a skilled labour force[6]. Biofuel investment on marginal land can transfer agricultural knowledge, increase employment, deliver infrastructure, and improve national balance of payments[4]. Local fuel production increases local fuel security, including mines, and enables effective fuel competition to exist.

3.8. AUSTRALIAN MINING AND ECONOMIC DIVERSIFICATION AS A COMPARISON FOR AFRICAN NATIONS

With a small population, high geographic diversity, and industrial capital intensiveness, Australia has always been dependent on FDI. Mining sector FDI has increased to around US$150 billion annually, almost one-third of national FDI inflows[27]. The Australian experience of integrating mining into the economy with a skilled workforce and sourcing local goods and services (such as exploration technology, data interpretation, software services, machinery and equipment support, innovative mine processes and management, etc.) has created an economic multiplier that is up to four times that of royalties and taxes[71]. Despite the known cycles of boom and bust in mining, the Australian resources sector has generated and sustained national prosperity by linking mineral and energy resources with FDI, a skilled workforce, technological advancements, and relatively low government involvement, and is an internationally competitive player in a globalised minerals and energy market[27]. The standout area where Australia has not been able to extract economic benefits is downstream minerals processing and beneficiation, where the experience has been that it is very difficult to sustain in a globally competitive market, with many attempts (both mandated by governments or otherwise) failing to achieve the benefits originally sought[71]. Nonetheless, Australia's success at harnessing extractive industries is due in part to policies that foster the collection, collation, and integration of publically available geographical and geoscience information. This is an example where policy can reduce the risk and cost of exploration investment and enable clustering or agglomeration of private exploration[27].

4. African Investment Trends in Science, Technology and Innovation in Agriculture

African leaders recognise that for agriculture to serve as the engine of national growth and wealth creation and to regain competitiveness in the global food economy, the sector must be transformed. To this end, in 2003 they launched the Comprehensive Africa Agriculture Development Programme (CAADP) as an important framework for revitalising agriculture on the continent. To date CAADP has helped countries to refocus investment in agriculture as a traditional cornerstone of development. It has also encouraged and facilitated a renewal of national sectoral strategies, and investment plans and programmes. In this context 2014 was the African Union's Year of Agriculture. The fundamental question for rural development in Africa is how to enable national governments and the private sector to make critical institutional and infrastructural investments that stimulate a diversified economic development of major regional centres[44]. The 'private sector' in SSA agriculture includes farmers, farmer groups, non-governmental organisations (NGOs), and private companies[46], and co-investing can spur growth that advances development[50].

AGRICULTURAL DEMAND-SIDE TRENDS

- Demand for food in Africa exceeds supply; Africa imported at least US$35 billion worth of food in 2014.
- Growing urban middle classes are demanding more varied and nutritious diets, including more animal-sourced foods, such as meat, milk, eggs, and fish, many of which are currently imported.
- There is also growth in demand for convenience foods and for the fast-food sector; e.g. preference for rice rather than sorghum, as rice is much easier and quicker to cook; fast-food chains are expanding in cities e.g. KenyaChick; pizza establishments use tomato paste imported from China.
- The 'supermarket revolution' means that an increasing amount of food is being sold through small and medium-sized supermarkets in cities and towns across Africa; this is increasing the demand from consumers for higher quality and safe food, it also extends the value chain for farmers and traders supplying supermarkets and opens prospects of new markets.

AGRICULTURAL SUPPLY-SIDE TRENDS

- **Land:** Africa has 60% of the world's available arable land suitable for agriculture.
- **Water:** Water is a constraint, as most agricultural systems in Africa are rain-fed with little irrigation.
- **Climate change:** Climatic changes are affecting agriculture in unpredictable ways, with more erratic rainfall and more extreme weather events.
- **Public policy:** Over 40 countries have committed to growing their agricultural sectors to meet an African Union/CAADP target of at least 6% growth per year; most countries have developed national investment plans under the umbrella of the African Union's CAADP, which was updated in 2014.
- **Smallholder sector:** Many countries have as public policy the goal to increase the efficiency of the smallholder sector through sustainable intensification of crop and livestock production, and to enable small-scale producer access to growing urban markets; smallholder production is less efficient than broad-scale agriculture, but small and medium-scale producers remain a significant component of food and agricultural production in Africa.

