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Employment and Labour Market Policies Branch

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INTERNATIONAL LABOUR OFFICE – GENEVA

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Abstract

This paper aims at providing empirical information about agricultural labour intensities of large commercial farms in Sub-Saharan Africa. Our hope is that this information can be used by Sub-Saharan African governments to design policies and incentives to attract private investors in agriculture conditional on the quantity and quality of employment created, the adoption of productivity enhancing technologies, and the environmental sustainability of the investment.

More specifically, we argue in this paper that the evaluation of prospective agricultural investment projects should be based not on the absolute number of jobs potentially obtainable with a project, but on the quantity and quality (in terms of temporary vs. permanent, and income and wages earned) of jobs obtainable *per hectare* of land, or, in other words, the agricultural employment intensity. This varies according to various factors, including the type, seasonality and number of cultivated crops, the cultivation methods and technology adopted, and the farm's size. In particular, the promotion of sustainable, productivity enhancing technologies and cultivation methods, and of medium size farms, can lead to simultaneous increases in both agricultural employment intensity and agricultural productivity. As a result, the use of limited land resources would be optimized.

The paper presents a dataset on wage employment and size of cultivated land from 87 farming companies operating across 18 Sub-Saharan African countries, involved in different farming activities and adopting different agricultural technologies and cultivation methods. On the basis of these empirical observations we derive our discussion of policy implications and conclusions.

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Contents

1. Introduction

This paper aims at providing guidelines to place employment creation, agricultural productivity, and sustainable development in the center of the policies to attract and benefit from agricultural investment in Sub-Saharan African countries. The motivation for this research goal is manifold.

First, employment creation is at heart of Sustainable Development Goal 8 (SDG 8), which calls to "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all." Among the targets of SDG 8, we find: "Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors." A focus on how to achieve full and productive employment and decent work through diversification and technological upgrading in agriculture – the most labour intensive sector in the developing countries – is therefore a compelling implication of SGD 8.

Second, it has been recognized by the international community that for the SDGs to be achieved, it is necessary to mobilize private investment along with public investment. It is therefore essential to align all financing flows and policies with economic, social and environmental priorities. "Mobilizing investment and ensuring that it contributes to sustainable development is a priority for all countries." With these words, UNCTAD opens its 'Investment Policy Framework for Sustainable Development', which sets out guidelines for a "new generation of investment policies [that] place inclusive growth and sustainable development at the heart of efforts to attract and benefit from investment" (UNCTAD, 2015, p. 1). Agriculture and food security is listed in UNCTAD's report as one of the ten priority sectors for countries' sustainable development prospects, in which strategic investment promotion initiatives should try to channel private and public investment.[1]

Moreover, this paper's focus on Sub-Saharan Africa stems from the fact that in this region agricultural investment policies will soon require a step-change. In fact, the increasingly limited availability of arable land is going to pose a constraint on governments' agricultural investment policies, as clarified by the following sentence from Lynam et al. (2016, p. 437):

> "Agriculture in Sub Saharan Africa is at a prospective tipping point. Agricultural growth has increased in the past decade, probably in response to the reforms of a decade before. This growth path, however, relies on the unsustainable tactic of increasing the use of finite resources. Shifting to a growth path based on increased productivity – as in the rest of the developing world – is essential if Africa is to increase rural incomes and compete in both domestic and international markets. The yield gap in African agriculture is significant; scenarios on feeding the world into the future highlight the need to increase Africa's agricultural production."

The shift from a growth path based on the extension of the area under cultivation to a growth path based on increased productivity is therefore essential for Sub-Saharan Africa's food security, poverty reduction and integration in international markets, as participation in agricultural global supply chains nowadays requires increasingly stringent suppliers' reliability and quality standards. Moreover, such a shift would help slowing down the deforestation connected to extensive agricultural activities, which is causing irreparable

[1] The other priority sectors for sustainable development listed in UNCTAD's report are: power, transport, telecommunications, water and sanitation, climate change mitigation, climate change adaptation, Eco-systems/biodiversity, health and education.

losses in Africa's biodiversity and ecosystems, and could alleviate the political pressure associated to foreign ownership of agricultural land.

In studying how governments can place employment creation, agricultural productivity and sustainability at the heart of their agricultural investment policies, this paper focuses on the direct wage-employment impact of large agricultural investments in Sub-Saharan Africa. To the extent that these often are foreign-invested companies, this paper is related to the direct wage-employment impact of agricultural global supply chains in Sub-Saharan Africa.[2] On the other side, in this paper we do not focus on the agricultural investment model of 'contract farming'. Contract farming differs from large commercial farms in that the former generates job opportunities mainly in self-employment and not in wage-employment, as under contract farming smallholders farm their own land as 'outgrowers' of a large agro-processing company, with whom they have a contract to sell their produce. The study of the social benefits and costs of outgrower schemes relative to large agricultural investment is left for future research.

The reason why this paper prioritizes the study of wage employment in large agricultural companies is twofold. On one side, there is a research gap in the study of agricultural wage employment as opposed to smallholder farmers. As a very crude measure of this observation, Box 1 provides the results of a series of searches in Google Scholar (excluding citations).

Box 1

Searches on Google Scholar (excluding citations)

- "plantation workers": 16,300 results
- "agricultural wage labour": 1860 results
- "agricultural wage labor": 1710 results
- "agricultural wage employment": 1260 results
- "agricultural wage workers": 820 results
- "farm wage workers": 249 results
- "large-farm workers": 18 results
- "large-farm employees": 6 results
- "smallholder farmers": 55'000 results
- "contract farming": 19'300 results
- "outgrower": 4170 results

Searched on July 4th, 2017.

In Box 1 it can be observed that searching for academic papers related to agricultural wage-employment provides far fewer results than searching for "smallholder farmers", "contract farming" or "outgrower". This literature gap is reflected by (or a reflection of) a significant gap in policy debates and official statistics on agricultural wage employment. As explained by Carlos Oya and Nicola Pontara (2015) in the introduction to their book on 'Rural Wage Employment in Developing Countries', this implies the risk of neglecting in

[2] In this paper we do not include the analysis of agricultural investments' indirect employment effect (i.e. jobs created through backward linkages in the inputs supply chain) and induced employment effect (i.e. jobs created via the multiplier effect on subsequent increases of consumption, production and employment) (see Lieuw-Kie-Song, 2017, for a framework to evaluate the direct, indirect and induced employment effects of sector policies and programmes). This extension is left for future research.

policy debates those who lie at the bottom of production chains as wage labourers, or combine wage and self-employment to live, or rather survive, at the margin of poverty:

> "Publications on rural poverty, particularly in low-income countries (LICs), continue to spill a great deal of ink on proposals to improve the lives and prospects of small producers (smallholder farmers), self-employed workers and micro-entrepreneurs. By contrast, not much attention has been paid to the fate of those who lie at the bottom of production chains as wage labourers, or those who eke out a living by combining different kinds of economic activities to survive, including both wage and self-employment. Theory, evidence, and policy have been particularly silent about seasonal and casual agricultural wage workers, a segment of the rural working class that is not adequately captured in official statistics but that remains central to poverty reduction strategies, since a large proportion of rural wage workers tend to be extremely poor (World Bank 2007). As a result, the policy debate on the constraints to and the opportunities for expanding wage labour demand, the levels of real wages, and the prevailing working conditions, has been squeezed out." (ibid., p. 43).

The literature gap on agricultural wage employment is also a reflection of a statistics gap. As observed by Oya and Pontara (ibid., pp. 57–64) labour market statistics are not only generally poor in developing countries, particularly in Africa, but also inadequate to capture the significance and nature of rural wage employment. This is due to both the scarcity of detailed employment data and the low quality of the employment data collected. On one side, in fact, in-depth (rural) Labour Force Surveys (LFSs) are very infrequent in most African countries – in turn a reflection of both under-resourced statistical agencies and a preference of international aid agencies for consumption data collection through income-expenditure surveys or integrated household surveys, over employment data collection obtained through detailed LFSs (Oya and Pontara, ibid., p. 59). Moreover, labour force surveys and related questionnaires, definitions and sampling procedures are often designed mimicking those of the developed countries, with the result of being unsuitable to capture the complexity of African labour markets, characterized by occupation multiplicity, irregularity and strong seasonality (Oya and Pontara, ibid., p. 60).[3]

Beyond the need for filling a research gap, the reason why this paper prioritizes the study of wage employment in large agricultural companies is related to the relevance of this kind of employment for the rural poor. In fact, wage-employment in agriculture often represents a vital opportunity not only for landless people, but also for rural poor families in subsistence farming to get some family members earning the needed cash to pay for important living expenses, such as school fees or seeds and fertilizers. The pivotal report of the 1972 employment mission to Kenya (ILO, 1972) already highlighted the need for cash of poor households and the crucial link between wage-employment and the need for cash:

> "A related though often separate problem, even for those with somewhat more land, is the need for cash: cash for taxes, for school fees, for a mass of minor purchases and – for the better farmers at least – for the hybrid seed, fertiliser and other things needed to raise their levels of output. A lack of crops for sale leads many families to seek a direct source of cash, perhaps from a relative working for wages. Others, particularly the young and educated, migrate to the towns and seek jobs there, joining other urban wage earners most of whom still maintain close links with their rural base" (ibid., p. 4).

[3] A comprehensive analysis of agricultural wage-employment data available from LFSs of Sub-Saharan African countries is planned as a research extension of the present paper.

Moreover, there is some evidence that foreign-owned and larger farms tend to pay higher wage rates – albeit still very low and often below living wages [4] – than local and smaller farms. For instance, Cramer, Oya and Senders (2008, p. 372) find that in Mozambique the median monthly wage paid by foreign-owned farming companies is more than double the median monthly wage paid by local farmers. Similarly, Castel-Branco (2012) reports that in South Africa cane workers working for small growers generally earn less than workers on large farms and estates. An analogous result is found by Osae (2005, p. 62), who reports that in the commercial pineapple farming sector in Ghana employees of large scale farms had average monthly savings higher than employees of small-scale farms (defined as farms with sizes less than 350 acres, i.e. 142 ha).[5]

For all these reasons, the aim of this paper is to study how Sub-Saharan African governments can place employment creation, agricultural productivity and sustainability at the heart of their efforts to attract large investors in their agricultural sectors. It is important to note at this point that attracting large foreign investors in agriculture is not necessarily the best development and poverty reduction strategy. It has been argued, in fact, that rural development strategies focusing on smaller, more labour-intensive commercial farms (Aabø and Kring, 2012; Baumgartner et al. 2015) or enhancing the links between large and small agribusinesses (as in Ethiopia's Integrated Agro-Industrial Parks: Government of Ethiopia National Planning Commission, 2015, and UNIDO, 2016) are more likely to reach pro-poor growth. Nevertheless, investment policies consisting in attracting large investors in agriculture are frequently used in Sub-Saharan Africa. Providing information useful to design policies and incentives to attract private investors in agriculture conditional on the quantity and quality of employment created, the use of sustainable, productivity enhancing technologies and cultivation methods, and the optimal use of limited land resources seems therefore a worthwhile goal.

More specifically, we argue in this paper that the evaluation of prospective agricultural investment projects should be based not on the absolute number of jobs potentially obtainable with a project, but on the quantity and quality of jobs obtainable *per hectare* of cultivated land, or, in other words, the agricultural employment intensity, together with the farm's agricultural productivity, and the sustainable use of limited land resources. Given that certain sustainable, productivity-enhancing agricultural techniques and cultivation methods require a more and/or better quality employment (in terms of employment stability and income or wages earned) per hectare than other cultivation methods, it is possible for governments to hit the policy "trinity" of creating more and better employment, increasing agricultural productivity, and optimizing the use of limited land resources with a reduction in the environmental impact of agriculture. This could be seen as another dimension of structural transformation, as opposed to simply "moving people out of agriculture into other sectors", which is often how structural transformation is interpreted.[6]

To the extent of our knowledge there are no datasets available that systematically compare employment intensities of different crops and cultivation methods across Sub-Saharan Africa. In this paper we present a new dataset, which we have created by collecting data on wage employment and size of cultivated land from 87 farming companies operating

[4] Anker and Anker (2014), Anker and Anker (2017) and Potjer et al. (2015) show that wages in tea estates of Malawi, Kenya's horticulture sector and Kenya's cut-roses sector respectively are substantially below very conservative estimates of living wages.

