Joint Discussion Paper Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 16-2014

Susanne Väth and Michael Kirk

Do contract farming and property rights matter for rural development? Evidence from a large-scale investment in Ghana

This paper can be downloaded from
http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/index_html%28magks%29

Coordination: Bernd Hayo • Philipps-University Marburg
Faculty of Business Administration and Economics • Universitätsstraße 24, D-35032 Marburg
Tel: +49-6421-2823091, Fax: +49-6421-2823088, e-mail: hayo@wiwi.uni-marburg.de

Do contract farming and property rights matter for rural development? Evidence from a large-scale investment in Ghana*

SUSANNE JOHANNA VÄTH** AND MICHAEL KIRK

Institute for Co-operation in Developing Countries,
University of Marburg, Am Plan 2, 35032 Marburg, Germany
** correspondence to: vaeth@staff.uni-marburg.de

* We would like to thank the people and organizations who supported our research: the sector project "Land Policy and Land Management", a planning unit of the German Agency for International Co-operation (Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ), and the Ghana Market-oriented Agriculture Programme (MOAP), a joint program of the Federal Republic of Germany and the Ministry of Food and Agriculture of the Republic of Ghana (MOFA) for financial and/or logistical support; and Simone Gobien, Klaus Deininger, Martin Petrick, Annelies Zoomers, Bernd Hayo, Christian Traxler, and Kerstin Nolte for valuable comments on the paper.

Abstract

With the rising demand for agricultural land, land deals must be designed to benefit not only the investors but also the local population. This paper looks at two ways this might be done for farmers in the vicinity of a large-scale oil palm investment in Ghana: contract farming and secure property rights to land. We compare farmers to whom outgrower contracts were allocated, in a quasi-natural experiment, with independent oil palm growers. We find that property rights have a significantly positive effect on households' agricultural income, profit per acre, and perceived future security, but that while contract farming has a significantly positive effect on households' aggregated assets and perceived future security, its effect on agricultural income and profit per acre is significantly negative because of effort substitution, since outgrowers have a higher probability of engaging in non-farm business. The identified effects are highly significant and supported by robustness checks. We conclude that large-scale investment need not be to the disadvantage of the local population if it respects existing bundles of property rights and may be beneficial for those who participate in contract farming.

JEL classifications: D60, O17, Q13

Keywords: Contract farming; Property rights; Large-scale land investment; Quasi-natural experiment; Oil palm; Ghana

1. Introduction

Driven by the latest food, fuel, and financial crises, private and public investors from all over the world are rediscovering the agricultural sector and investing in large tracts of arable land. However, their demand for food and fodder, industrial raw materials, bio mass, or safe financial investment does not necessarily coincide with host countries' demand for economic integration of the local population, infrastructure development, employment creation, and technology transfer (Borras and Franco, 2012; Cotula and Vermeulen, 2011; Deininger et al., 2011; De Schutter, 2011; Görgen et al., 2009). In particular, where properly enforced legal frameworks are lacking, customary ownership is often inappropriately recognized (German et al., 2013; Deininger et al., 2011; Sjaastad and Cousins, 2008; Ray, 1996), and poor documentation and weak enforcement of rules and regulations prepare the ground for rent-seeking activities and elite capture (Nolte and Väth, 2013; Ubink and Quan, 2008). There is therefore a danger of land being acquired at the cost of the local population (Amanor, 2012, for Ghana; Wisborg, 2012, for Ghana; Schoneveld et al., 2011, for Ghana; Cotula et al., 2009; von Braun and Meinzen-Dick, 2009).

Although risks are high and institutional environments are challenging, large-scale investment in agricultural land may – if well-designed – be a means to close yield gaps after decades of neglect of agriculture in developing countries (HLPE, 2011; World Bank, 2008; Bruinsma, 2003). It is therefore worth learning from the experience of a country like Ghana that aims to maximize welfare. The aim of our study was to investigate whether contract farming can forge a sustainable link between the local population and an investor.

Whether outgrower schemes[2] can simultaneously enable an investor to benefit from local land resources and small-scale farmers to commercialize their agricultural production is subject to debate. Some researchers point to increased efficiency as a result of overcoming rural market imperfections (e.g. Saenger et al., 2013; Bellemare, 2012; Minten et al., 2009; Simmons et al., 2005); others point to increased vulnerability because of one-sided risk transfers from the investor to the farmers (e.g. Yaro and Tsikata, 2013; Sivramkrishna and Jyotishi, 2008; Porter and Phillips-Howard, 1997; Little and Watts, 1994). As Narayanan (2014) shows, the effects of outgrower schemes vary according to the contracted commodity and the contracting company. It is thus inappropriate to generalize. Our study looked at potentially beneficial contract farming in a competitive setting where the investor has an excess demand due to large production capacities and offers long-term contracts for tree crop production to rural households whose land rights remain untouched.

Our study benefits from a setting in which contracts were allocated in a quasi-natural experiment where farmers did not influence their assignment to the treatment (contract farmer) or the control group (independent farmer) (see DiNardo, 2008, for a discussion on quasi-natural experiments). Our analysis therefore does not suffer from reverse causality problems and biases caused by unobserved differences between treatment and control group. This enables us to estimate the causal effect of contract farming and go beyond a number of studies that fail to eliminate possible selection bias with regard to famers' attitudes, geographical placement, and the selection criteria applied by the company, as highlighted by Barrett et al. (2012). Our study complements a recent strand of literature addressing possibly unobserved ex-ante heterogeneity, such as Dedehouanou et al. (2013), Bellemare (2012), Rao and Qaim (2011), Ashraf et al. (2009), Minten et al. (2009), and Miyata et al. (2009).

[2] The terms 'contract farming' and 'outgrower scheme' are used interchangeably in this study.

Considering various transmission channels of contract farming, we complement household-level measures of asset endowment and agricultural income with plot-level measures of profit per acre. Household data enables us to capture the overall effect, including potential spillover effects; for example, knowledge transfer may improve agricultural income from non-contracted plots when outgrowers switch to new agricultural techniques, and access to credit may foster outgrowers' investment beyond oil palm production and in turn enhance their asset endowment. Plot data enables us to emphasize direct productivity effects; for example, contracted plots may increase profits because of quality inputs supplied by the investor or decrease profits because of principal-agent problems since the investor cannot completely monitor the outgrower's effort on the contracted plot.

To gain a more comprehensive picture, we add a subjective well-being measure to these objective outcome variables (MacKerron, 2012; Frey et al., 2002). Following Cummins's (1996) 'domains of life satisfaction' approach, we draw on satisfaction with future security and use subjective well-being as a proxy for self-assessed utility (Krueger and Schkade, 2008).[3] This enables us to analyze the risk-reducing effects of contract farming that cannot be assessed using conventional monetary outcome variables (Dedehouanou et al., 2013).

We go beyond Dedehouanou et al. (2013), who were the first to relate contract farming to subjective well-being when analyzing overall life satisfaction. Although they point to various transmission channels linking contract farming to subjective well-being (e.g. income and productivity effects, security aspects, or health and work-related conditions), their outcome variable 'overall life satisfaction' does not make it possible to differentiate between these channels. In contrast, with our measure of perceived future security, we detach the security

[3] Cummins (1996) identifies eight domains of life satisfaction: standard of living, personal health, life achievement, future security, personal relationships, personal safety, community connectedness, and spirituality/religion.

aspects of contract farming from income, productivity, and wealth effects, which we assess separately.