4.1. IMPORTANCE OF SCIENCE AND TECHNOLOGY FOR AGRICULTURAL TRANSFORMATION IN AFRICA

A new 'Science agenda for the transformation of agriculture in Africa' has been developed under the auspices of the African Union and the Forum for Agricultural Research in Africa (FARA)[72]. It highlights the important role that science will play in improving the productivity and sustainability of the agricultural sector, and thus lead to the transformation of African economies. The major point of departure for the science agenda is the realisation that a productive, competitive, and efficient food and agricultural sector in Africa remains essential for sustainable development as well as for economic and political stability. The purpose of the science agenda is to advocate the importance of science as part of the transformation process of agriculture and economic development in Africa. By presenting a new vision for science and agriculture in Africa, it seeks to influence African leaders, policy-makers, research and science administrators, producer organisations, and entrepreneurs to take decisive and informed measures that would enable science to deliver on its full potential in the transformation of agriculture in Africa. Two key messages from the science agenda are:

1) Science can and should drive transformation of agriculture and society in Africa.

Science contributes towards making agriculture in Africa more productive, competitive, sustainable, and inclusive. Scientific solutions for agricultural transformation need to be pursued further, while recognising the fragility of African environments, their rich biodiversity, and the complexity of agricultural production systems across the continent. Transforming Africa's agriculture requires a science system that produces both 'technical' and 'institutional' innovations. This new science agenda for agriculture in Africa therefore requires innovative educa-

tional and training approaches that are more connected to the new challenges facing rural communities, and that build the capacity of young people to be part of the transformation of the agricultural sector.

2) Now is the time to increase investments in science and agriculture in Africa, when countries have the means and opportunities to invest and gain returns because:

- **It is necessary:** Science underpins the solution to many of the dynamic problems Africa is facing. Research-based solutions will be needed to support the addition of value to agriculture products whose demand is rising through urbanisation and opening of export markets, including expanding of trade within Africa.
- **It is feasible:** Africa is one of the last frontiers of arable land and a new focus for mining of minerals, oil, and gas. With proper land management regimes, social responsibility and fiscal management of extractive industries, Africa will have the financial resources for science support and rational management of its agricultural and economic development.
- **The private sector is increasingly important in agribusiness:** The role of the private sector will grow as value-adding processing and new products enter markets. Private sector innovations (e.g. mobile banking, index-based crop and livestock insurance and market information) have enabled transformative changes.
- **High rates of return on investments in science for agriculture:** Returns in the order of 40–60% have been shown consistently, covering many different countries at various stages of development.
- **National financial commitment by government:** This commitment unlocks support from public and private investors.

More consideration should be given by governments to long-term policies attracting the private sector[42], with a particular focus on government and private-sector transparency[21,40]. Long-term commitments in the areas of science, technology, and innovation are indispensable precursors to economic linkage strategies for a diversified economic base, while recognising that these are neither 'cheap' nor 'quick' investments[71]. Within this context, investment and economic transformations are underway in Africa:

Complementarity of investments: The focus of the African Union's science agenda is on the role of science in agriculture; however, the application of science and technology alone will not bring about the necessary improvement in productivity, food security, reduced hunger, or enhanced nutrition. Investment and evidence-based policies will also be required to achieve sustainable agricultural productivity growth, build resilient and diversified economies, and bring about overall socio-economic transformation. Here too, several countries in Africa have shown remarkable preparedness through investing massively in technical and social infrastructure, as well as in the information and communications technology (ICT) sector, including cellular phone connectivity in both urban and rural areas.

Decentralisation initiatives: Civil societal developments have improved the ability of rural populations to participate in their own development and defend their interests. This, in turn, has created space for independent organisations of producers and business to flourish. The creation of the Pan-African Farmers' Organization (PAFO), the strengthening of regional agricultural producer organisations, as well as the rapidly increasing international private capital interest in investing in Africa's land sector are cases in point.

Roles of women and young people: There is a gender gap that remains with respect to the marginalisation of women in access to land, farming assets, inputs and services, credit, and suitable technologies that would render their farming operations more productive and remunerative. There is also an imperative for creating incentives to enable young people to engage in profitable farming and agribusiness opportunities. The continued use of outmoded technology in Africa's agriculture does not appeal to young Africans. This needs to be addressed, in addition to the challenges of improved farm technology, access to land, agricultural education, start-up capital, and advisory services.