[5] In comparison with the official minimum agricultural wage, some reports find that foreign-owned and larger farms pay below the statutory minimum for agricultural workers (as in Cramer, Oya and Senders, 2008, p. 388). In contrast, some studies report large-farms and estate workers to earn around the agricultural minimum wage (as in Castel-Branco, 2012) or above it (as in Anker and Anker, 2014).

[6] Thank you to Maikel Lieuw-Kie-Song for this observation.

across 18 Sub-Saharan African countries, involved in different farming activities and adopting different agricultural technologies and cultivation methods. On the basis of these empirical observations we derive our discussion of policy implications and conclusions.

The paper is structured as follows. The next section explores what are the pros and cons of attracting large foreign investors in agriculture. Section 3 discusses the determinants of agricultural employment intensity. Section 4 presents our dataset on crop labour intensities in large commercial farms in Sub Saharan Africa. Section 5 summarizes the main findings and discusses the policy implications.

2. The pros and cons of attracting large foreign investors in agriculture

Several Sub-Saharan African governments include the development of their agricultural sector as an essential part of their structural transformation strategies. As stated by the African Center for Economic Transformation, a Ghana-based think-tank:

> "Converting subsistence agriculture into a modern commercial sector – whether large commercial farms, small and medium- size farms using modern and intensive methods, outgrower schemes, or other commercially scalable models – is… an essential part of the transformation agenda" (African Center for Economic Transformation, 2014, p. 107).

The transformation of agriculture is not only a need for Sub-Saharan African countries, but also a logical starting point for the diversification and structural transformation of these economies. In fact, as explained by Hidalgo (2011):

> "one important aspect of the process of economic development is the channel by which countries move from the products that they currently produce to products that are nearby in the Product Space" (ibid, p. 11).[7]

Through his empirical analysis of the Product Space in five Southern and East African countries, Hidalgo comes to the conclusion that

> "the most natural avenue for future product diversification for these five Southern and East African nations resides in the agricultural sector, since all of these nations appear to have productive structures that are pre-adapted to the production of many agricultural products that none of them are currently exporting… These results suggest that while diversification into all sectors should remain an important long-term goal of the region, the path towards increased diversification in the near future may well lie in a more empowered and diverse agricultural sector." (ibid. p. III)

Among the tools available to policy makers to promote the transformation of the agricultural sector into a modern commercial sector are investment policies to attract large agro-industrial companies in the country. These normally consist in agreements between the government and a large agro-industrial company, entailing the concession of large land leases often combined with fiscal and other incentives. The creation of new jobs is generally one of the main aims of governments in pursuing these agreements with agro-industrial companies (von Braun and Meinzen-Dick, 2009). Box 2 illustrates two examples of this kind of agreements between a Sub-Saharan Africa government and a big agro-industrial company: the agreement between Unilever and the Government of Tanzania (2013) and the agreement between Olam International and the government of Gabon (2012).

As shown in Box 2, in both cases the agreements are motivated by the "hope" of the government to generate a substantial number of direct wage-employment jobs (5000 jobs in the case of Unilever and 6000 jobs in the case of Olam). Moreover, the agreements are expected to have a significant indirect impact on incomes of smallholder farmers (30,000 people, equivalent to 6000 5-members families, in the case of Unilever) or on employment (5000 indirect jobs in the case of Olam). Note however that in both agreements reference is made only to the *total* number of jobs obtainable, and not to the number of jobs obtainable

[7] Hidalgo defines the 'Product Space' as the frequency with which pairs of products are co-exported across all countries. This is interpreted as an estimate of the relative number of capabilities shared by a pair of products (ibid, p. 11).

per hectare of land, nor to the *structure* of employment (in terms of seasonal, temporary or permanent jobs).

Box 2

Unilever and Government of Tanzania agreement on tea, 2013

"Unilever and the Government of Tanzania have agreed to establish an ambitious partnership to reinvigorate the Tanzanian tea industry. The partnership aims to create 5,000 jobs linked to the Unilever Mufindi tea estates, develop 6,000 hectares of smallholder tea farms and thereby improve incomes and lives of approximately 30,000 people economically sustained by the smallholder farming." (Unilever)

Olam International and Government of Gabon agreement on oil palm and rubber, 2012

Singapore-based agricultural trading and processing firm, Olam International, and the Government of Gabon created a public-private partnership to develop oil palm and rubber plantations in Gabon. The project is 60%-owned by Olam and 40% by the government. The Gabonese government has allocated a total of 300,000ha to the company. In Phase 1, Olam aims at developing 50,000 hectares by 2017. The project will benefit from a 16-year income tax holiday, and exemptions on payment of duties or tax on machinery, gas, oil, fertilisers and other inputs.

"The government hopes that more than 6,000 direct jobs and 5,000 indirect jobs will be created, supported by an Olam-administered training programme, while a planned processing plant – with a daily capacity of 225 tonnes – will help to ensure local value addition. Natural rubber has enjoyed a growing share of total global rubber consumption, rising from 39% to 43% over the last decade. Through its Gabon Emergent strategy, the country's government is seeking to diversify its economy away from its reliance on oil, as well as retaining larger segments of the value chain within the country." (Economist Intelligence Unit, 2012)

Sources: Unilever: https://www.unilever.com/news/press-releases/2013/13-09-02-Unilever-and-government-of-Tanzania-sign-agreement-to-accelerate-sustainable-agriculture-growth-for-tea.html; Olam International: http://olamgroup.com/investor-relations/olam-insights/issue-12016-olam-palm-gabon-sets-benchmark-sustainable-large-scale-palm-plantation-africa/facts-olam-palm-gabon/; and Economist Intelligence Unit (2012) http://country.eiu.com/article.aspx?articleid=1089133893&Country=Gabon&topic=Economy&subtopic=Rec_9.

The creation at once of a very high number of direct wage jobs is therefore a main driver in governments decisions to sign such agreements with large agribusiness companies. It is common in fact for large estates to employ more than 1'000 workers (albeit many are not permanent but seasonal jobs) and in several cases to employ more than 5'000 workers. In few cases, large agricultural companies are the largest private employers in the country (such as Firestone rubber estates in Liberia, Unilever Tea estates in Kenya, or Compagnie Fruitière banana plantation in Cameroon). Moreover, large-scale farming operations often run outgrower schemes, creating income opportunities for a large number of smallholder farmers who are contracted to supply their produce to the company.

Although the quality of jobs in agricultural wage-employment is often very poor, due to low and unstable wages and poor working conditions, governments surely consider the creation of wage-employment opportunities an essential policy objective. In fact, the establishment of large agribusiness companies in undeveloped rural areas can offer the opportunity for local families in subsistence farming to get some family members into wage-employment and earn the cash income needed by the family to pay for important living expenses such as school fees, or seeds and fertilizers. Moreover, as discussed in the previous section, although very low paid, plantation and large-farm workers tend to receive relatively higher wages (including in-kind benefits) compared to agricultural wage workers of smaller farms.

Beyond job creation, governments might value other factors driving their choice to attract large-scale agricultural investors. First, large-scale farming operations in undeveloped rural areas can work as flagship firms, developing new supply chains, infrastructure, expertise and competences, thus enhancing the attractiveness of the region for other commercial farming and agro-processing companies. [8] For instance, it is common for large agricultural companies established in remote rural areas, to build roads connecting their nucleus farms to the villages around it, as well as to build schools and nurseries offering education and medical services to their employees and their families. Another decision driver is certainly the fact that large companies pay corporate income tax (even if only after initial tax holiday period is expired) representing an important income source for the government, and – if foreign owned – contribute to FDI, increasing the country's foreign exchange reserves (Aabø and Kring, 2012). Moreover, large companies have easier access to export markets and can therefore contribute to the country's exports and incoming of foreign currency. Last, but not least, governments could value the fact that big scale is needed for private companies to invest in agricultural R&D.

However, the contribution to wage employment of large-scale agricultural investment can turn out to be not so positive as initially hoped. For instance, Richardson (2010) shows how the absorptive capacity of large-scale investment in sugar cane production in southern Africa has been limited and has brought to higher inequality. Taking a case study of the South African company Illovo in Zambia, the argument is made that the potential for greater tax revenue, domestic competition, access to resources and wealth distribution from sugar/ethanol production have all been perverted and with relatively little payoff in wage labour opportunities in return. Richardson highlights that on one side this large-scale agro-industry has provided relatively high wages for those fractions of labour engaged as employees or contracted outgrowers, as well as benefited the wider estate community through its donations to public infrastructure. On the other side, however, it has used up substantial public resources to fund its smallholder scheme, resources that instead could have assisted other smaller-scale labour-intensive indigenously-owned agrarian projects (e.g. tomato paste, honey or groundnut production) which would have created more employment (per unit of allocated land) with less inequality.

Moreover, the income and employment impact of large-scale agricultural investments can differ across gender. Osabuohien et al. (2016) explore the gender impact of large scale agricultural investments in Tanzania. The two investments analyzed in this study are Kilombero Sugar Company Limited (KSCL) and the rice investment Kilombero Plantation Limited (KPL). Looking at these case studies, the authors find that female-headed households working in large-scale land investments have lower total consumption than female-headed households not working in large-scale land investments or participating in outgrower schemes. This result holds also for the total (male and female-headed) households sample, suggesting that a negative relationship may exist between the presence of large-scale land investments in communities and household consumption (either total or of female-headed households) (ibid. pp. 28–29). The authors also look at agricultural wage income as a share of total household income and find that this share is lower for female-headed households working in large-scale land investments compared to the total sample of households working in large-scale land investments. In contrast, female-headed households participating in outgrower schemes or not working in large-scale land investments tend to have the same share of agricultural wage in total household income as the total (male and female-headed) household sample (ibid. pp. 29–30). This result suggests that female-headed households may benefit from the presence of a large-scale land investment less than proportionally than male-headed households.

[8] See for instance the case of AgDevCo investment in Babator Farming Company in Ghana (http://www.agdevco.com/our-investments/by-investment/BABATOR-FARMING-COMPANY-BFC).

Similarly, Rao (2012) reports that in larger agribusinesses with processing plants, men tend to take the higher paid jobs such as mechanics and overseers, whereas women tend to work in repetitive tasks such as hand-picking. Even where women have the same jobs as men, they tend to be paid less. As observed by Rao, however, despite discrimination wage-employment in agriculture can provide women with an income source that they would otherwise not receive and other businesses may well be equally discriminatory if not worse (ibid. p. 9).

Outside Sub-Saharan Africa, Thapa (2013) examines the structure of employment in India's tea plantations and shows that the employment performance of the tea plantations in terms of quantity of employment has been sluggish and there has been increased casualization of the workforce. The analysis of the wage structure of plantation workers shows that the growth rate of the real wages and earnings of the workers has remained stagnant in recent years. Further, an increased use of piece-rated women workers, whose wages were lower than the time-rated workers, was observed.

Other risk factors should be considered by governments when trying to attract large-scale agricultural investment projects into the country.

First of all, large land concessions tend to dispossess local people, creating tensions with the local communities who depend on that land for their livelihoods (access to water, firewood, and farming activities). Regarding access to water, in areas where water is limited there is a risk that large scale farms – which typically have better water pumps and irrigation equipment, as well as formal rights to water in terms of water quotas or guarantees provided by the government as part of the investment plan – exhaust water sources at the expense of smaller surrounding farms. Moreover, large land concessions often involve clearing of large areas of tropical forest, putting at risk local biodiversity and the environment.

Next, large estates employing thousands of workers are riskier, because, should the company fail, thousands of workers in the same community would become unemployed at once. If several smaller farms were located in the same area, instead, the unemployment risk for the community would be lower as it would be diversified over several companies. Box 3 provides an example of this kind of risk associated to large agricultural companies.