Finally, by using multiple outcome variables, we differentiate between flow and stock measures (Grootaert, 1983; Sahn and Stifel, 2003). Whereas the former capture short-term effects, which are often highly volatile, such as agricultural income or profit per acre, the latter assess more stable long-term impacts such as asset endowment and perceived future security.

We find that holding an outgrower contract has a significantly positive effect on the household's asset endowment and the perceived future security of the household head. Thus, contract farming improves households' welfare and performs a risk-reducing function in rural areas where markets are often imperfect and social safety nets underdeveloped. This is in line with research by Huddleston (2006), who describes beneficial effects of contract farming for oil palm farmers in Ghana and Indonesia, and Pagliettie and Sabrie (2012), who describe positive effects for rubber and sorghum outgrower schemes in Ghana. Nonetheless, our analyses show that being an outgrower has a significantly negative effect on a household's agricultural income and the oil palm profit on contracted plots. Similarly, besides some positive effects, Pagliettie and Sabrie (2012) also identify inefficiencies in sorghum production under contract. However, given our finding that outgrowers are significantly more likely to engage in non-farm business, this poor performance might be caused by effort substitution. In this regard, our case study provides empirical evidence of a fairly beneficial connection between a large-scale investor in agricultural land and the surrounding local population.

In our study we show that various bundles of property rights to land have a positive effect on agricultural income, plot profit per acre, and perceived future security. This is in line with analyses of monetary outcome variables by Abdulai et al. (2011), Goldstein and Udry (2008),

and Besely (1995), who show the importance of property rights given the weak land administration system in Ghana, and with the findings of Gobien (2014), van Landeghem et al. (2013), and Huq et al. (2007), who show for Cambodia, Moldova, and Bangladesh respectively a positive relationship between landownership and measures of subjective well-being. Our study's additional contribution is that it shows the importance of secure property rights for local land users adjacent to a large-scale investment.

The remainder of the paper is organized as follows. Section 2 derives hypotheses about possible effects of contract farming and property rights to land; Section 3 provides background information on the oil palm investment and argues that the implementation of the outgrower scheme occurred as a quasi-natural experiment; Section 4, the empirical analysis, presents an overview of our data and first descriptive analyses, introduces the estimation strategy, and provides estimation results and the associated robustness tests; and Section 5 concludes.

2. Possible effects of contract farming and property rights

In general, the term "contract farming" comprises institutional arrangements that formalize a farmer's supply of a contracted commodity to a processing or retailing company (Grosh, 1994). Many studies find positive outcomes of this kind of farming. For example, they find that it helps participants to overcome various market shortages, be better integrated into the value chain, earn higher (agricultural) income, and be more productive (e.g. Bellemare, 2012, for Madagascar, Escobal and Cavero, 2012, for Peru; Rao and Qaim, 2011, for Kenya; Miyata et al., 2009, for China; Simmons et al., 2005, for Indonesia; Warning and Key, 2002, for Senegal). By facilitating access to credit, high value inputs, and better extension services than are usually provided in rural areas, outgrower schemes can enhance investment and efficiency (e.g. Begum et al., 2012, for Bangladesh; Key and Runsten, 1999, for Mexico; Glover, 1984,

for less developed countries). In addition, contract farming can produce positive spillover effects for non-contracted crops and for neighboring farmers who do not hold a contract (e.g. Bellemare, 2012, for Madagascar; Govereh and Jayne, 2003, for Zimbabwe; Warning and Key, 2002, for Senegal). When outgrowers invest more, and over a longer period, than they would if they were independent farmers, and at the same time use their resources more efficiently, they can accumulate extra wealth from higher returns to investment. Thus, participation in an outgrower scheme may also have a positive influence on households' aggregated assets.

Beyond lowering transaction costs, contract farming is often associated with risk sharing (e.g. Key and Runsten, 1999 for Mexico) and can therefore have a positive effect on perceived future security. By enabling households to secure the sales of their produce regardless of peak and lean seasons, it decreases price and income volatility (e.g. Michelson et al., 2012 for Nicaragua, Bolwig et al., 2009 for Uganda; Minten et al., 2009 for Madagascar). Agricultural extension service by the contracting firm may result in improved management practices, which in turn produce higher self-esteem (Dedehouanou et al., 2013 for Senegal). When such a positive change in attitude contributes to a better social standing, it may enhance outgrowers' access to social safety nets and thus have an additional positive influence on their perceived future security.

Many other researchers, however, find negative outcomes. They observe that contract farming can lead to risk transfers from companies to farmers and thus increase the already very unequal power relations (e.g. Singh, 2002, for India; Porter and Phillips-Howard, 1997, for Nigeria and South Africa; Little and Watts, 1994, for sub-Saharan Africa). This not only decreases farmers' autonomy, it also increases their vulnerability because of their heavy dependence on the contracted crop (e.g. Kirsten and Sartorius, 2002, for developing countries; Key and Runsten, 1999, for Mexico; Porter and Phillips-Howard, 1997, for Nigeria and South

Africa). When a company secures only its own risks in such a setting, there is a strong probability that outgrowers' perceived future security and agricultural income will decrease. There is also a risk of hold-ups when processors, especially exporters, reject produce on the grounds of non-compliance with quality standards (e.g. Sivramkrishna and Jyotishi, 2008, for India). This can decrease outgrowers' agricultural income and in the long run also their asset endowment when they have to dispose of assets to mitigate income shocks.[4]

However, the negative effects of outgrower schemes may be caused not solely by the contracting company but also by the farmers. This can be explained by the principal-agent problem that is inherent to contract farming (Lajili et al., 1997). Because of time restrictions and high monitoring costs, the principal (the company) is unable to fully monitor the agent (the outgrower). This opens the door to a moral hazard problem, where outgrowers may exploit the asymmetric information for their own benefit. Instead of following the intention of the contract and maximizing the outcome of the contracted plot, farmers may relocate inputs and effort to other plots or other tasks, resulting in a lower plot profit per acre and in turn possibly decreasing agricultural income.

In our particular setting the contract does not specify special quality standards, thus hold-up risks are expected to be low. This seems to be especially the case as the contracted crop is also traded at local markets, which can provide alternative sales channels and enhance outgrowers' bargaining power. Given that the investor, the company that buys the produce and does the processing, has underutilized production capacity and thus an excess demand, it is unlikely to breach contract on its side.[5] Outgrowers, furthermore, cultivate multiple plots with various

[4] Further negative effects have also been found: higher pressure and increased workloads can reduce farmers' subjective well-being (Dedehouanou, 2013), companies may extract maximal rents at the cost of the outgrowers, and the poorest farmers may be excluded from participation (Key and Runsten, 1999, for Mexico), rural social differentiation may be increased (e.g. Escobal and Cavero, 2012, for Peru; Singh, 2002, for India; White, 1997, for Indonesia), and the local political ecology may be ignored (Yaro and Tsikata, 2013, for Ghana).