5. Successful African Agricultural and Diversified Economic Transformations

5.1. SUCCESS STORIES IN AFRICAN AGRICULTURAL INVESTMENT

African agricultural investments have a number of major advantages: the diversity of agro-ecosystems and their natural resources provide for mixed and resilient livelihoods; active rural–urban linkages and expanding domestic urban demand for agricultural products; high efficiency of smallholder agriculture given appropriate inputs and management; a large and youthful population; increasing investments in education; acceleration in GDP growth; effectively coordinated agricultural development policy frameworks; rapidly growing mobile and internet connectivity; and expanding provision of infrastructure. The future of African agricultural investments can also be looked at from the perspective of recent successes, including some of the following[iv]:

Intensifying staple food production: Achievements have been made in the domestication and intensification of a range of staple crops throughout the continent. These include: the breeding of a wide range of varieties of banana in the eastern and central African highlands; the development and diffusion of high-yielding varieties of maize (Africa's main staple food crop) in eastern and southern Africa that are also credited with improving the productivity of millions of African farmers and moderating food prices for urban consumers; and productivity gains in cassava, Africa's number-two staple food, through breeding and improved pest control measures. Also, successive campaigns to control mealy bugs and green spider mites on cassava in the humid tropical zones of Africa have demonstrated the essential role that investing in science underpinning biological control can play. The release of New Rice for Africa (NERICA) rice varieties is an example of where an interspecific cross between the Asiatic rice species (known for high yield) and the African rice species (known for hardiness) boosted rice production, especially in West and Central Africa.

Smallholder dairying in Kenya: Dairy production in Kenya, spurred by improved veterinary services and availability of better feed and breeds, and effective marketing systems, turned smallholder dairying into a profitable enterprise with the support of the International Livestock Research Institute. Conducive government policy with respect to small-scale dairy production and marketing were key to the success of the dairying in Kenya, as these policies enabled small-scale producers and traders to participate in the markets and invest in milk production as a commercial commodity.

Beef export sector in Botswana: Botswana has developed a modern beef-export industry, serving this otherwise agriculturally challenged country as a new major backbone of its economy. This has been achieved at the same time as the development of a diamond mining and processing industry – which ordinarily would have put pressure on the currency – and would have created an adverse economic climate for agricultural exports.

Cotton in West Africa: Productivity gains in cotton production, including the profitability of GM cotton in countries like Burkina Faso, has made West Africa the world's third-largest cotton-exporting block.

PHOTO: DAVID DOEPEL

vi This section draws on two recent compilations of agricultural success stories in Africa: (i) Haggblade, Steven and Peter B. R. Hazell. 2010. *Successes in African Agriculture: Lessons for the Future*. Baltimore: The Johns Hopkins University Press for the International Food Policy Research Institute). (ii) Spielman, David, J., and Rajul Pandya-Lorch. 2009. *Highlights from Millions Fed: Proven Successes in Agricultural Development*. International Food Policy Research Institute.

Tea, coffee and horticultural exports from Kenya and Tanzania: Integrated farm-level research and technology development – financed largely by the private sector – has enabled tea and floriculture to be dominant sources of export earnings in East Africa in general, and Kenya (tea and flowers) and Tanzania (coffee and tea), in particular.

Effective Africa/global partnership to unlock key production constraints: Some successes depended on regional and international scientific collaboration that involved African and international scientists. For instance, the successful eradication of rinderpest in cattle across Africa was implemented by the InterAfrican Bureau for Animal Resources (AU-IBAR) and the Pan African Veterinary Vaccine Centre (AU-PANVAC), in conjunction with the World Organisation for Animal Health (OIE) globally, together with national veterinary services and livestock keepers, especially pastoralists in Africa.

Building regional centres for excellence: Sharing of research facilities and collaborative undertakings has also been undertaken at various times and places in Africa. The most recent examples include the sub-regional organisations in West Africa, Conseil Ouest et Centre Africain Pour la Recherche et le Développement Agricoles (CORAF), and the Association for Agricultural Research in Eastern and Central Africa (ASARECA). Their experience in establishing commodity-specific centres for excellence also serves in the dissemination of pertinent technologies throughout the sub-region. Biosciences eastern and central Africa (BecA), a joint African Union/International Livestock Research Institute (ILRI) collaboration – (the BecA-ILRI Hub) – is an institutional innovation as a shared research platform that offers opportunities for research and training in genomics to African scientists by sharing its advanced laboratories with eminent scientists from within and outside Africa.

Establishing ICT-based marketing systems: At the national level, institutional innovations in agricultural marketing, such as the Commodity Exchange initiatives in Kenya and Ethiopia, are of considerable value, for such mechanisms improve produce marketing through assuring commodity quality and quantity and prompt payment and delivery arrangements.