Box 3

Sher Karuturi, the biggest flower firm in Kenya

Sher Karuturi was Kenya's biggest flower firm employing over 3,000 workers. However, in late 2012, the Kenya Revenue Authority started the process which would later determine that the multinational used transfer mispricing to avoid paying the government nearly Sh 2.1 billion at today's exchange rate ($ 20 million) in corporate income tax. The flower company had in earlier years been unable to adequately pay its Kenyan workers and creditors and had in the recent past been at loggerheads with the Kenya Plantation and Agricultural Workers Union. At the height of its troubles, unpaid workers went on strike for weeks on end crippling its operations (2014). The company went under in February 2014, after it faced cash flow problems and was placed in receivership. In 2016 the High Court ordered Naivasha-based flower exporter is to be sold after its Indian owners failed to defend a winding up petition filed at the High Court by creditors, leaving the fate of more than 3,000 workers uncertain.

Sources: farmlandgrab.org.

Furthermore, large agricultural producers can exert a monopolistic power on domestic and international food prices. For instance the Rockefeller Foundation warns in its report on Olam International's rice commercial farm in Nigeria:

> "More investigation also needs to be done into the potential impact of this type of model on competition and on the price of rice in national and international markets. If Olam comes to have a monopoly over domestic rice production, it will also have a great deal of influence on setting the price of rice both within Nigeria and in world markets." (Rockefeller Foundation, 2014).

Last, but not least, leveraging the power of big multi-nationals for quick results in terms of wage employment and exports might create a trade-off in terms of creating local knowhow and developing domestic businesses in the same sector. This trade-off could be avoided (or at least dampened) with appropriate policies to promote knowledge spillovers and production links between international companies and local firms. For instance, big agricultural companies could be allowed tax deductions for expenses run for training their suppliers or to provide them with irrigation kits, and local mid-size farms could be allowed fiscal or financial incentives to upgrade their technology and achieve quality certifications required by the international buyers. Note that this is a typical trade-off faced in structural transformation strategies in all the selected priority sectors, agricultural or manufacturing alike.[9]

[9] See also African Center for Economic Transformation (2014) and Galli (2017a) for further discussion of this topic.

3. The determinants of agricultural employment intensity

Faced with the fact that governments' investment policies do include and will continue including efforts directed towards the attraction of large foreign investors in agriculture, this section suggests that these policies should be designed to attract the specific investment projects that can maximize the quantity and quality (including income and wages) of jobs obtainable per hectare of cultivated land, at the same time increasing agricultural productivity with sustainable technologies and cultivation methods. This core principle shifts the focus from the total number of obtainable new jobs to the number and quality of jobs obtainable per hectare of land, making the trade-off between employment creation and land use explicit, and helps directing public choices towards the agricultural investment projects that can create more and better employment opportunities and increase agricultural productivity.

Agricultural employment intensity is defined in this context as the average yearly number of full-time equivalent workers employed per hectare of cultivated land. Under this definition, the creation of seasonal and part-time jobs in agricultural estates would imply a less than proportional increase in the number of jobs created by the estate per hectare. Analogously, factors allowing to reduce the seasonality of estate jobs or increase average working hours would be reflected in a higher employment intensity per hectare of cultivated land.

There are several factors and conditions determining the employment intensity of agricultural investments, which should be considered by governments in their efforts to attract and benefit from agricultural investment. The first is certainly the **type of crop**. As a matter of fact, some cultivations require more intense labour input than others. For instance, Evans et. al. (2010) observe that

> "because of the small fruit size and high numbers of fruit per plant, the picking and packing labor for a cherry or grape tomato crop can be substantially higher than large fruited-tomatoes" (ibid, p. 620).

On the other hand, Verité's report on Ecuador's palm oil sector (Verité, 2016) states that

> "palm oil requires far fewer workers than most other crops, leading to a high level of competition among workers for scarce jobs, which renders them easily replaceable and thus unable to protest poor conditions" (ibid, p. 3).

Similarly on sugar cane, Richardson (2010) observes:

> "it is worth noting that the labour intensity of the sugar industry is relatively low. For example, while 7,500 are formally employed in the sugar industry, around 200,000 people are informally engaged as outgrowers in the similarly sized cotton industry" (ibid, 2010).

More generally, governments can promote high-value agricultural products, which are

> "non-traditional agricultural commodities that either require special handling, such as fresh fruits and vegetables, or are processed in one or more post-harvest stages prior to reaching the end market, such as specialty coffee, asparagus and honey. These products tend to be significantly more labour intensive than cereal crops and other traditional agriculture, largely because mechanization is complicated by the need to prevent damage to fragile produce" (ILO, 2016, p. 26).

The second factor influencing agricultural employment intensity is the **productivity per hectare** of the crops. Typically, the amount of labour required increases if more tons are produced per hectare. For instance, certain land is naturally more suitable for some crops than others, so that cultivating the more productive crop would at the same time increase the

number of jobs created.[10] Moreover, using high-yield seeds also requires higher labour input per unit of cultivated land (Islam, 2014, p. 22). Interestingly, the direct relationship between productivity per hectare and employment intensity per hectare implies that farms adopting better farming practices and productivity enhancing technologies – such as high-yield seeds, planting superior *clonal rootstocks*, switching to *high-density plantation systems*, and adopting *Precision Agriculture* (PA) technologies (precision irrigation and fertigation in particular) – can have the double advantage of obtaining more tons of produce and creating more hours of work per hectare of cultivated land (see Box 4 for more information about clonal rootstocks, high-density plantation and PA technologies). Moreover, farms' higher productivity can have a positive impact on wages both because more productive farms would be in a better position to pay higher wages (if pressed for instance by social standards organizations) and because agricultural wage-workers are often paid according to their productivity (e.g. per kilo of harvested tea leaves, or by number of pruned plants).

Box 4

Clonal Rootstocks, High-Density Plantations and Precision Agriculture technologies

What are clonal rootstocks?

Rootstocks cloning is a scientific agronomic technique that allows to create several, identical plants from one mother plant. The mother plant is selected from many trees, according to desirable characteristics such as higher production, higher resistance to diseases or suitability to a specific soil type. For the farmer, this means that every cloned tree can grow and produce like the "best" tree, and that fruits are uniform in shape, colour, and flavour. Clonal rootstocks are obtained through vegetative propagation as opposed to seedlings germination. Clonal rootstocks therefore allow to obtain genetically superior plants, but in no way are a GMO (Genetically Modified Organism).

Sources: https://www.duartenursery.com/ag-science-and-technology/clonal-rootstock/

What are High-Density Plantations?

High Density Plantations (HDPs) are scientific agronomic techniques allowing to plant up to 20 times the number of trees normally planted per acre in traditional orchards. When coupled with irrigation and fertigation, HDPs have the potential to yield as much as 200% more produce than with the traditional method, and allow to obtain uniform export quality fruits. Given that the global availability of cultivation land is shrinking year after year, HDPs provide a concrete possibility for optimal utilization of limited land resources. HDPs are used in citrus fruit orchards, mango orchards in India and South Africa, and in one cocoa plantation in Ivory Coast (described below).

Sources: Singh, Jaiswal and Kumar (2017).

What is Precision Agriculture?

Digital technologies applications to agriculture go under the name of Precision Agriculture (PA) and are essentially based on digital sensor technologies. Sensor technologies are used in agriculture to measure soil humidity, pH and soil nutrient levels, animals' body temperature, mapping weeds, and other relevant indicators, allowing for substantial saving of resources (water, fertilizers and seeds) and for substantial increases in yield and reductions in harvest losses. Thanks to rapidly decreasing sensor prices, precision irrigation and precision fertigation tools have the potential to reach high levels of adoption in developing countries.

Source: Galli, R. (2017b).

[10] For instance Rwanda's main staple used to be sweet potato, but it was discovered that for many parts of the country the conditions were much more suitable for normal potatoes, so that much higher yields could be achieved per ha. In few years, the country switched from sweet to normal potatoes as main staple. We would like to thank Maikel Lieuw-Kie-Song for this observation.

At the same time, **prevailing wage levels** and ease at which labour can be recruited, can have an impact on agricultural employment intensity. If wages are very low, then firms have little incentive to manage, organize and train the workers to be more productive. This may explain some of the variation in employment intensity for the same crops.[11]

Another factor influencing agricultural employment intensity is **seasonality**. Very simply, seasonal agricultural products need more labour during the productive and harvest season and less labour off season. Given that agricultural employment intensity is defined in this context as the average yearly number of full-time equivalent workers employed per hectare of cultivated land, farms producing just one type of seasonal product – other things equal – would have a lower percentage of permanent employees (hence lower employment intensity) than farms producing a non-seasonal product or producing more than one product with different seasonalities. In this sense *multiple cropping*, i.e. the practice of growing two or more crops in the same piece of land in different growing seasons, reduces seasonality and helps creating more regular farm jobs throughout the year, consequently increasing the farm's employment intensity.[12] Similarly, technology upgrading of farms can reduce seasonality and increase the farms employment intensity. In particular, the switch from rain-fed to *irrigation* allows farms to extend the productive season over a longer span of the year compared to rain-fed cultivation, as well as to obtain more yield per hectare, leading to a higher and more stable labour demand over the year. For the same reason, the adoption of *digital precision irrigation technologies* would allow upgraded farms not only to optimize water resources and obtain higher yields, but also to increase the demand for permanent employees (as opposed to seasonal).[13]

A further factor influencing agricultural employment intensity is higher **quality** (hence higher unit value) of the agricultural products. This is the case of specialty products, hand-picked and hand-selected quality products, as well as of organic cultivation methods. In the case of cocoa, for instance, the care taken by the farmer in the various stages of production – from cutting the pods from the trees, scraping the beans out, to fermentation and drying – is an important factor in the end quality of the cocoa, and the price it will fetch on local and international markets (Anti-Slavery International, 2004, p. 11).

Finally, labour intensity per hectare depends on the degree of **mechanization** of the farm. Higher degrees of mechanization obviously lead to lower labour intensity per hectare. In this sense, the larger the **size of the farm** the more likely it is to mechanize the processes leading to a lower labour intensity per hectare. Note, however, that often in agriculture the mechanization of harvesting or subsequent processing implies a loss in quality and therefore

[11] We would like to thank Maikel Lieuw-Kie-Song for this observation.

[12] Multiple cropping can take the form of double-cropping, in which a second crop is planted after the first has been harvested, or relay cropping, in which the second crop is started amidst the first crop before it has been harvested. A related practice, companion planting, is sometimes used in gardening and intensive cultivation of vegetables and fruits. One example of multi-cropping is tomatoes + onions + marigold; the marigolds repel some tomato pests. Multiple cropping is found in many agricultural traditions. In the Garhwal Himalaya of India, a practice called *baranaja* involves sowing 12 or more crops on the same plot, including various types of beans, grains, and millets, and harvesting them at different times (https://en.wikipedia.org/wiki/Multiple_cropping, accessed on December 13th 2017).

[13] Of course, other policies could be implemented to create employment and income opportunities during seasons of low agricultural labour demand, as tourism or artisanal activities. Moreover, an improved employment framework for agricultural seasonal work could be created, so to upgrade it from purely casual or informal to regulated temporary employment.

a decrease in the unit value of the product. [14] This is not true instead for the sorting and packaging lines of commercial farms, which tend to be highly mechanized in the largest estates.

[14] For instance, the above-cited document by Anti-Slavery International (2004) reports that attempts to mechanize the cocoa pods opening process failed because the cutting systems often damage the cocoa beans (ibid., p. 11).

4. Data-base on crop labour intensities in large commercial farms in SSA

As argued in the previous section, in order to forecast the impact on employment and income of alternative large-scale private investments in agriculture, governments need to estimate the agricultural employment intensity of different projects, under alternative crop choices and production conditions. To the extent of our knowledge there are no quantitative datasets available systematically comparing labour intensities per hectare across different crops and production methods, but only scattered and mainly qualitative assessments of employment intensities of specific cultivations or agricultural investments (as in the above-mentioned papers by Evans et al., 2010; Richardson, 2010; Verité, 2016). A few studies provide quantitative estimates of employment intensities per hectare of specific large-scale agricultural investments (Baumgartner et al. 2015; Aabø and Kring, 2012).

The paper by Baumgartner et al. (2015) provides an ex-ante analysis under different scenarios of the impact on employment and income of a large-scale rice agricultural investment in Ethiopia (MIDROC's Saudi Star). Their simulation model requires, among the other coefficients, to make a quantitative estimation of the employment intensity per hectare of Saudi Star's farms. As explained by the authors:

> "Based on interviews with farm management personnel, we assumed low-labor intensity conditions (for rice production) at 0.2 jobs created per hectare (i.e., 40 per block). These jobs will be filled mainly by migratory workers (2/3) and to a lesser share by local labor (1/3)" (ibid., p. 184).