[5] Our study took advantage of the structure of Ghana's underfinanced oil palm sector. Since the 1970s, when government-backed investment was based on land expropriation by the military government, four large-scale investments, now privatized, have dominated the sector. The rest of the sector consists of thousands of small-

commodities; we therefore expect that they are not heavily dependent on the contracted crop. Consequently, we assume for our setting that the positive effects of outgrower schemes outweigh the negatives and suggest the following hypothesis:

> Contract farming has a positive effect on asset endowment, perceived future security, agricultural income, and profit per acre.

With the establishment of a large-scale agricultural investment, land availability in the area declines and, with the increased pressure on the remaining resources, tenure security becomes of utmost importance. Many studies show that secure property rights to land provide incentives for long-term investment as they guarantee that future profits return to the landowner (e.g. Ali et al., 2012, for Pakistan; Ali et al., 2011, for Ethiopia; Abdulai et al., 2011, for Ghana; Fenske, 2011, for West Africa; Galiani and Schargrodsky, 2010, for Argentina; Deininger and Feder, 2009, on a general matter; Holden et al., 2009, for Ethiopia; Goldstein and Udry, 2008, for Ghana; Place and Otsuka, 2001, for Malawi; Gavian and Fafchamps, 1996, for Niger; Besley, 1995, for Ghana). Thus, property rights to land increase the productive use of land resources (e.g. Bellemare, 2013, for Madagascar; Chand and Yala, 2009, for Papua New Guinea; Holden et al., 2009, for Ethiopia; Goldstein and Udry, 2008, for Ghana; Deininger and Jin, 2006, for Ethiopia; Banerjee et al., 2002, for India) and in turn enable landowners to transfer effort from agricultural activities and property protection to non-farm business or the labor market (Field, 2007). Thus, secure land rights can translate into higher profit per acre and higher agricultural income. Apart from efficiency gains through

---

scale farmers cultivating roughly 85% of the estimated 285,000 ha of oil palm plantations (Poku and Asante, 2008). Because the capacity of the large-scale mills is larger than the big players' plantations can supply, investors are forced to obtain additional oil palm fruit (Fold, 2008). But as landownership in Ghana is fragmented among various chieftaincies, families, and individuals with rather low willingness to lease land on a long-term basis to foreigners (Kasanga and Kotey, 2001), it is rarely possible to acquire more land to convert into large-scale oil palm plantations. The investors have therefore been forced to link up with small-scale farmers. With government initiative and donor support, this has led over the past three decades to contract farming being implemented as a rather new rural institution, with the investors' aim being to run their mills efficiently and the public's aim being to close the persistent yield gap between large-scale plantations and small landholdings.

higher productivity, clearly defined property rights also facilitate land sales and rentals, which increase factor mobility and, in turn, allocation efficiency (Deininger and Chamorro, 2004, for Nicaragua, Besley, 1995, for Ghana).

Secure property rights to land can also serve as collateral, which facilitates access to credit (Carter and Olinto, 2003, for Paraguay; Feder and Nishio, 1998, for Thailand; Feder and Onchan, 1987, for Thailand) and enhances a landowner's position in social networks (Binswanger et al., 1995). These rights thus increase food security by enhancing a landowner's ability to cope with shocks (Deininger, 2003) and, by reducing exposure to risks, should have a positive effect on perceived future security. However some studies point out that perceived tenure security is often more crucial than registered property rights (Awuah and Hammond, 2013; Abdulai, 2006; Dekker, 2003).[6] Therefore, our second hypothesis is:

> Perceived secure property rights to land have a positive effect on perceived future security, agricultural income, and profit per acre.

3. Research setting

3.1 Contract farming as a quasi-natural experiment

In 1976 the Ghana Oil Palm Development Company (GOPDC) was established as a state-owned company in the Kwaebibirem District of the Eastern Region in order to expand the oil palm business and foster development in this remote area (Adjei-Nsiah et al., 2012; Fold and Whitfield, 2012; Fold, 2008; Huddleston and Tonts, 2007; Huddleston, 2004). Today it is the biggest palm oil producer in Ghana and the biggest employer in its district. In 1995, the Belgian investor Société d'Investissement pour l'Agriculture Tropicale (SIAT) took over the

[6] This is in line with findings by Abdulai and Hammond (2010), for Ghana, that land registration is not a prerequisite for obtaining formal loans and Jacoby and Minten (2007), for Madagascar, that land titles do not result in higher investment.

majority shares of the company (GOPDC, 2013; SIAT, 2013). In the course of privatization the state transferred a 50-year leasehold (as of 1976) for the Kwae Concession directly to the investor. This concession comprises 8,953 ha including the land containing the mill and housing structures (Republic of Ghana, 1976). In 2000 a second 50-year leasehold, the 5,205 ha Okumaning Concession, was transferred to the GOPDC to expand its oil palm plantations (Republic of Ghana, 2008).[7]

Complementary to the plantation system, an outgrower scheme was established in 1986 as a World Bank-supported development project with the twofold aim of running the mill in an economically efficient manner and integrating the local population into the economy by recruiting as many outgrowers as possible from a broad pool of rural farmers (World Bank, 1994; interview with Lands Commission senior official; interview with GOPDC senior manager)[8]. Expert interviews and focus group discussions revealed that the outgrower scheme had been expanded in waves over the years.[9] This expansion did not follow a clear pattern but came about arbitrarily as a consequence of the differing financial status and changing policies of various GOPDC managements. When a decision had been made as to the time and extent of an expansion, the management would then select the area where it would be put into effect. Each particular expansion wave was thereby strictly limited to a demarcated area to keep transaction costs low for inspecting potentially suitable farms, carrying out training activities, and later collecting the fruit (interview with GOPDC senior manager). It was thus impossible to anticipate where – if at all – to expect the next extension wave. Hence, because the pace,

[7] For more details on GOPDC please refer to Väth (2013).

[8] Our quantitative database was enriched by semi-structured expert interviews conducted in the Kwaebibirem District and Accra in October and November 2011. Due to the sensitiveness of the topic, interviews were not recorded. To guarantee the anonymity of the interviewees, we reveal their (rough) position and organization but not their names.

[9] We also conducted focus group discussions from September to November 2011 with groups of independent farmers and outgrowers in the Kwaebibirem District. They were conducted in the local languages Twi and Fante, recorded and transcribed in English. Between 7 and 15 participants per group were selected according to perceived wealth levels.

scope, and sites of expansion were unpredictable, farmers could not migrate strategically in order to self-select into the scheme.

The company offered a contract at short notice to those farmers who had a ready-to-cultivate plot in a specific area at a specific time (interviews with GOPDC senior managers; interview with outgrower association executives).[10] Farmers considered themselves lucky to get a one-time offer by the time their plots were cleared. They had the option to refuse the offer but, according to interviews with the executives of the outgrower association and focus group discussions with farmers, the rejection rate was as good as zero. According to Fold (2008) and Huddleston (2006), farmers were keen to access credit and technology and were motivated to sign a contract.