5.2. RELEVANCE FOR FDI IN AGRICULTURE

Taken together, these national and pan-African initiatives demonstrate that there is sufficient scientific and technological attention being given to African-centric agriculture improvement. The investment in agricultural R&D and capacity building is significant; greater than the equivalent investment in African-centric mining R&D. What is absent are the commercial structures to take advantage of this already existing R&D. Providing systems and repositories of this knowledge and making it available for potential agricultural investors would serve to both promote opportunity and also to catalyse investment.

5.3. MEGA TRENDS IN AGRICULTURE AND LESSONS FROM SUCCESSES

Deserved attention must be given not just to the individual success stories, but also to the critical factors that engendered such outcomes. Success cannot be a substitute for strategy. In order for such successes to stimulate broader and more sustained processes, they have to be backed by effective policies and appropriate levels of investment. For example, central to the above success stories in improving the productivity of staple food crops include availability of a comprehensive and long-term public and private support package, and provision of public and private funding to critical stages of crops research by national, regional, and international research institutes. Within Africa itself, rising populations and growing urbanisation, as well as rapidly expanding ICT platforms are trends which will have a considerable impact. Furthermore, Africa has been undergoing a rising share of youth in its growing population and large-scale urbanisation. It is estimated that most countries in Africa will become more than 50% urban by 2030. Even at that point, rural development will still be of high importance because the rural population densities will have actually increased due to population growth. As the two major extractive industries in Africa – mining and agriculture – investments in these sectors will be required to navigate these changes to ensure continuity of returns and sustained productivity gains.

Between now and 2050, with the global population projected to grow to more than nine billion, and changing diets in emerging economies, stabilising the global commodity supply will be a challenge[73]. In particular, it is expected that growing price volatility for agricultural commodities will present major challenges for producers and consumers alike. The above trends indicate an overall growth in global demand for food of some 70% by 2050[74]. Similar projections for minerals and energy exist. Water scarcity is also a limiting factor in many African production systems, a problem that is likely to worsen. In large parts of SSA, soils are often of low inherent fertility and are subject to long-term degradation. Changing climates can lead to the spreading of a range of diseases and pests that have hitherto been contained or existed at manageable levels. New patterns of susceptibility to human diseases and also plant and livestock diseases, and pests (locusts, mealy bugs, white flies, tsetse, and ticks), will appear and strain existing resources. Accordingly, meeting the challenge of extractive industry productivity and production security and broader development objectives requires investment and political commitment at the highest level.

6. Conclusions and Recommendations

It is apparent from the available literature that there is a compelling argument for leveraging the current significant mining activity FDI (and associated expertise) for the expansion of FDI for agriculture. It may very well be that the downturn in world ore, metal, and energy prices – with the concomitant 'cooling' of investment activity in the extractive sector – leads to a window of opportunity for investment in African agribusiness. This report has sought to outline the rationale and benefits of de-risking FDI activities in the agricultural sector by a tight coupling with extractive industry FDI. What it has not done is advanced the means whereby such outcomes could be achieved. What exactly are the catalytic activities that will create FDI opportunities for agriculture in Africa? For example, many African countries invest in sending delegations to global mining conferences and markets such as Mining INDABA, Africa Down Under, Africa on Top, etc. There are analogous global agribusiness marketing opportunities that similar delegations can attend. Many African countries have sought international assistance in improving legislation and regulation to encourage mining activity, and at the same time derive maximum benefit from the same. Do these same countries make similar efforts with regard to improving land tenure rules, transparency initiatives, technology sharing, best practice, (etc.) for global agribusiness?

Perhaps, as a beginning, there needs to be a concerted effort to engage with those who raise capital for mining activities in Africa. This may encourage pilot investment activities to translate currently largely theoretical opportunities conveyed in this report into practical examples on the ground. These examples can point the way to transformational FDI in the agribusiness sector alongside the mining sector in SSA to help Africa realise its vision for inclusive economic growth and prosperity for its citizens.

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FOR FURTHER INFORMATION, CONTACT:

Dr Denis Blight AO FRSA
Chief Executive
The Crawford Fund
61 2 6188 4370
crawford@crawfordfund.org
www.crawfordfund.org
Twitter: @crawfordfund

Dr Mark P. McHenry
School of Engineering and Information Technology, and the Africa Research Group at Murdoch University, Perth, WA.
mpmchenry@gmail.com

Professor Gabrielle Persley AM
Research Director
The Crawford Fund
g.persley@doylefoundation.org

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