Regarding the employment intensity of different cultivation methods, the authors note that:

> "The farm management interview revealed that the farm will operate on 200 ha units (blocks). Each of these units will be cultivated by a block manager, a number of foremen, tractor drivers, field workers, and technical staff. Depending on the capital-intensity there will be a trade-off ratio of technical staff/tractor drivers vs. manual laborers" (ibid., p. 189).

The study by Aabø and Kring (2012) provides quantitative estimates of the employment intensity per hectare of 15 large-scale agricultural investment projects for biofuel production approved by the Mozambique government between 2007 and 2009. Specifically, the seven projects approved in 2008 were supposed to create an average of 0.102 jobs per acquired hectare, while the approved projects in 2009 and 2010 estimated an employment potential of 0.065 and 0.084 jobs per hectare respectively. As explained by authors, these estimates are

> "based on information provided by the investors in their investment proposals, as submitted to and approved by the government. It is unlikely that the investors have underestimated the employment generating potential of their investments" (ibid., p. 35).

Moreover, the authors report that according to a 2009 land audit, fifty percent of the approved projects had yet to begin, or were far behind schedule, and that according to Hanlon (2011), the job creation in biofuels was "less than the government had hoped for", at only 0.05-0.143 jobs per hectare (ibid., p. 35).

Although very valuable, the studies by Baumgartner et al. (2015) and by Aabø and Kring (2012) provide quantitative estimates of employment intensities per hectare of a *specific* cultivation (rice and biofuels respectively) in a *specific* farm or location (Saudi Star in Gambela, Ethiopia and rural Mozambique respectively). It would be useful to have several of this kind of studies to gather and compare information on employment intensities per hectare across different cultivations, locations and production methods. These data could be

used as a baseline for governments to compare the employment potential of alternative agricultural investment projects.

To our knowledge, the only published work comparing employment intensities across different cultivations, locations and production methods, is the World Bank report by Deininger and Byerlee (2011). Based on business plans for investments covered in case studies undertaken for the report, the authors show that employment intensities per hectare differ widely across crops of interest to large investors, ranging from 0.01 (i.e. 1 job per 100 hectares) in large-scale mechanized grain farming, to 0.35 (35 jobs per 100 hectares) for oil palm, and 0.42 (42 jobs per 100 hectares) for rubber and jatropha (a plant used for biodiesel production). As explained by the authors, this is because for tree crops and perennials – such as oil palm or rubber trees – key operations, especially harvesting, are usually manual regardless of farm size, whereas the ease of mechanizing grain production leaves greater scope to substitute capital for labour in large-scale investments. As for sugarcane used for ethanol production, the authors show how employment intensities differ according to the production method, ranging from around 0.15 (15 jobs per 100 hectares) in plantations with mechanized or partly mechanized harvest, to 0.70 (70 jobs per 100 hectares) in a manually harvested irrigated large-scale plantation in Tanzania (ibid., p. 39).

One of the main purposes of this paper is to contribute filling this information gap by collecting data on the number of wage employees per cultivated hectare for the largest agricultural companies in Sub-Saharan Africa, providing quantitative estimates of labour intensities for a certain number of cultivations, under different production methods and technologies.[15]

To this aim, we conducted an extensive internet-based research of the websites of the largest agricultural companies established in Sub-Saharan Africa. For each company, we took note of the total farm extension and the area currently under cultivation (in hectares), the number of permanent employees, the number of contract or temporary employees at peak season (if indicated), as well as the produce cultivated, the production methods and technology used (if indicated). Collected data are presented in the appendix to this paper.

Starting from the websites of different organizations (such as Max Havelaar Foundation, Environmental Justice Atlas and the Institute of Developing Economies of the Japan External Trade Organization) through "snowball" internet-based research we were able to collect data from the websites of 87 companies operating across 18 Sub-Saharan African countries, involved in different farming activities: banana plantations (4), citrus fruit estates (2), cocoa plantations (1), coffee plantations (4), floriculture farms (32), maize farms (4), oil palm plantations with palm oil extraction plants (10), pineapple plantations (6), rice growing and milling farms (3), rubber plantations (8), sugar cane estates with sugar factories (3), tea plantations (7), and tomatoes farms (3).[16]

All companies considered are large commercial farms (most of them belonging to Multi-National Companies, MNCs) with more than 100 permanent employees, and including both permanent and temporary workers (at peak) their size is as follows: 17 companies employ between 100 and 499 workers; 17 companies employ 500-999

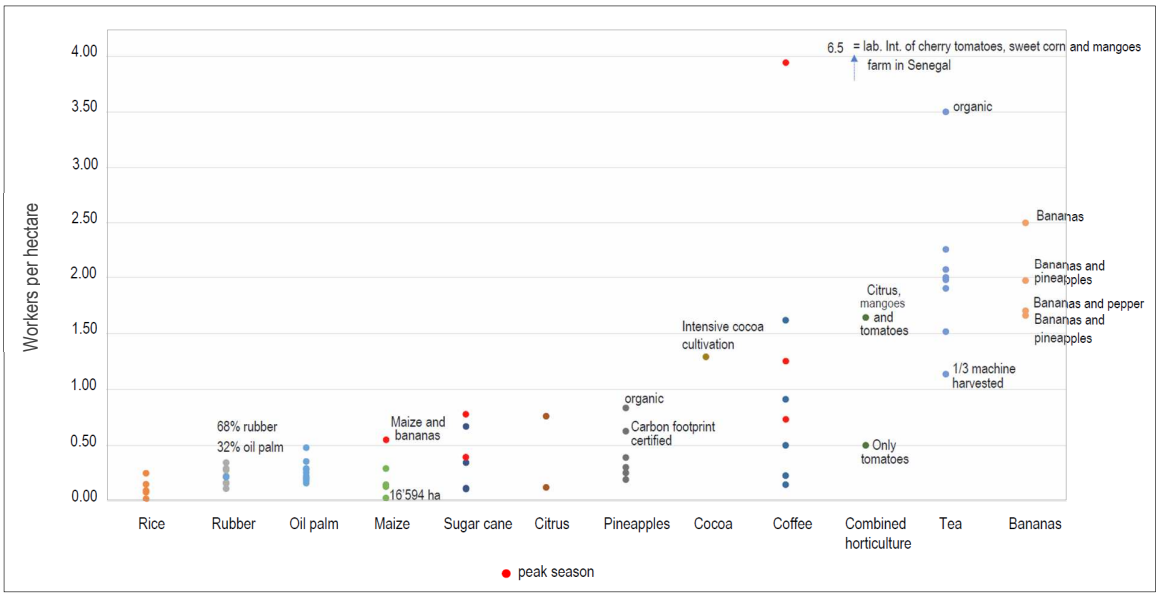
[15] Due to the limited scope of the present research project, the number of cultivation types considered is restricted to food crops. The growing of non-food crops (such as cotton or tobacco), the farming of animals, fishing and aquaculture, as well as forestry and logging sector are excluded from the analysis.

[16] The reason why floriculture is over-represented in our sample is because the Max Havelaar Foundation website provides information on farm size and number of employees of all Max Havelaar-certified farms, of which many are in floriculture.

workers; 33 companies employ 1'000-4'999 workers; 16 companies employ between 5'000 and 10'000 workers; and 2 companies employ more than 10'000 workers.

For each company we calculated the average number of workers employed per hectare of cultivated land. Where the number of workers in different seasons was indicated, we calculated the seasonal minimum and maximum employment intensities. Similarly, when the number of permanent and contract labourers was indicated, we calculated the permanent-jobs intensity and the overall employment intensity.

Figure 1: Crop labour intensities in selected large agricultural companies in Sub-Saharan Africa, excluding floriculture (workers per hectare)



Note: Lab. Intensity of cherry tomatoes, sweet corn and mangoes farm in Senegal (= 6.5) not shown in Figure 1.

Source: Author's calculations based on company-specific information.

Figure 1 shows the total number of workers (permanent and temporary) employed per hectare for each agricultural company grouped by kind of cultivation. Where the number of workers varies substantially across seasons (and the data is available), Figure 1 shows both the low season and peak season number of workers per hectare (peak season indicated by red markers, low season indicated by the crop-specific colour). In this way, the spectrum of all possible labour intensities can be observed for each cultivation.

At the lower end of our sample of employment intensities per hectare we found rice, rubber, oil palm and maize.

- **Rice:** our sample includes three large-scale rice plantations (of which two with rice processing plants) located in Ethiopia (1) and Nigeria (2). In two of these farms the observed employment intensity spectrum ranges from 0.02 to 0.09 jobs (including seasonal jobs) per hectare. This means that for every 100 hectares (around 70 football pitches) cultivated with rice only 2 (permanent) jobs up to 9 (permanent and seasonal) jobs are generated. In the third farm observed labour intensity is higher, ranging from 0.15 permanent jobs to 0.25 jobs per hectare in peak season. This last farm is described as an "irrigated and mechanised paddy farm, with state-of-the-art machinery and techniques, including GPS leveling". This farm is also reported to "still employ field laborers to harvest rice in some areas where machines cannot get in to do the work." Irrigation – which, as discussed in the previous section, increases farm productivity – and the partial reliance on hand harvesting could explain this farm's higher employment

intensity. However, no information is available on the level of mechanization of the other two farms.

- **Rubber:** our observations of eight large rubber plantations show employment intensities ranging from 0.11 to 0.34 per hectare, with median 0.22, including permanent and temporary employees. This means that 100 hectares cultivated with rubber trees generate between 11 and 34 permanent and temporary jobs. Note that since rubber trees are tapped to harvest the latex throughout the year, most of these jobs are not seasonal. Nevertheless, not all workers have a permanent contract (Veritè, 2016, p. 13). The proportion of permanent and temporary workers varies significantly across firms. For instance, the four plantations participated by SIPH (Societe Internationale de Plantations d'Heveas), are reported in the SIPH Annual Report 2015 (p. 33) to have the following number of permanent and temporary workers respectively:

SAPH (Ivory Coast)	4861 (permanent) (78%)	1351 (temporary)
GREL (Ghana)	553 (permanent) (17%)	2746 (temporary)
RENL (Nigeria)	2197 (permanent) (94%)	130 (temporary)
CRC (Liberia)	1199 (permanent) (97%)	37 (temporary)

  Further investigation is needed to understand why the proportion of temporary workers is so much higher in GREL rubber plantation in Ghana compared to the other three plantations belonging to SIPH.

  Note moreover that the plantation with the highest observed employment intensity (0.34) is cultivated both with rubber trees (68% of total cultivated area) and oil palm trees (32% of total cultivated area) and is equipped with one rubber factory, one palm oil mill and one palm kernel crushing plant, providing evidence in favor of the hypothesis that diversified cultivations and multiple cropping require more jobs per hectare than monocultures.

- **Oil palm cultivation and extraction of crude palm oil and palm kernel oil:** in the ten large-scale oil palm plantations (with integrated oil mills) included in the sample, the employment intensity spectrum ranges from 0.16 to 0.48 jobs per hectare, with median 0.24. This means that these plantations generate between 16 and 48 permanent and temporary jobs for every 100 hectares of cultivated land. Oil palm trees can be harvested all year round, so jobs are not seasonal in nature. Nevertheless, like in the case of the rubber plantations, not all workers in oil palm plantations have permanent jobs. While we could not find clear data on the number of permanent and temporary workers in the ten oil palm plantations included in our sample, there are indications that the living and working conditions, as well as the workers' compensation, in several oil palm plantations in Africa are problematic.[17]

- **Maize:** our sample includes four large maize farms, producing maize and other annual or seasonal crops (like wheat, soya and sorghum), or producing maize and fruit and vegetables (one farm, mainly bananas). Employment intensity ranges from 0.03 to 0.55 (permanent and seasonal) jobs per hectare, with median 0.21. Note that the farm with the lowest employment intensity (0.03, i.e. only 3 jobs per 100 hectares) is one of the

[17] For instance, the French National Contact Point for the implementation of the OECD Guidelines for Multinational Enterprises has been promoting an agreement with the Cameroon palm oil giant Socapalm and its owners (France's Bolloré) since 2010 to improve workers' conditions in Socapalm and its suppliers, improve stakeholders engagement with local communities, and reduce environmental damage (see http://www.tresor.economie.gouv.fr/File/426854).

largest included in our sample (16'594 ha under cultivation), providing evidence in favor of the hypothesis that beyond a certain threshold larger estates generate fewer jobs per hectare, due to the possibility to employ large-scale mechanized operations.[18] The farm with the highest employment intensity (0.55, i.e. 55 permanent and seasonal jobs per ha at peak) produces both maize and bananas, providing evidence that cultivating fruit and vegetables requires more jobs per hectare than cultivating maize and other annual crops, and that multiple cropping, in this case combining horticulture and annual crops, results in higher employment intensity.