However, farmers were only eligible to participate if they could prove secure land use rights for a period of 25 years by holding either documented property rights or a long-term sharecropping arrangement (GOPDC, n.d.). Given the weak land administration system in Ghana, deed registration is poor in rural areas and titles to verify ownership rights are to date not available in the Kwaebibirem District. Nevertheless, the predominantly customary land tenure system of the Akyem area around the GOPDC proved to be dynamic and partially filled this gap (Amanor, 1999; Gyasi, 1994) as family heads and chiefs began to document customary rights upon request and for a small fee. This enabled landowning farmers to enter into an outgrower contract with a kind of "informal deed" (GOPDC, n.d.). The cocoa industry of the late 19th century had made long-term sharecropping arrangements common in Akyem (Amanor and Diderutuah, 2001; Amanor, 1999; Gyasi, 1994).[11] The GOPDC therefore also

[10] A ready-to-cultivate plot is one that is not currently under cultivation. Farmers in our research area typically cultivate various plots with food (maize, plantain, cocoyam, cassava etc.) and cash crops (cacao, citrus and oil palm) that can be partly intercropped (interview with Ministry of Food and Agriculture official). Given the different crop cycles over multiple farms and periods under fallow, rural households have from time to time a ready-to-cultivate plot available.

[11] As has been shown for other parts of the world (Otsuka et al., 1992), sharecropping is a flexible instrument for improving allocation efficiency of land and labour resources as a reaction to land pressure caused by the

offered tripartite contracts to farmers who had held a sharecropping agreement for at least 25 years. Such contracts were similar to those offered to farmers possessing customary ownership except that the landlord had to agree by signing the contract (GOPDC, n.d.).

Independent oil palm farmers also rely on long-term land use rights. Given the high investment costs and the late break-even point around the seventh year after planting (Poku and Asante, 2008), they only grow oil palm if they hold customary ownership or long-term sharecropping arrangements that are expected to guarantee usufruct rights. As the poorest are unlikely to possess secure land rights for a long period and to be able to afford high investment costs, they are unable to engage in any kind of commercial oil palm farming. Watts (1994) confirms that the poorest do not participate in the GOPDC's outgrower scheme. Given this exclusion, which is caused by the nature of the crop and thus also pertains to independent oil palm farmers, the poorest do not belong to the population under consideration in our study and thus cannot cause any bias.

Furthermore, the GOPDC did not apply selection criteria specific to the characteristics of the plot. Interviews with two managers revealed that the company merely organized a short farm visit to confirm that the potential land for the scheme was low land. Low land is not intrinsically of better quality than high land, but it is more suitable for oil palm cultivation, and Ghanaian farmers have long balanced their needs for low and high land for various crops through sharecropping arrangements (Amanor and Diderutuah, 2001; Gyasi, 1994). Thus, the visit can be understood as a pro forma measure. This holds true especially as technical suitability such as the soil fertility or rainfall patterns of the plots under consideration were also not assessed because of measurement costs and the desire to expand the outgrower scheme quickly to run the mill efficiently (interviews with GOPDC senior managers). Moreover, neither the outgrower association executives nor the GOPDC's staff reported that

establishment of plantations and population growth. Thus, sharecropping arrangements tend to be as important as customary claims for assessing long-term land use rights.

the criterion of accessibility played a role. Even though it was at first declared that a plot should not be more than 400 meters from an accessible road (GOPDC, n.d.), the underdeveloped road system allowed for a completely arbitrary definition of accessibility. Thus, differences in the performance of independently managed plots and outgrower plots are not caused by the GOPDC's plot selection criteria, because these criteria were either common knowledge (and therefore applied without the help of the GOPDC) or only existed on paper (and thus were not enforced).

Another set of selection criteria was supposed to be used to assess individual characteristics. Originally, the GOPDC intended to target Ghanaian nationals aged 18 to 45, but Huddleston's data (2006) reveals that the age criterion was not implemented. This was confirmed in interviews with two outgrower association executives and three GOPDC managers. We did not find any evidence that the GOPDC tried to assess personal or socio-economic characteristics. Hence, differences in the performance of farmers with and without contract are not based on selection bias according to individual characteristics. We can therefore claim that contracts were allocated in a quasi-natural experiment.

3.2 The status quo

At the time of data collection 7,279 outgrowers were linked to the GOPDC. They are obliged to sell all oil palm fruit from the contracted plot to the company, which, in turn, pays them according to a formula based on the world market price for crude palm oil. The outgrower provides the land and the labor force, and the GOPDC provides inputs, credit, and extension services (GOPDC, n.d.; interview with GOPDC manager; interview with outgrower association executives; focus group discussion with outgrowers).

In addition to the outgrower scheme, the GOPDC also makes third party purchases to utilize its production capacities. Within a 30 km radius of the company's oil palm mill some 3,000

independent farmers decide on the spot whether they will sell their produce to the GOPDC or the local market (interview with Ministry of Food and Agriculture official). Although the investor and the local economy compete at input markets, their output markets are distinct (Poku and Asante, 2008). Thus, they are able to pay different prices for oil palm fruit. As the GOPDC pays according to world market prices, it tends to pay more than the local market during the peak season. This is because the Ghanaian market is too small to affect the world market. In contrast, when oil palm fruit is scarce the domestic market is more attractive as local competition for the fruit increases prices for farmers. While the GOPDC manufactures standardized palm oil for industrial purposes, small-scale mills in the area produce the locally demanded red cooking oil, which cannot be manufactured by the investor (Osei-Amponsah et al., 2012). Consequently, the company is constantly under pressure to deal with problems with the local population, in order to guarantee a sufficient delivery of oil palm fruit.

Besides the independent farmers who are free to sell to anyone, outgrower farmers also tend to sell to local markets (Fold and Whitfield, 2012; Fold, 2008). They are likely to breach contracts if they feel unfairly treated by the company. To prevent such side-selling, the GOPDC can improve its relations with the local population by acting as a good corporate citizen or by competing with the market women and the surrounding small mills for higher oil palm fruit prices. To take legal action against outgrowers seems to be no comprehensive solution, as transaction costs are high given Ghana's slow and costly jurisdiction (interviews with GOPDC senior managers).

In the past the company sometimes coped by making more investments in infrastructure such as roads, electricity poles, boreholes, educational institutions, and medical clinics, and sometimes by carrying out fewer social responsibility activities and instead offering farmers higher prices (interviews with GOPDC senior managers; focus group discussion with outgrowers; Väth, 2013). Considering the conflict-sensitive and at the same time highly

competitive environment, it has not yet been possible to forge stable links between the investor and the local population. There is always a danger of dissension being caused by common daily operational difficulties such as changing price policies, reduced absorption capacity of the mill due to repairs, or delay of payments due to force majeure (interviews with GOPDC senior managers). Nevertheless, there is more potential for satisfying the needs of both the investor and the local population in a dynamic environment like that of our study area than in a context where a monopolistic company has the power to dictate its conditions to contract farmers.

4. Empirical analysis

4.1 Data and descriptive statistics

Our quantitative analysis is based on a household survey (N= 824) conducted from October to December 2010 within a 30 km radius of the mill. Access to the company's database enabled us to draw a random sample (confidence level: 95%, confidence interval: 5). We interviewed 436 outgrowers, spread across 47 villages, out of a total population of 7,279 households (see Table 1).