Going on with the description of Figure 1, we find sugar cane estates with integrated sugar mills, citrus estates and pineapple plantations in the lower-middle labour intensity range.

- **Sugar cane:** the three large sugar cane estates and sugar factories included in our sample (one in Tanzania, one in Uganda and one in Zambia) report to employ from a minimum of 10 permanent workers per 100 hectares (0.1 w/ha) up to a maximum of 77 permanent and seasonal workers in peak season per 100 hectares (0.77 w/ha). Since sugar cane harvesting is a seasonal job, sugar cane estates generate a relatively high number of seasonal jobs, but a low number of permanent jobs per hectare (comparable to the least employment intensive rubber plantations). Note that the largest estate (Zambia Sugar, 17'000 ha) has the lowest labour intensity at peak season, suggesting that over a certain size threshold large-scale commercial operations have lower labour intensity per ha.

- **Citrus fruit:** the two large citrus fruit estates included in our sample (both in South Africa) present very different employment intensities: the largest citrus farm (9'000 ha) employs 0.1 workers per hectare (10 workers per 100 ha), while the smaller citrus farm (320 ha) employs 0.8 workers per hectare (80 workers per 100 ha). While this difference is probably explained by different technology levels, it is notable that the relatively smaller farm is described as "highly mechanised". On the other hand, the smaller farm reports that "fruit picking is done exclusively by hand" while no information about fruit picking methods is available for the larger farm. The difference in labour intensity could also be caused by the different technology level of the sorting and packing lines, in that the larger farm is equipped with a high-tech packing house.

- **Pineapple plantations:** in the six large pineapple plantations (all in Ghana) included in our sample, the observed employment intensity spectrum ranges from 0.2 to 0.8 jobs per hectare, with median 0.32. In other words these pineapple plantations employ from 20 up to 80 workers per 100 hectares of cultivated land. Note that the farm with the highest employment intensity per hectare (0.8) is the smallest in size (120 ha) and produces organic pineapples. Moreover it is notable that since pineapples are harvested throughout the year in Ghana, most workers have a permanent employment relationship with the plantations.[19]

[18] Note that a similar observation on the same farm (belonging to Zambeef) has been reported by Hall, Scoones and Tsikata (2017, p. 530): "In Zambia, the Zambeef Chiawa estate employs few people, and the workforce includes a substantial number of migrants from outside the area. As an increasingly mechanised operation, the levels of employment and degree of integration with the local economy are low. There is no local procurement or sale of produce into the local economy."

[19] This information is derived from the above-cited Banana Link's report on working and living conditions in banana and pineapple plantations in Ghana: "Sense of job security was high since 91% of respondents are permanent workers with only 9% still employed as temporary workers" (Addoah and Sulemana, 2016, p. 8).

Furthermore, Figure 1 shows relatively higher employment intensity in cocoa, coffee, tea and banana plantations, as well as in some large farms with combined horticulture production (i.e. tomatoes and fruit).

- **Cocoa:** as cocoa in Africa is mainly produced by smallholders, our sample includes only one large cocoa plantation (in Ivory Coast), reported to be one of Africa's largest industrial cocoa farms.[20] This is also Africa's first intensive cocoa cultivation based on innovative agronomic techniques (fertigation and high-density plantation). Labour intensity in this farm is 1.3 per hectare, i.e. 130 jobs per 100 ha.[21]

- **Coffee:** our sample includes four large coffee plantations (two in Ethiopia, one in Tanzania and one in Uganda). Bebeka Coffee Estate, located in the South West part of Ethiopia, is the biggest non-fragmented coffee plantation in the world. Due to the seasonality of coffee harvesting time, the observed labour intensity spectrum is rather wide across seasons, ranging from 10 to 90 permanent jobs per 100 ha, going up during peak season to 90-400 workers per 100 ha depending on the estate (median labour intensities: 0.36 w/ha and 1.43 w/ha for permanent and total workers in peak season respectively).

- **Combined horticulture (tomatoes, mangoes and other):** two farms included in our sample combine different vegetables and fruit production. In Ethiopia, the largest producer of citrus fruit and other tropical fruits in the country is also the main producer of tomato paste and tomato juice. The combination of perennial crops (1'200 hectare of citrus, 400 hectare of mango, and the remaining papaya, guava, lemon, lime and grape vine) and annual crops (2'000 hectare cultivated mainly with tomatoes, followed by haricot beans, cotton and maize) generates 164 jobs per 100 hectares, although of these only 21 are filled with permanent workers and the remaining 143 are daily labourers. The second farm is the major export horticulture company in Senegal, which reports to employ 2'000 workers over its 100 ha of greenhouses, 170 ha of open fields with market garden produce (mainly cherry tomatoes and sweet corn) and more than 40 ha of fruit culture (mango), averaging 650 jobs per 100 hectares. Note that these high employment intensities contrast with the employment intensity of 0.5 per hectare of a tomatoes growing farm in South Africa (also included in Figure 1), suggesting that combined horticulture requires more jobs per hectare than monocultures.

- **Tea:** our sample includes seven large tea plantations: two in Kenya, three in Rwanda and two in Tanzania. As in these countries tea is able to be harvested year round due to

[20] "The majority of cocoa farmers in West Africa are smallholders, with 22 per cent of cocoa produced on farms of less than two hectares, 65 per cent on farms of between two and ten hectares and only 12 per cent on plantations of more than ten hectares" (Anti-Slavery International, 2004).

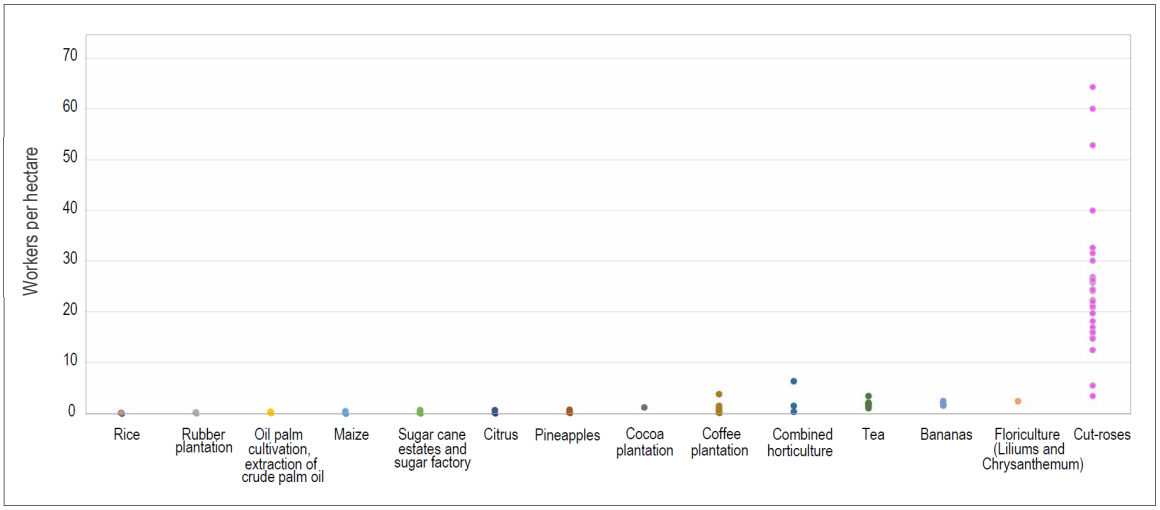
[21] Bloomberg reports that Solea, a unit of Brussels-based KKO International SA, is pioneering in central-eastern Ivory Coast, Africa's first intensive cocoa cultivation based on innovative agronomic techniques (fertigation methods – i.e. a micro-irrigation system bring water and soluble fertilizer to each of the plantation's 800,000 trees – enabling high-quality cocoa beans to be produced with rising yields). Moreover, in its experimental section, Solea is looking at ways to have 6,000 cocoa trees per hectare -- compared with 1,300 in a regular Ivory Coast plantation (this has only been tested on an experimental farm in Ecuador, under different climate conditions). The cocoa plantation will be Africa's biggest cocoa farm, spanning 1,949 hectares of land (of which 620 hectares already in operation) and currently employing 800 people. Bloomberg reports that the plantations are located in Ivory Coast's previous cocoa belt, where soil became unfertile and forest was decimated after years of extensive cocoa and coffee farming, leading to a drop in rain which prompted thousands of farmers to move to the nation's west in the search of better land. See Bloomberg, Biggest Africa Cocoa Farm Takes Shape in Central Ivory Coast, October 2016, https://www.bloomberg.com/news/articles/2016-10-09/africa-s-biggest-cocoa-farm-takes-shape-in-central-ivory-coast.

the lack of a cold season (with peak tea production coinciding with rainy seasons) [22], the seasonal variability in the number of jobs in the observed tea plantations is relatively limited. Nevertheless, most of the workers in these tea plantations have casual job arrangements and only a few are permanent workers. Employment intensity per hectare (including both permanent and casual workers) ranges from 1.13 to 3.5, with median 2, i.e. tea cultivation in the observed plantations generate between 113 and 350, with median 200, jobs per 100 hectares. Note that the lowest labour intensity (113 jobs per 100 ha) was observed in a tea company operating three tea estates in Tanzania, one of which is Africa's first 100% machine-harvested tea estate. Hence, the lower average labour intensity of the tea company. On the other hand, the highest labour intensity (350 jobs per 100 ha) was observed in a 100% organic tea plantation in Rwanda.

- **Bananas:** our sample includes four banana plantations: one in Cameroon, one in Ivory Coast and two in Ghana. Bananas in these countries are available throughout the year, so the reported number of jobs do not depend on season. In these plantations, labour intensity ranges from 1.7 to 2.5, with median 1.8, i.e. 170 to 250 jobs per 100 hectares. Note that three out of these four plantations intercrop bananas with pineapples or pepper, suggesting that multiple cropping is associated to relatively high employment intensities.

As already said, our data set on labour intensities per hectare includes also 32 large commercial floriculture farms (of which 31 produce cut-roses and one specializes in liliums and chrysanthemum). Of these, 4 are in Ethiopia, 25 in Kenya and 3 in Tanzania. The size of these farms ranges from 7 to 650 ha, with median 48 ha. The number of employees ranges from 150 to 11'000 with median 690.

Figure 2: Crop labour intensities in selected large agricultural companies in Sub-Saharan Africa, including floriculture (workers per hectare)



Source: Author's calculations based on company-specific information.

As shown in Figure 2, large floriculture farms have employment intensities that are much higher than most other commercial farms included in our data set. More specifically, the spectrum of employment intensities per hectare in the 31 cut-roses farms ranges from 3.5 up to 64.3, with median 22.3 workers per ha (w/ha). The farm specializing in liliums and

[22] See https://worldoftea.org/tea-harvest-dates/.

chrysanthemum employs 2.5 workers per ha. Note that since floriculture is not seasonal (production is mostly carried out in greenhouses) these jobs are not seasonal in nature.

Our observations indicate that the median number of jobs created per hectare in the cut-roses farms included in our sample (22.3 w/ha) is 131 times the average amount of jobs created per hectare *in peak season* by the two rice farms for which we know the number of seasonal workers employed (0.09 and 0.25 w/ha respectively), 101 times the median amount of jobs needed per hectare in rubber plantations (0.24 w/ha), 93 times the median amount of jobs created per hectare in oil palm plantations (0.22 w/ha), 70 times the median amount of jobs needed per hectare in pineapple plantations (0.32 w/ha), 16 times the median amount of jobs created per hectare *in peak season* in coffee plantations (1.43 w/ha), 12 times the median amount of jobs created per hectare in bananas plantations (1.8 w/ha) and 11 times the median amount of jobs created per hectare in tea plantations (2 w/ha).

Further investigation seems worthwhile, in order to have a better understanding of the characteristics of floriculture and the conditions under which the required amount of labour per hectare is so high. Certainly floriculture is known as a labour-intensive activity. Moreover, from our browsing of company websites it appears that most cut-roses farms operations take place in greenhouses (and in two cases with modern hydroponic methods)[23], which can be related to higher plant density and productivity, both in turn related to high labour intensity.

[23] Hydroponics is a method of growing plants without soil, using mineral nutrient solutions in a water solvent. In the observed farms, plants are grown in black polythene bags filled with coco peat. This method enhances the per unit area productivity while reducing water consumption.

5. Summary of findings and policy implications

In sum, our collection of data on wage employment, area under cultivation and cultivation methods of some of the largest agricultural companies operating in Sub-Saharan Africa, has allowed us to draw some empirical observations regarding agricultural employment intensities.

First, we found that agricultural employment intensities vary across different cultivations in quite a regular pattern – with rice, rubber, oil palm and maize presenting the lowest labour intensities per hectare; sugar cane, citrus and pineapple showing lower-middle labour intensities per hectare; coffee, tea, banana and horticulture showing higher labour intensities per hectare; and floriculture presenting the highest labour intensities per hectare.[24] The median number of workers required per hectare varies substantially across different cultivations. For example in our sample the median number of jobs required per hectare in pineapple plantations (0.32 w/ha) is 1.4 and 1.3 times higher than the median number of jobs required per hectare in oil palm (0.22 w/ha) and rubber trees plantations (0.24 w/ha) respectively. As for horticulture and floriculture, the median number of jobs created per hectare in the cut-roses farms included in our sample (22.3 w/ha) is 101 times the median amount of jobs needed per hectare in rubber plantations (0.24 w/ha) and 70 times the median amount of jobs needed per hectare in pineapple plantations (0.32 w/ha).

Second, we found that within-crop employment intensities vary according to farms productivity, seasonality, product quality, technology and farm size. More specifically, we have observed the following facts:

- Within-crop employment intensities tend to be higher in more productive farms (as in the case of irrigated farms and high-density plantations).

- Within-crop employment intensities tend to be higher in poly-cultures (i.e. combined cultivation of more than one crop on the same land at the same time) than in mono-cultures, particularly if farm includes some horticulture products.

- Within-crop employment intensities tend to be higher in organic farms, as organic production requires more labour (e.g. lower use of pesticides and more human weeding). Organic production is therefore more suitable in areas with higher rural unemployment.

- Within-crop employment intensities tend to be higher in relatively smaller farms. Very large farms – particularly those having a size over 10’000 hectares – tend to have the lowest labour intensities, suggesting that beyond a certain threshold employment intensity per hectare decreases with farm size, most likely due to the possibility to apply large-scale mechanized operations.

- Where mechanized harvesting is possible, it reduces crop employment intensity (as in the tea plantation included in our sample). Mechanization is therefore more useful in areas with more acute agricultural labour shortages.

[24] Note that the agricultural products resulting from the above-mentioned research by Hidalgo (2011) as opportunities to expand the productive structure of five East and South African countries include several medium and high employment intensity products, such as sugar cane, tea, horticulture (onions) and fruticulture (mangoes, guavas, pineapples, citrus fruits and bananas).

These findings suggest several possibilities to place employment, productivity enhancing technological upgrading, and sustainable development at the heart of the efforts to attract and benefit from agricultural investment. [25] Policy-makers aiming to achieve these goals could consider the following policy tools:

- **Promotion of data collection** on plantations/estates size and on permanent and temporary employment of large commercial farms, as well as on products cultivated, production method, and productivity (yield per ha). Specifically, large and medium scale agriculture investors could be required to report periodically on employment and productivities per ha. For this governments could develop a clear template and set of indicators for them to report on, leveraging on firms' production and HR data, with no additional data collection required. This would allow governments to calculate employment intensities per hectare under different crops and productivity conditions, and use them to forecast the potential direct employment impact of agricultural investment under alternative crop and productivity scenarios. To deepen understanding in this area, case studies of specific farms and interviews with farm managers would be very useful complementary tools to understand the relationships between employment intensity per hectare, products cultivated and production methods and to be able to formulate policies and mechanisms to influence them.

- **Promotion of farms cultivating employment intensive agricultural products**:

  - Promotion of employment intensive agricultural sectors, such as fruticulture, horticulture and floriculture.

  - Promotion of combined cultivations of less labour intensive crops (such as rice or maize needed for food security) with more labour intensive cultivations (such as bananas or horticulture products) so to increase the farm's average labour intensity per hectare.

  - Promotion of organic and specialty agricultural products.

Note that a shift towards the same employment intensive agricultural products by several countries might have an impact on global prices. Hence national agricultural investment policies should take into consideration the policies of neighbor countries as well as the final goal market. Moreover, quality standards required by high income countries on agricultural products may act as bottleneck and should be carefully considered. [26]

- **Promotion of environmentally conscious estate-level investments, agronomic practices and technological innovations to optimize farms' productivity per hectare while respecting the environment.**[27] Since higher farm productivity is associated with higher agricultural employment intensity, this can help the workers to receive higher wages. This could be done through fiscal or financial incentives, as well

[25] Promotion of labour-intensive agricultural production should preventively assess farm labour shortages and address it with accompanying policies. For example Mohan (2016) reports that: "in the Nepali case, firms upgrading to organic production could have adopted policies to foster immigration of laborers that would have helped households harvest good-quality tea leaf to address labor constraints." (ibid., p. 63)

[26] Thank you to David Kucera for these observations.

[27] It is important to underline that the goal of increasing productivity per hectare should be achieved through environmentally friendly investment and technological innovations, as otherwise it could stimulate the overuse of fertilizers, bringing a host of other environmental problems. Thanks to Maikel Lieuw-Kie-Song for this observation.

as by strengthening the knowledge flows between agricultural research centres, large and medium commercial farms, and government extension services. In particular:

- Promote the planting of superior *clonal rootstocks* and drought-resistant clone plants.

- Promote *High-Density Plantation systems* in conjunction with fertigation methods. By allowing to plant up to 20 times the number of trees normally planted per acre in traditional orchards, HDPs provide a concrete possibility for optimal utilization of limited land resources, at the same time requiring more employment per unit of land relatively to traditional orchards.

- Promote the adoption of *Precision Agriculture (PA)* technologies (precision irrigation and fertigation in particular). The increase in productivity associated to PA technologies would imply higher employment intensity per hectare and could have a positive impact on the income of those workers paid by piece rate or productivity target. Note that less wage labour might be required by the farms adopting PA technologies for watering or fertilizing activities, with the displacing effect on agricultural wage workers likely to be more significant for casual wage-workers.

- **Promotion of estate-level investments, agronomic practices and technological innovations reducing seasonality and weather-dependency of crops**, as lower seasonality and weather-dependency is associated with higher agricultural employment intensity and extended employability of workers throughout the year. This in turn could increase the proportion of permanent agricultural wage-workers and allow income increases for workers. Like above, this could be done through fiscal or financial incentives, as well as by strengthening the knowledge flows between agricultural research centres, large and medium commercial farms, and government extension services. In particular:

  - Promote irrigation investments to extend productive and harvest periods and reduce rain dependency.

  - Promote non-seasonal cultivations and poly-cultures versus mono-cultures (simultaneous cultivation of more than one crop with different seasonality on the same land).

- **Promotion of medium-sized farms.** As suggested above, beyond a certain size threshold labour intensity per hectare decreases with farm size, as large-scale mechanized processes become viable. In contrast, medium-scale commercial farms can be more prone to invest in productivity enhancing technologies rather than in mechanization. Since higher productivity is associated to higher employment intensity, medium-scale commercial farms can create more jobs per hectare than large-scale commercial farms, at the same time being large enough to adopt modern technologies and to compete internationally. As medium-scale farms might be credit-constrained (as suggested by the "missing middle" argument), financial incentives should be put in place to facilitate the access of medium farms to bank credit.

In sum, this paper has argued that agricultural investment policies should be formulated with stronger recognition that land is the scare resource, and agricultural employment can be generated through the adoption of sustainable, productivity-enhancing technologies. By promoting the "right" type of agricultural investments – i.e. farms cultivating employment intensive agricultural products; environmentally friendly estate-level investments, agronomic practices and technological innovations to optimize farms' productivity per hectare reducing seasonality and weather-dependency of crops (such as the planting of

superior clonal rootstocks and drought-resistant clone plants, high-density plantation systems and precision fertigation methods); and medium-sized farms – it is possible for governments to hit the policy "trinity" of creating employment, optimizing the use of limited land resources, and increasing agricultural productivity in a sustainable way.

It should be reminded, however, that promoting employment intensive cultivations – such as horticulture or floriculture – is not sufficient to develop a new sector able to expand and sustain its absorptive capacity over time, especially when aimed at exports and connected to agro-food Global Supply Chains. In order for a new sector – even as technologically simple as floriculture – to break into and flourish in the context of increasingly powerful global buyers and increasingly stringent quality standards, local capabilities must be developed that go beyond the production process, and involve "soft" skills like management, logistics, or marketing. As Gebreeyesus and Sonobe, we think that "*This endeavour cannot be left to the market and individual firms alone, but requires coordination between firms and within industries and strong private–public partnerships*" (Gebreeyesus and Sonobe, 2012, p. 346).

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Appendix

Farm-size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (1/6)

Crop/ processing activity	Host country	Name of company	Major shareholder/ owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Bananas and pepper	Cameroon	Société des Plantations du Haut Penja (PHP)	Compagnie Fruitière	France	3,530	6,000	1.7	1.8		Compagnie Fruitière is the largest private employer in Cameroon.	n.a.
Bananas and pineapples	Ivory Coast	Société de Culture Bananière (SCB)	Compagnie Fruitière	France	3,800	6,300	1.7		In Abidjan, Compagnie Fruitière has built the only laboratory of banana and pineapple plantlets on the African continent. These plantlets are guaranteed as GMO-free and enable to cultivate healthy plants of high quality in all of the group's plantations.	SCB joined the Compagnie Fruitière group in 1997. It is the largest private employer in Ivory Coast. It accounts for 56% of Ivory Coast's banana exports.	n.a.
Bananas and pineapples	Ghana	Golden Exotics Limited (GEL)	Compagnie Fruitière	France	1,115	2,200	2.0			Created in 2003, GEL is the leading main plantation of bananas and pineapples in Ghana.	n.a.
Bananas and pineapples	Ghana	Volta River Estates Ltd (VRE)		Ghana / Netherlands	200	500	2.5		VREL reports to minimize the use of agro-chemicals and to replace the use of chemicals mainly with manpower, employing close to 500 permanent workers.	VREL was established in 1988 by a Ghanaian/ Dutch venture with the support of the Ghanaian Government.	n.a.
Citrus	South Africa	ALG Estates	privately owned	South Africa	320	243	0.759375	0.5	Farming operations are highly mechanised and include orchard management with computerised irrigation. Fruit picking is done exclusively by hand and transported to ALG's own packhouse where it is graded according to quality and size and treated to prolong shelf-life.		n.a.
	South Africa	Mouton Citrus	privately owned	South Africa	9,000	1,100	0.1		Open Hydroponic Drip Irrigation Systems supply trees with just right daily optimal irrigation; high-tech packing house.	Mouton Citrus is one of South Africa's leading growers and exporters of top quality citrus fruit and Rooibos tea.	n.a.
Cocoa growing	Ivory Coast	Solea	KKO International SA (KKO)	Belgium	620	800	1.3	1.3	Africa's first intensive cocoa cultivation based on innovative agronomic techniques (fertigation and High-Density Plantation).	KKO is a pioneer for intensive cocoa cultivation	n.a.
Coffee plantation	Ethiopia	Bebeka Coffee Estate Plc.	Horizon Plantations PLC - Midroc Group	Saudi Arabia	10,030	2200 (permanent) + 94 (contractual); 5000-7000	0.2 w/ha (permanent only); 0.7-0.9 w/ha (peak season)	0.36 (permanent) 1.43 (at peak)	The plantation also produces considerable quantities of black pepper, cinnamon, cardamom, ginger and turmeric; has a trial plot for the production of vanilla along coffee, and runs a beekeeping scheme to enhance pollination of its coffee trees.	Bebeka Coffee Estate Plc. is the biggest non-fragmented coffee plantation in the world.	n.a.
	Ethiopia	Limmu Coffee Farm	Horizon Plantations PLC - Midroc Group	Saudi Arabia	8,000	4'000 (permanent) + 6000 (seasonal)	0.5 (permanent only); 1.25 (perm. and seas at peak)		In addition to the ample rainfall that all our farms receive, the six farms are all endowed with abundant river water that flows through the farms giving them potential for supplementary irrigation.	The six farms under Limmu Coffee Farm administration makes the farm the largest owner of modern coffee plantation in the country.	n.a.
	Tanzania	Burka Coffee Estates Ltd (BCE)			330	300 (full-time); + 1000-2000 (peak season)	0.9 (permanent only); 4-6 (perm. and seas at peak)		Burka Coffee Estates operates two independent wet mills on-site giving it full control of coffee processing.	The six farms under Limmu Coffee Farm administration makes the farm the largest owner of modern coffee plantation in the country.	n.a.
	Uganda	Kaweri Coffee Plantation Ltd.	Neumann Kaffee Gruppe (NKG)	Germany	1,700	250 (full-time); up to 2500 (peak season)	0.1 (permanent only); 1.6 (perm. and seas at peak)		Due to the location at the equator, Kaweri experiences two rainy- and two dry seasons and the farm does not apply irrigation. Blooming usually takes place in February and July and coffee thereof is harvested 9 – 12 months later. The farm harvests coffee almost throughout the year but, with peaks in December/January and May/June.	The six farms under Limmu Coffee Farm administration makes the farm the largest owner of modern coffee plantation in the country.	n.a.