Table 1

Populations and sampling

Contractual arrangement	Population size	Sample size
Outgrowers	7,279	436
Independent farmers	unknown ≈ 3,000	388
Observations	≈ 10,279	824

Note: Outgrowers based on random sampling; independent farmers based on two-stage sampling with community size as stratum and clustering at village level.

We also interviewed 388 independent farmers out of an estimated population of 3,000 households, sampled in a two-stage selection process. Village size served as a stratum to

sample proportionally 25 of these 47 communities. In small villages (<1,000 inhabitants) we interviewed all the independent oil palm farmers. In medium (>1,000–5,000 inhabitants) and large villages (>5,000 inhabitants) we applied a second-stage regional cluster sampling. We excluded migrant farmers who had been in the catchment area less than 24 years – since the introduction of the outgrower scheme – to avoid biases through migration effects.

We follow Johnson et al. (1990) in generating the outcome variables aggregated assets (i.e. equipment, appliances, houses and land owned by a household) and household's agricultural income per year. To assess productivity effects, we generate the profit per acre as an additional outcome variable.

We modify our sample towards a plot level data set (N= 761), to capture the fact that households typically cultivate several plots (Amanor and Diderutuah, 2001). A household may cultivate oil palm independently on several plots, while at the same time having other plots under contract which is the case for more than 90% of households in our sample. Besides oil palm, households cultivate other cash crops (i.e. cocoa and citrus) and food crops on separate plots. Our sample comprised only oil palm plots with trees that were at least four years old, to ensure that crop production had already begun. Plots with other crops were excluded from the plot level analysis. We included only plots belonging to farmers who sell their produce per kilogram, to avoid measurement errors when calculating profits for those who sell per bunch. We follow the Cook's Distance criterion to eliminate outliers that might distort our analysis. Thus, we distinguish between plots under outgrower contract and independent oil palm plots without any contractual arrangements.

Following Cummins (1996), we take household head's perceived future security as an additional dependent variable to complement mainstream economic measures with a measure of subjective well-being. On a scale of 0 to 10, 0 represents a very low and 10 a very high

interviewee satisfaction with future security. Table 2 summarizes medians of these outcome variables with regard to contractual arrangement.

Table 2

Descriptive statistics of outcome variables at household level (medians)

OUTCOME VARIABLES	Data	Observ.	Medians (sd)				Diff. in medians
			Outgrowers		Independent farmers		
Aggregated assets	HH level	824	1,126	(24,274)	732	(3,673)	***
Perceived future security	HH level	824	7	(2.221)	5	(1.967)	***
Agricultural income per year	HH level	824	8,660	(50,119)	9,340	(92,524)	*
Output per acre per year	Plot level	761	721	(815)	930	(741)	***

Note: As all outcome variables are strongly skewed to the right, medians are more informative than means. Currency is Ghana cedi (exchange rate 1 October 2010: 1 GHS = 0.70 USD). Differences in medians according to Wilcoxon's rank sum test.

Wilcoxon's rank sum tests show that outgrowers report significantly higher values than independent farmers for aggregated assets (1,126 vs 732 GHS) and perceived future security (7 vs 5). This is in line with Väth's qualitative analysis of (2013), which shows improved asset endowment and credit access for outgrowers. In contrast, independent farmers outdo outgrowers with regard to household's agricultural income (8,660 vs 9,340 GHS) and oil palm profit per acre (721 vs 930 GHS). This is rather surprising in view of Huddleston's (2006) finding that outgrowers realize higher incomes and Väth's (2013) finding that outgrowers apply new agricultural technologies and techniques.

An overview of different sets of independent variables such as land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, household and individual level socio-demographics, and village characteristics is presented in Table 3.

Table 3

Descriptive statistics of independent variables (means)

CATEGORIES	VARIABLES	Means (sd)				Diff. in means
		Outgrowers (436)		Independent farmers (388)		
Land-related characteristics	Own land (in acres)	6.202	12.81	4.821	5.519	**
	Land under cultivation (in acres)	17.27	10.47	9.410	5.794	***
	% of land with right to sell and use as collateral	0.251	0.364	0.453	0.460	***
	% of land with right to use as	0.0520	0.186	0.0880	0.245	*

	collateral					
	Sharecropping factor 1/3 for landlord (plot level)	0.712	0.453	0.426	0.495	***
	Sharecropping factor 1/2 for landlord (plot level)	0.0200	0.140	0.0236	0.152	
	Average plot size (in acre)	4.657	2.795	5.273	3.062	***
	Minutes to walk to plot	51.18	42.62	50.08	28.08	*
Oil palm specifics	Age of trees (plot level)	13.12	5.719	9.411	4.262	***
	Number of prunings	1.284	0.608	1.059	0.517	***
	Number of fertilizer applications	0.158	0.465	0.0928	0.672	***
	Use of a cover crop	0.963	0.188	0.845	0.362	***
	Improved techniques dummy	0.328	0.470	0.131	0.388	***
Labor characteristics	Use of hired labor	0.956	0.204	0.912	0.283	**
	Use of household labor	0.683	0.466	0.611	0.488	**
	1st occupation not in agriculture	0.0413	0.1991	0.0850	0.2793	***
	Head: absences > 6 months/yr	0.0573	0.233	0.106	0.308	**
	Household number	6.041	2.844	4.054	2.091	***
Security	Taken a loan within last year	0.179	0.384	0.0567	0.232	***
	Member of a self-help group	0.360	0.481	0.294	0.456	**
Socio-demographic characteristics	Age of head	52.86	10.86	47.66	12.92	***
	Female-headed household	0.112	0.316	0.0773	0.267	*
	Years of schooling of head	8.362	0.223	7.193	0.229	
	Head is married	0.826	0.380	0.814	0.389	
	Household is not Akan	0.255	0.436	0.258	0.438	
Village level characteristics	Large village (>5,000)	0.255	0.436	0.232	0.423	
	Small village(>1,000)	0.294	0.456	0.289	0.454	
	Traditional area: Bosome	0.0229	0.150	0.0387	0.193	
	Traditional area: Kotoku	0.463	0.499	0.407	0.492	

Note: Sample contains only household heads; significance levels at: *** p<0.01, ** p<0.05, * p<0.1; for dummies: yes = 1, no = 0, for percentages: values within a range from 0-1; dummy for improved techniques = 1 if household uses cover crops, applies fertilizer at least once a year, and prunes at least twice a year; two sample tests of proportions for dummies, otherwise Wilcoxon rank-sum tests are applied.

Outgrowers and independent farmers are quite similar with regard to time-invariant socio-demographic and village level characteristics. Other control variables differ considerably, which might be a consequence of different development paths induced by the length of time the contract has been held. In particular, outgrowers own larger areas of land and have more land under cultivation than independent farmers. Descriptive analysis reveals that roughly 75% of their non-contracted plots were acquired after they became outgrowers. Independent farmers have to invest more money to establish oil palm plots than outgrowers do and they have to build savings to mitigate shocks. Outgrowers invest less because they receive subsidized inputs and credit from the GOPDC, and they can mitigate shocks by accessing additional land or accumulating productive assets such as a chainsaw or a vehicle.

4.2 Estimation strategy

Our data from a quasi-natural experiment enables us to run various OLS regressions for the outcome variables: logged aggregated assets (y_1), perceived future security (y_2),[12] logged agricultural income (y_3), and logged plot profit per acre (y_4). We thus focus on the effect of holding an outgrower contract (x_1) and the effect of different bundles of property rights to land (x_2 and x_3).