Farm size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (2/6)

Crop / processing activity	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Floriculture	Ethiopia	Ethiopian Meadows PLC	Karuturi Global Ltd.	India	75	3000	40.0	22.1	The entire production is under greenhouses. The farm is equipped with propagation facility. Drip irrigation systems are used to supply water and fertilisers. Weeding, cleaning of greenhouses and spraying form a part of the daily routine.	Karuturi Global Limited is the world's largest producer and exporter of cut roses with operations spread across Ethiopia, Kenya and India.	n.a.
	Ethiopia	Golden Rose Agro-Farm Ltd			22	590	26.8				n.a.
	Ethiopia	Red Fox PLC	Dümmen Orange	Netherlands	40	2400	60.0				n.a.
	Ethiopia	Sher Ethiopia	Afriflora	Netherlands	650	11000	16.9		cut-roses	Sher Ethiopia is the largest rose farm in the world.	Fairtrade
	Kenya	Bigot Flowers Kenya Ltd	Bigot Group	France	48	1000	20.8				n.a.
	Kenya	Black Petals Ltd	Black Tulip Flowers	Kenya	40	500	12.5				n.a.
	Kenya	Flamingo Flowers	Flamingo Horticulture		92	2250	24.5				n.a.
	Kenya	Fontana Ltd	Fontana Flowers PLC	India	110	2000	18.2		cut-roses		n.a.
	Kenya	Harvest Flowers			40	1200	30.0				n.a.
	Kenya	Laurel Investments Ltd.	Black Tulip Flowers	Kenya	35	780	22.3				n.a.
	Kenya	Liki River Farm			23	578	25.7				Fairtrade
	Kenya	Mahee Flowers			14	337	24.1				n.a.
	Kenya	Oserian			230	6004	26.1				n.a.
	Kenya	Panda Flowers			50	800	16.0				Fairtrade
	Kenya	Penta Flowers			57	1500	26.3				Fairtrade
	Kenya	Primarosa Flowers Ltd			100	1500	15.0		Aqua Check soil moisture management (software producing graphs with indication of root activity to monitor and manage irrigation in greenhouses, improving irrigation scheduling and reducing water consumption).		n.a.
	Kenya	Ravine Roses	Karen Roses Ltd Group	Kenya	57	1200	21.1				n.a.
	Kenya	Shalimar Flowers			170	600	3.5		Shalimar Flowers produces cut-flowers and vegetables.		Fairtrade
	Kenya	Sher Karuturi	Karuturi Global Ltd.	India	188	3000	16.0		In addition to the conventional methods of farming, the company adopted the modern hydroponics method wherein plants are grown in black polythene bags filled with coco peat. This method enhances the per unit area productivity while reducing water consumption. The farm was equipped with a fertigation unit and drip irrigation system, and sprayed with environment friendly fungicides.	Sher Karuturi was Kenya's biggest flower firm. In 2016 the High Court ordered the company is to be sold after its owners failed to defend a petition filed at the High Court by creditors, leaving the fate of its 3'000 workers uncertain.	n.a.
	Kenya	Sian Roses			95	1873	19.7				Fairtrade
	Kenya	Simbi Roses Farm			23	558	24.3				Fairtrade
	Kenya	Tropiflora Ltd			40	500	12.5				Fairtrade
	Kenya	Tulaga Flowers Ltd			7	220	31.4				Fairtrade
	Kenya	Utee Biotech Pvt Ltd	Black Tulip Flowers	Kenya	60	150	2.5		Specialising in the growing of Liliums and Chrysanthemum		Fairtrade
	Kenya	Valentine Growers			27	398	14.7				Fairtrade
	Kenya	Waridi Farm			79	438	5.6				Fairtrade
	Kenya	Zena Roses - Asai			13	328	26.2		cut-roses		Fairtrade
	Kenya	Zena Roses - Sosiani			11	581	52.8		cut-roses		Fairtrade
	Kenya	Zena Roses - Thika			12	400	32.5		cut-roses		Fairtrade
	Tanzania	Hortanzia Farms Ltd			7	450	64.3		Hortanzia Farms' main activity is the production of fresh cut roses under hydroponic cultivation. It also propagates rose plants using high-performance greenhouses. Other products grown at the farm include green beans, baby corn, coffee and maize.	80% of output is made up of cut roses, exported to Netherlands, Norway and UK. Lower-quality roses go to the domestic market. Maize and vegetables are produced for sale on the domestic market.	n.a.
	Tanzania	Kiliflora			50	1100	22.0			Kiliflora Ltd. is the largest grower of roses in Tanzania supplying quality cut flowers and fillers mainly to markets around the world.	Fairtrade
	Tanzania	Mount Meru Flowers Ltd			15	295	19.7				Fairtrade

Farm size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (3/6)

Crop / processing activity	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Horticulture (citrus, mangoes and tomatoes)	Ethiopia	Upper Awash Agro-Industry Enterprise	Horizon Plantations PLC - Midroc Group	Saudi Arabia	4200	900 (permanent workers) + 6000 (daily workers)	0.2 w/ha (permanent only); 1.64 w/ha (permanent and daily)	1.64	Located on the upper course of the Awash River, UAAIE uses flood irrigation to irrigate its crops. Currently, the farm is being re-structured through state-of the-art production and processing technologies. Planned investments in heavy-duty trucks and machineries, greenhouses, fruit sorting line, etc.	UAAIE is the biggest producer of oranges, mandarins and other tropical fruits like mango and papaya in Ethiopia.	n.a.
Horticulture (cherry tomatoes, sweet corn and mango)	Senegal	Société des Grands Domaines du Sénégal (GDS)	Compagnie Fruitière	France	300	2000	6.5	6.5	Located on the edge of the River Senegal, it develops its crops in greenhouses over 100 hectares, in open fields with 170 hectares of market garden produce and more than 40 hectares of fruit culture (mango). A conditioning station with electronic grading enables to prepare the sale of tomatoes in the best possible conditions, under the "Doona" brand, out of season compared to the European offer.	Created in 2003 by Compagnie Fruitière, GDS is today the major export horticulture company in Senegal.	n.a.
Horticulture (tomatoes)	South Africa	Tshalata Farms	domestic company		400	200	0.5	0.5		A large portion of the company's tomato crop is exported to Mozambique, Zimbabwe and Botswana.	n.a.
Maize and bananas	Ethiopia	Gojeb Agricultural Development	Horizon Plantations PLC - Midroc	Saudi Arabia	1000	145 (permanent) + 400 (seasonal)	0.15 (permanent only); 0.55 (permanent and seasonal)	0.21	The farm comprises about 2'000 ha of cultivable land, of which 50% is used for sheep breeding, 25% for fruits and vegetables and 25% for annual crops (mainly maize), involving double cropping for the latter using irrigation.	Gojeb Agricultural Development is one of the major source of organic fruits and vegetables in Ethiopia.	n.a.
Maize, sorghum, grain and onion	Ghana	Babator Farming Company (BFC)	AGDEVCO (investor)	UK	356	85 (permanent) + 19 (casual)	0.24 w/ha (permanent); 0.29 w/ha (permanent and seasonal)		356 ha of modern irrigation infrastructure installed. 65 FTE jobs created and sustained in 2016, of which 35% were women. As of Q1 2017, the headcount amounted to 85 permanent staff and 19 casual workers. The average income uplift amounted to $1,347 per FTE employee, which is significant given the rural setting of the farm.	AgDevCo has created BFC and committed a total $6.3m to establish a 356 ha modern farm and prove that commercial farming can be sustainable in this part of Ghana, under irrigation.	n.a.
Maize, soya and dry sugar beans	Mozambique	AC Matama	AGDEVCO (investor)	UK	950	122	0.1		In 2016, the company produced maize, soya and dry sugar beans over 950 ha and sold 3,131t to local markets. Trials of other crops, such as potatoes, is on-going. In 2016 AC Matama expanded its smallholder network to 68 farmers and employed 122 staff.		n.a.
Maize, wheat and soyabean	Zambia	Mpongwe Farms	Zambeef Products PLC	publicly-owned company	16594	450	0.0		The farm produces maize and soybeans during the summer, and wheat and maize during winter. It has 10 combined harvesters each with a grain capacity of 10 tonnes and 25 tractors. The farm provides raw materials for further value add processing within the Group.	The farm, which has been running from 1978 under different ownership, is one of the biggest not only on the Copperbelt but in Zambia.	n.a.

Farm size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (4/6)

Crop / processing activity	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Oil palm cultivation, extraction of crude palm oil	Cameroon	Socapalm	PalmCam SA	Cameroon	34980	6400	0.2	0.24	All plantations are endowed with an oil mill and with modern technical agricultural and industrial services.	Socapalm has six plantations and a head office in Douala.	n.a.
	Cameroon	Société Africaine Forestière et Agricole du Cameroun (SAFACAM)	Socfin Group	Luxembourg/ Switzerland/ Belgium	9505	2758	0.3		5348 ha of oil palm trees (56% of total cultivated area) 4157 ha of rubber trees (44% of total cultivated area)		n.a.
	Democratic Republic of Congo	Brabanta	Socfin Group	Luxembourg/ Switzerland/ Belgium	6169	2954	0.5				n.a.
	Gabon	Olam Palm Gabon (OPG)	Olam international (60%) Government of Gabon (40%)	Singapore	24998	5200	0.2			Olam International is developing seven industrial and agro-industrial projects in a number of joint-ventures with the Gabonese Republic. OPG operates 3 processing units.	n.a.
	Ghana	Ghana Oil Palm Development Company Ltd (GOPDC)	Société d'Investissement pour l'Agriculture Tropicale (SIAT)	Belgium	8505	3'000 (peak season)	0.4 (peak season)		Seed nuts are purchased from Benin (Pobé) or Ivory Coast (Lamé). After germination in a germination room, the sprouted seed are planted in the pre-nursery. After 3 months of growth, the seedlings further develop for 6 months in the main nursery before being transplanted into the field. To save water, GOPDC has established an innovative system of drip-irrigation for the main nursery. It has resulted in a decrease of about 80% of the water consumption. Using satellite and Lidar technology and ground truth observations, GOPDC has built a Geographic Information System (GIS) to make an inventory of all the farms in its catchment area. This system allows management to follow up productivity up to the plot level and to trace back all fruit that arrives at the GOPDC mill. Linked with the farmers' accounts, the GIS allows the traceability and follow-up of each individual farm.	Integrated agro-industrial company specialized in the cultivation of oil palm, extraction of crude palm oil and palm kernel oil. GOPDC produces refined specialty oils for use by the food industry. In addition, in 2012, GOPDC diversified into the cultivation of rubber trees.	n.a.
	Ghana	Plantation Socfinaf Ghana (PSG)	Socfin Group	Luxembourg/ Switzerland/ Belgium	5687	1271	0.2		5044 ha of palm oil trees (89% of total cultivated area) 643 ha of rubber trees (11% of total cultivated area)		n.a.
	Nigeria	Okomu Oil Palm Company Plc	Socfin Group	Luxembourg/ Switzerland/ Belgium	21799	3822	0.2		14 464 ha of palm oil trees (66.4% of total cultivated area) 7 335 ha of rubber trees (33.6% of total cultivated area)		n.a.
	Rep. of São Tomé and Principe	Agripalma	Socfin Group	Luxembourg/ Switzerland/ Belgium	2210	630	0.3		1 palm oil factory planned for 2018		n.a.
	Sierra Leone	SAC	Socfin Group	Luxembourg/ Switzerland/ Belgium	12319	3128	0.3				n.a.
	Zambia	Zampalm	Zambeef Products PLC	Zambia	2612	120 (permanent) + 400 (seasonal)	0.05 (permanent only); 0.20 (permanent and seasonal)				n.a.