We identify the effect of an outgrower contract in three ways. We start our sets of estimations with an outgrower dummy for households holding at least one plot under contract, then in a second step replace it with the logged size of the land under contract, and finally in a third step replace it with the number of years a household has held a contract. This enables us to capture the effect of holding a contract from different angles. The dummy variable tests for an on/off effect of contract farming independently of the size of the land under contract, whereas the logged size of the land under contract tests for size effects in association with economies of scale (assuming that a percentage increase in the size of land under contract has a constant effect), and the number of years a household has held a contract tests for time effects (assuming that experience matters).

With regard to property rights to land, we distinguish between two bundles of rights. This enables us to capture varying qualities of customary land rights when it comes to mortgage and disposal. The lack of clearly documented land rights in Ghana obliged us to use reported rights instead of registered deeds. At the plot level we differentiate between plots with the right to sell them and to use them as collateral (x_2) and plots with the right to use them as collateral only (x_3) (both measured as dummies). At household level we stick to these categories, but since households cultivate several plots, each of which might be associated

[12] Ferrer-i-Carbonell and Frijters (2004) find that ordinal and cardinal treatments of subjective well-being variables produce similar results. However, as a robustness check we complement our OLS estimates with logistic regressions.

with a different bundle of property rights, we calculate (x_2) and (x_3) as percentages of the total amount of land owned and convert them into a scale of 0 to 1. These proxies enable us to estimate the effects of property rights at plot and household level. Even though, we cannot ensure that property rights to land are exogenous and are therefore unable to estimate a causal effect, correlations might give us a hint on their importance.[13]

In a first step, we estimate the net effects of holding a contract when controlling for exogenous time-invariant socio-demographic and village level characteristics. In a second step, we introduce the two bundles of property rights and further controls for land-related variables, oil palm specifics, agricultural diversification, labor characteristics, productive assets, and financial background. Thus, our estimation strategy follows the general model:

$$y_{1\text{-}4} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 c_1 + \ldots + \beta_{3+r} c_r + \varepsilon$$

with $r>1$
y_1 = aggregated assets (log)
y_2 = perceived future security
y_3 = agricultural income (log)
y_4 = plot profit per acre (log)
β_0 = constant
$\beta_{1\text{-}3+r}$ = parameters related to the corresponding individual variables
x_1 = outgrower dummy (alternatively: size of land under contract (log) or duration of contract in years)
x_2 = % of land with the right to sell it and to use it as collateral (for plot level: dummy)
x_3 = % of land with the right to use it as collateral (for plot level: dummy)
c = control variables for land-related characteristics (not applicable for y_1) oil palm specifics, labor characteristics, access to security mechanisms, socio-demographics, and village level characteristics
ε = error term

For estimations at household level standard errors are clustered at village level, whereas plot level data is clustered at household level.[14] In a second step, we limit our plot level analysis to independently managed plots. This enables us to compare the productivity of outgrowers and

[13] We assume that the bundles of property rights to land are more important than sharecropping. Nevertheless, we control for sharecropping factors at plot level.
[14] Alternatively, we estimate our models with sample weights and linearized standard errors and find similar results.

independent farmers on plots that are free from the GOPDC's sphere of direct influence and thus identify possible spillover effects.

Finally, we calculate the probability of outgrowers being engaged in a non-farm business by using the following logistic regression model:

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 c_1 + \ldots + \beta_{3+r} c_r + \varepsilon}}{1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 c_1 + \ldots + \beta_{3+r} c_r + \varepsilon}}$$

with $r>1$
$\pi(x)$ = probability of being engaged in a non-farm business
β_0 = constant
$\beta_{1\text{-}3+r}$ =parameters related to the corresponding individual variables
x_1 = outgrower dummy (alternatively: size of land under contract or duration of contract in years)
c = control variables for land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, socio-demographics, and village level characteristics
ε = error term

We thus investigate whether holding an outgrower contract encourages households to engage in income generating activities beyond agriculture. Once again, we differentiate between the net effect (controlling for socio-demographic and village level characteristics only) and the effects when including additional controls.

4.3 Results

As Table 4 shows, we find that participating in the outgrower scheme has a highly significant and positive effect on household's aggregated assets (models 1, 2, 3, and 4). When controlling for exogenous socio-demographic and village level characteristics, holding an outgrower contract leads to a 41.4% increase in households' aggregated assets (model 1). When we add additional control variables, this effect remains highly significant and there is a similar increase (40.5%) in the household's aggregated assets (model 2). The positive effect is confirmed when we replace the outgrower dummy with the continuous variables logged acreage of land under contract and years of holding a contract (models 3 and 4). Doubling the

size of the contracted land increases aggregated assets by 5.3% (model 3), and one additional year of holding a contract results in a 2.0% increase (model 4). As both coefficients are quite low, we expect the on/off effect of outgrower contracts to be more important than size- and time-related effects.

In the subsequent models we therefore focus on the outgrower dummy, which might capture the effect of contract farming best from a content-based perspective. Nevertheless, for all the models in the remainder of this paper, our results hold when replacing the outgrower dummy with the size of contracted land and the number of years of holding a contract. The same holds true for estimating the net effects instead of controlling for a wide range of variables.

Table 4

Estimations at household level

	(1)	(2)	(3)	(4)	(5)	(6)
	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Future security	Agric. income (log)
VARIABLES	OLS	OLS	OLS	OLS	OLS	OLS
Outgrower dummy	0.414***	0.405***			2.220***	-0.397***
	(0.102)	(0.100)			(0.216)	(0.104)
Size of contract land (log)			0.0532***			
			(0.0113)			
Years of holding contract				0.0204***		
				(0.00504)		
% of land with right to sell and use as collateral					0.486*	0.756***
					(0.281)	(0.170)
% of land with right to use as collateral					0.387	0.418**
					(0.316)	(0.180)
Socio-demographic and village characteristics	yes	yes	yes	yes	yes	yes
Other controls	no	yes	yes	yes	yes	yes
Observations	824	824	824	824	824	824
R-squared	0.176	0.192	0.201	0.190	0.218	0.132
Adjusted r-squared	0.164	0.176	0.185	0.174	0.198	0.107
Test of joint significance	F(12,46)= 24.87***	F(16,46)= 26.18***	F(16,46)= 27.17***	F(16,46)= 29.10***	F(20,46)= 20.36***	F(23,46)= 15.63***
Highest variance inflation factors (without age and age squared)	1.76	2.08	2.08	2.09	3.26	3.28
Ramsey's RESET test (p-value)	0.607	0.888	0.508	0.967	0.984	0.241

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls

for labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics are reported in Appendix A. Variance inflation factors for age and age squared around 40.

Model 5 reveals a 2.2 points higher level of perceived future security for outgrowers than for independent farmers and thus confirms earlier findings. Given the scale of 0 to 10, this is a tremendous positive effect of contract farming. Moreover, the right to sell the land and also to use it as collateral has a positive effect on perceived future security but the effect is only weakly significant. Thus, the finding that a 100% increase of land with those rights leads to a 0.5 point increase in perceived future security should be treated with caution.[15]

With regard to households' agricultural income, model 6 reveals strong and highly significant effects of the two bundles of property rights under consideration. We find that 100% of land with the right to sell and also to use it as collateral increases households' agricultural income by 75.6%, and that 100% of land with the right to use it only as collateral still results in a 41.8% increase (model 6). Thus, our analysis lends support to the idea that even an incomplete bundle of property rights is beneficial for households in rural areas where land administration systems are weak. In contrast, holding an outgrower contract decreases agricultural income by 39.7% (model 6). With a highly significant effect, this result contradicts our earlier findings of a beneficial effect for contract farming.

As Table 5 shows, plot level analysis also reveals a negative effect as plots under contract show a 27.2% decrease in profit per acre (model 1). To verify whether this effect holds for all oil palm plots cultivated by an outgrower household, we limit our subsequent analysis to independently managed plots (i.e. we exclude plots under contract). Model 2 reveals that the outgrower dummy is insignificant and does not have an effect on independently managed plots.[16] Thus, contract-holding households are not less productive in general – it is only on

[15] With regard to subjective well-being measures, we point to a substitutive relationship between contract farming and property rights to land, as they expect both to fulfil rural households' security needs, and thus follow Palmer's (1998) diminishing marginal returns argument.
[16] These results also hold when estimating the profit per plot.

their plots under contract that they are less productive. In line with Lajili et al. (1997), this can be explained by principal-agent problems.

Table 5

Estimations at plot level

	(1)	(2)
	All plots	Independent plots
	Profit per acre (log)	Profit per acre (log)
VARIABLES	OLS	OLS
Plot under outgrower contract	-0.272***	
	(0.0596)	
Outgrower dummy		-0.0778
		(0.0895)
Right to sell plot and use as collateral	0.423***	
	(0.102)	
Right to use plot as collateral	0.0330	
	(0.0896)	
Socio-demographic and village characteristics	yes	yes
Land-related and other controls	yes	no
Observations	761	539
R-squared	0.221	0.04
Adjusted r-squared	0.191	0.02
Test of joint significance	F(28,463) = 14.8***	F(12, 273) = 2.22**
Highest variance inflation factors (without age and age squared)	2.20	1.72
Ramsey's RESET test (p-value)	0.73	0.32

Note: Clustered standard errors at household level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, socio-demographic and village level characteristics are reported in Appendix A. Variance inflation factors for age and age squared around 40.

However, with regard to property rights to land, we find that holding a plot with the right to sell it and to use it as collateral has a high and significant effect, resulting in a 42.3% increase in plot profit per acre in model 1.[17] Whereas all our estimations fully support the hypothesis that secure property rights to land have a positive effect on perceived future security, agricultural income, and profit per acre, the contradictory findings for contract farming call for further investigation.

Given that contract farmers' profit on independently managed plots is similar to that of farmers without a contract, we can reason that they divert effort from contracted plots. The estimations in Table 6 support this explanation. Whether we estimate the net effect of contract

[17] Given the lack of degrees of freedom, we cannot control for the effect of property rights to land in model 2.

farming by controlling only for socio-demographic and village level effects (model 1) or by including further control variables (model 2), we find that outgrowers have a significant and roughly 10% higher likelihood of engaging in non-farm activities.

Table 6

Estimations of likelihood of engaging in non-farm business at household level

Non-farm business VARIABLES	(1) Logit	(2) Logit
Outgrower dummy	0.097*** (0.0330)	0.092*** (0.0380)
Socio-economic and village characteristics	yes	yes
Land-related and other controls	no	yes
Observations	824	824
Wald's chi^2	$chi^2(12) = 88.56$***	$chi^2(22) = 197.09$***
Pseudo R-squared	0.054	0.065

Note: Marginal effects are displayed. Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics are reported in Appendix A.

To sum up: our hypothesis that contract farming has a positive effect holds true for the outcome variables aggregated assets and perceived future security, but has to be rejected for agricultural income and profit per acre. Despite the interpretation that poor agricultural performance is a result of effort substitution, we can nevertheless conclude that contract farming is to some extent beneficial for farmers in the vicinity of a large-scale investment.

4.4 Further robustness checks

In Appendix B we provide further robustness tests. The ordered logit model in Table 10 shows that the positive outgrower effect on perceived future security also holds for a different estimation procedure. In Table 11 we complement the estimation of oil palm profit per acre (models 1 and 2 in Table 5) with estimations of absolute profit per plot. Our similar results show that ratio fallacies of spurious correlation induced by indices of a common component do not disturb our estimations (Kronmal, 1993). The models in Table 12 are based on the various models presented in Table 4 and refer to all our dependent variables of interest. To

avoid possible bias caused by large landowners, we exclude households that own more than 30 acres from the analysis (what we call 'extreme' landowners). The coefficients for the outgrower dummy (models 1, 2, 5, and 6), the size of land under contract (model 3), the years of holding a contract (model 4), and the two bundles of property rights (model 6) stay significant and keep the same sign. Similarly, significance levels and signs for our variables of interest hold when we exclude extreme landowners from the earlier plot level analysis shown in Table 5 (models 1 and 2 in Table 13).

In another set of robustness checks, we differentiate between landowning and landless households. All the estimations for landowners confirm the earlier results at household level (models 1, 3, and 5 in Table 14) and at plot level (model 1 in Table 15). They emphasize that the right to sell the land and also to use it as collateral has a positive effect on agricultural income and plot profit per acre and that holding an outgrower contract affects aggregated assets and perceived future security positively, whereas it has a negative effect on agricultural income and plot profit per acre. The positive effect of being an outgrower on aggregated assets and perceived future security also holds true for landless households (models 2 and 4 in Table 14). Similarly, the negative effect of contract farming on agricultural income and plot profit is confirmed (model 6 in Table 14). Moreover, models 3 and 4 in Table 14 reveal that landowning and landless farmers who hold an outgrower contract are equally productive on independently managed plots. Thus, additional robustness checks indicate that our results are highly robust to model specifications and changes in estimation techniques.

5. Conclusion

In this study we found that property rights matter. We found that holding the right to use the land as collateral already has a positive effect on households' agricultural income in rural

areas where land administration is weak and cumbersome. Further, having the right both to sell the land and to use it as collateral has a positive effect on perceived future security, agricultural income, and profit per acre. Nevertheless, we have to keep in mind that it is unclear if our findings go beyond identifying correlations. As we cannot be sure if property rights are exogenous in our setting, results have to be taken with caution.

In contrast, our setting, where contracts were allocated as in a quasi-natural experiment, allows us to identify a causal effect. With regard to contract farming we observed mixed effects. While holding a contract has a positive effect on a household's aggregated assets and, according to our interviewees, on perceived future security, the effect on agricultural income is negative. Furthermore, profits on contracted plots were lower than on independently managed plots. Nevertheless, we provided further evidence that contract farmers tend to benefit from the scheme as inputs and credit offered by the investor enable them to diversify risks. Thus, they show a 10% higher probability than independent farmers of engaging in non-farm business. Given that outgrowers' profits on non-contracted plots do not differ significantly from those of independent farmers, we identified principal-agent problems and the associated effort substitution as a plausible explanation for their lower profits on contracted plots.