Crop / processing activity	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Pineapples	Ghana	Bio Exotica			120	100	0.8	0.35		Bio Exotica was established in Ghana in 2003. One of their principal products is organic pineapples. Its products are exported to the European market.	Global GAP; Fairtrade; Control Union Certifications of Netherlands.
	Ghana	Bomarts Farms Ltd	privately owned	Switzerland / Ghana	1,620	631	0.4		Bomarts is an integrated farm, processor and exporter of pineapples and mangoes. It also has a factory to produce dry mangoes, the main product, pineapples and coconuts.	Bomarts is an integrated farm, processor and exporter of pineapples and mangoes. It also has a factory to produce dry mangoes, the main product, pineapples and coconuts.	Euro GAP; Fairtrade
	Ghana	Gold Coast Fruits Ltd (GCF)	?	Germany / Ghana / UK	400	260	0.6			Established in 2005, GCF is Ghana's 4th largest pineapple exporter shipping to Europe, North Africa and Middle East. GCF is the first pineapple farm in Africa to get Carbon Footprint certificate (PAS 2050).	Carbon Footprint Certificate (PAS 2050); Fairtrade
	Ghana	Jei River Farms Ltd (JRF)	privately owned (domestic?)		1,861	469	0.3		Pineapples are handpicked and go through a three stage selection process. According to JRF, this labour intensive process has ensured that it has the highest quality pineapples, which has won it the prize of best pineapple farm in Ghana.	JRF is a leading producer and exporter of fresh fruits in Ghana. Ist pineapples are exported to Germany, Switzerland, UK, France and Italy.	Euro GAP; Fairtrade
	Ghana	Milani Farms Ltd (MF)	privately owned	Switzerland / Ghana	800	242	0.3		Packaging station with an integrated cold storage warehouse in the heart of the plantation (built in 2007).	MF is one of the most important pineapple producers in West Africa.	Fairtrade
	Ghana	Sam Valley Farms Ltd			647	125	0.2			Sam Valley Farm currently serves the European and Middle Eastern markets with MD2 pineapple variety.	Global GAP

Farm size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (5/6)

Crop / processing activity	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Rice growing and rice milling	Ethiopia	Saudi Star Agricultural Development	Midroc Group	Saudi Arabia	14,000	4000, of which 1300 locals: 300 (permanent) + 1000 (seasonal)	0.29 (total); 0.02 (locals, permanent only); 0.09 (locals, permanent and seasonal)	0.09	Rice plantation (with rice processing plant)		n.a.
	Nigeria	Kereksuk Rice Farm	privately owned	Nigeria	8,000	600	0.1		Rice plantation (no rice processing)	Kereksuk Rice Farm is Nigeria's second largest commercial rice farm by land size (45'000 ha). The owner, Mr. Rotimi Williams, is a 36 year-old Nigerian entrepreneur.	n.a.
	Nigeria	Olam Nigeria Ltd (ON)	Olam International	Singapore	4,000	600 (permanent); up to 1'000 (peak season)	0.15 (permanent only); 0.25 (perm. and seas. at peak)		Rice plantation (with rice processing plant). Irrigated and mechanised paddy farm, with state-of-the-art machinery and techniques, including GPS leveling. "Olam is still employing field laborers to harvest rice in some areas where machines cannot get in to do the work." It has partnered with the West African Rice Development Association to test new rice varieties, both grown in irrigated paddies and rain-fed.	ON operates an integrated rice farm and milling facility, set up as a nucleus and out-grower farming model. Currently 3'000 farmers are engaged aas outgrowers, with a target of 16'000 by 2018.	n.a.
Rubber plantation + rubber processing plant	Ghana	Ghana Rubber Estates Ltd (GREL)	SIPH (Societe Internationale de Plantations d'Heveas)	France	14735	553 (permanent) + 2746 (temporary)	0.2	0.22		SIPH is Africa's leading natural rubber producer and exporter. Michelin holds 23.6% of SIPH 's capital.	n.a.
	Ivory Coast	Societe Africaine de Plantations d'Heveas (SAPH)	SIPH (Societe Internationale de Plantations	France	22564	4861 (permanent) + 1351 (temporary)	0.22 (permanent only); 0.28 (permanent and temporary)				n.a.
	Ivory Coast	Société des Caoutchoucs de Grand Béréby (SoGB)	Socfin Group	Luxembourg/ Switzerland/ Belgium	23332	8037	0.3		15861 ha of rubber trees (68% of total cultivated area) 7471 ha of palm oil trees (32% of total cultivated area) 1 palm oil mill, 1 rubber factory and 1 palm kernel crushing plant		n.a.
			SIPH (Societe Internationale				0.21 (permanent only); 0.21 (permanent and				n.a.
	Liberia	Cavalla Rubber Corporation (CRC)	de Plantations d'Heveas)	France	5809	1199 (permanent) + 37 (temporary)	temporary)	0.22			
	Liberia	Firestone Natural Rubber Company	Bridgestone Americas	US	48157	8000 (of which 500 in hevea wood factory)	0.16 (excluding hevea wood factory jobs)		FNRC produces Block Rubber which is tapped from rubber trees, processed to technical specifications in the factory, packed, and shipped to its tire plants in North America. Since 2009, FNRC also produces hevea woodproducts (made from unproductive rubber trees).	Firestone is the largest private employer in Liberia.	n.a.
	Liberia	Liberian Agricultural Company (LAC)	Socfin Group	Luxembourg/ Switzerland/ Belgium	13801	3996	0.3			LAC is the country's second largest producer, with a volume of over 15'000 tons per year.	n.a.
	Liberia	Salala Rubber Corporation (SRC)	Socfin Group	Luxembourg/ Switzerland/ Belgium	4616	517	0.1		SRC's rubber comes from its own plantation, but also from smallholders in the nearby villages. Since 2011, the raw material provided by the smallholders combined with that of the Salala plantation has not been enough to keep the Weala production equipment operating. The factory has therefore been shut down and all output is sent to the LAC factory 150 km southeast of Salala.		n.a.
	Nigeria	Rubber Estates Nigeria Ltd	SIPH (Societe Internationale de Plantations d'Heveas)	France	14060	2'197 (permanent) + 130 (temporary)	0.16 (permanent only); 0.17 (permanent and temporary)			SIPH is Africa's leading natural rubber producer and exporter. Michelin holds 23.6% of SIPH 's capital.	n.a.

Farm size, number of employees and labour intensity in selected large agriculture companies in Sub-Saharan Africa (6/6)

Crop / proA89:L99	Host country	Name of company	Major shareholder / owner	Owner's base-country	Cultivated area (ha)	Number of wage employees	Crop labour intensity (workers/ha)	Median labour intensity (total workers at peak/ha)	Info on products and production methods	Info on company	Certifications
Sugar cane estates and sugar factory (and electricity from biogas)	Tanzania	Kilombero Sugar Company Ltd. (KSC)	Illovo Sugar Limited	South Africa	8,000	850 (permanent) + 1'900-4'500 (seasonal)	0.1 (permanent only); 0.3 (perm. and seasonal); 0.7 (perm. and seas. at peak)	0.67		KSC is the largest sugar-processing company in Tanzania, with two processing factories. Sugar-cane is cultivated on the company's own nucleus estate of 8000 ha, supplemented by cane from outgrower farmers operating over 12,000 ha. Presently, exports are minimal.	n.a.
	Uganda	Kakira Sugar Works	Madhvani Group	Uganda	9,700	7,500	0.8			Sugar-cane is cultivated on the company's own nucleus estate of over 9,700 ha, supplemented by cane from over 4,000 outgrower farmers (with more than 11,000 ha under cane), for production of sugar.	n.a.
	Zambia	Zambia Sugar Plc (ZS)	Illovo Sugar Limited	South Africa	17,000	1'950 (permanent) + 4'700 (seasonal, at peak)	0.1 (permanent only); 0.4 (perm. and seas. at peak)			ZS is Zambia's largest sugar producer, with a sugar factory and a refinery for internal electricity generation. Sugar-cane is cultivated on the company's own nucleus estate of 17,000 ha, supplemented by cane from about 160 outgrower farmers operating over 12,000 ha.	n.a.
Tea	Kenya	James Finlays Kenya Limited	Finlays - John Swire & Sons	Hong Kong	5,000	9,500	1.9	2.00	James Finlays has a technology where tea is no longer transported from the fields using truck but are transported through conveyor belts to the processing chambers. At James Finlays, tea is plucked or harvested using machines hence reducing the time of harvest which traditionally was through hand picking.	Finlays is one of largest producers of tea in the world.	n.a.
	Kenya	Unilever Tea Kenya	Unilever	UK	8,250	12'500 (permanent) + 4'000 (seasonal)	1.5 (permanent only); 2 (permanent and seasonal)			Unilever Tea Kenya is the largest private sector employer in Kenya	n.a.
	Rwanda	Kitabi Tea Estate	Rwanda Mountain Tea Ltd	Rwanda (?)	900	35 (permanent) + 2'000 (casual, monthly average)	0.04 (permanent workers only); 2.3 (permanent and casual)				n.a.
	Rwanda	Rubaya Tea Estate	Rwanda Mountain Tea Ltd	Rwanda (?)	835	230 (permanent) + 1'500 (casual, monthly average)	0.3 (permanent workers only); 2 (permanent and casual)		Tea processing was upgraded from manual manufacturing to automated manufacturing—involving installation of two lines of Continuous Fermentation Units (CFU). "Before privatization 1Ha of Rubaya tea fields would yield roughly 6,000 tons of GL per year. Today it has increased to 8,000 tons of GL. By 2016, yields are projected to increase further to 9,000 tons of GL per HA. Increase in GL yields is attributed to consistent increase in size of tea plantations and good agricultural practices like regular weeding, use of adequate fertilizers, pruning and periodical plucking closely monitored and supervised by trained agronomists."		n.a.
	Rwanda	Rutsiro Tea Estate	Rwanda Mountain Tea Ltd	Rwanda (?)	289	11 (permanent) and 1'000 casual workers	0.04 (permanent workers only); 3.5 (permanent and casual)		From the onset, RMT strategized to make all tea plantations in Rutsiro 100% organic (hence the higher labour intensity).		n.a.
	Tanzania	Rift Valley Tea (RVT)	Rift Valley Corporation	Zimbabwe	2,200	2,500	1.1		The Kibena estates (730 ha) are Africa's first 100% machine-harvested tea estates (hence the overall lower labour intensity).	RVT operates three tea estates with factories. In addition, it operates one factory dedicated specifically to smallholders.	n.a.
	Tanzania	Unilever Tea Tanzania Ltd (UTT)	Unilever	UK	3,030	6,000	2.0			UTT's annual production of about 9,000 mt of made tea accounts for almost 40% of Tanzania's tea output. The tea is grown and processed in three factories. The company also processes about 300 mt of tea per annum from nearby smallholders.	n.a.

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