In terms of policy implications we conclude that large-scale investments in agricultural land can be good for rural development if they respect existing bundles of property rights and if they integrate the local population. However, we do not claim that are results can be generalized, but rather point to an exemplary case which is bound to a specific setting. One way an investor can do this is by offering contracts to farmers. Outgrower schemes offer long-term security as they enhance participants' asset endowment and perceived future security. This gives rural households room to maneuver and enables them to invest in non-farm activities. At the same time we observe that in the short run farmers are able to earn higher

agricultural income and profit per acre when they bear the full risk for independently managed plots. Therefore, economic integration of the local population seems to be most beneficial if investors aim at a mix of outgrower schemes and buying oil palm fruit from independently managed plots.

However, even under such favorable conditions, it would be illusory to interpret large-scale, land-based investments per se as an instrument to reduce poverty. In their first and narrow sense they aim to generate profits for their shareholders. In doing so, they can simultaneously benefit rural farmers who participate in a well-designed contract farming scheme. But, as highlighted in our study, the poorest and neediest people do not benefit from such schemes as they are often not eligible to participate. Regardless of possible spillover effects and corporate social responsibility, large-scale investment in agricultural land therefore runs the danger of fostering inequality in its neighborhood. Thus, host countries aiming for sustainable rural development should avoid a crowding-out of development projects by large-scale agricultural investments and rather initiate development projects to support disadvantaged population groups in the vicinity of an investment.

References

Abdulai, A., Owusu, V., & Goetz, R. (2011). Land tenure differences and investment in land improvement measures: Theoretical and empirical analyses. Journal of Development Economics, 96, 66–78.

Abdulai, R. T., & Hammond, F. N. (2010). Landed property market information management and access to finance. Property Management, 28(4), 228–244.

Abdulai, R. T. (2006). Is land title registration the answer to insecure and uncertain property rights in sub-Saharan Africa? The Royal Institute of Chartered Surveyors RICS Research Paper Series, 6(6), 3–27.

Adjei-Nsiah, S., Sakyi-Dawson, O., & Kuyper, T. W. (2012). Exploring opportunities for enhancing innovation in agriculture: The case of oil palm production in Ghana. Journal of Agricultural Science, 4(10), 212–223.

Ali, A., Abdulai, A., & Goetz, R. (2012). Impacts of tenancy arrangements on investment and efficiency: Evidence from Pakistan. Agricultural Economics, 43(s1), 85–97.

Ali, D. A., Dercon, S., & Gautam, M. (2011). Property rights in a very poor country: Tenure insecurity and investment in Ethiopia. Agricultural Economics, 42(1), 75–86.

Amanor, K. S. (1999). Global restructuring and land rights in Ghana: Forest food chains, timber and rural livelihood. Uppsala: Nordiska Afrikainstitutet.

Amanor, K. S., & Diderutuah, M. D. (2001). Share contracts in the oil palm and citrus belt of Ghana. London: IIED.

Amanor, K. S. (2010). Family values, land sales and agricultural commodification in South-Eastern Ghana. Africa, 80(1), 104–125.

Amanor, K. S. (2012). Global resource grabs, agribusiness concentration and the smallholder: Two West African case studies. Journal of Peasant Studies, 39(3-4), 731–749.

Ashraf, N., Giné, X., & Karlan, D. (2009). Finding Missing Markets (and a Disturbing Epilogue): Evidence from an Export Crop Adoption and Marketing Intervention in Kenya. American Journal of Agricultural Economics, 91(4), 973–990.

Awuah, K. G. B., & Hammond, F. N. (2013). Prognosis of land title formalization in urban Ghana: The myth and reality of awareness and relevance. African Studies Quarterly, 14(1), 55–75.

Banerjee, A., Gertler, P., & Ghatak, M. (2002). Empowerment and efficiency: Tenancy reform in West Bengal. Journal of Political Economy, 110(2), 239–280.

Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H.C., Narayanan, S., & Walker, T.F. (2012). Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries. World Development, 40(4), 715–730.

Begum, I. A., Alam, M. J., Buysse, J., Frija, A., & Van Huylenbroeck, G. (2012). Contract farmer and poultry farm efficiency in Bangladesh: A data envelopment analysis. Applied Economics, 44(28), 3737–3747.

Bellemare, M. F. (2012). As you sow, so shall you reap: The welfare impacts of contract farming. World Development, 40(7), 1418–1434.

Bellemare, M. F. (2013). The productivity impacts of formal and informal land rights: Evidence from Madagascar. Land Economics, 89(2), 272–290.

Besely, T. (1995). Property rights and investment incentives: Theory and evidence from Ghana. Journal of Political Economy, 103(5), 903–937.

Binswanger, H. P., Deininger, K., & Feder, G. (1995). Power, distortions, revolt and reform in agricultural land relations. Handbook of Development Economics, 3, 2659–2772.

Bolwig, S., Gibbon, P., & Jones, S. (2009). The economics of smallholder organic contract farming in tropical Africa. World Development, 37(6), 1094–104.

Borras Jr, S. M., & Franco, J. C. (2012) Global land grabbing and trajectories of agrarian change: a preliminary analysis. Journal of Agrarian Change, 12(1), 34–59.

Bruinsma, J. (Ed.) (2003). World agriculture: towards 2015/2030: An FAO perspective. London: Earthscan.

Carter, M. R., & Olinto, P. (2003). Getting institutions “right” for whom? Credit constraints and the impact of property rights on the quantity and composition of investment. American Journal of Agricultural Economics, 85(1), 173–186.

Chand, S., & Yala, C. (2009). Land tenure and productivity: Farm-level evidence from Papua New Guinea. Land Economics, 85(3), 442–53.

Cotula, L., Vermeulen, S., Leonard, R., & Keeley, J. (2009). Land grab or development opportunity? Agricultural investment and international land deals in Africa. London, Rome: IIED, FAO, IFAD.

Cotula, L., & Vermeulen, S. (2011). Contexts and procedures for farmland acquisitions in Africa: What outcomes for local people? Development, 54(1), 40–48.

Cummins, R. A. (1996). The domains of life satisfaction: An attempt to order chaos. Social Indicators Research, 38, 303–332.

Dedehouanou, S. F. A., Swinnen, J., & Maertens, M. (2013). Does contracting make farmers happy? Evidence from Senegal. Review of Income and Wealth, 59(S1), 138–160.

Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., & Stickler, M. (2011). Rising global interest in farmland: Can it yield sustainable and equitable benefits? Washington, D.C: World Bank.

Deininger, K., & Feder, G. (2009). Land registration, governance, and development: Evidence and implications for policy. World Bank Research Observer, 24(2), Washington D.C.: World Bank.

Deininger, K., & Jin, S. (2006). Tenure security and land related investment: Evidence from Ethiopia. European Economic Review, 50(5), 1245–1277.

Deininger, K., & Chamorro, J. S. (2004). Investment and equity effects of land regularization: The case of Nicaragua. Agricultural Economics, 30(2), 101–116.

Deininger, K. (2003). Land policies for growth and poverty reduction. Washington: World Bank and Oxford University Press.

Dekker, H. A. L. (2003). The invisible line: Land reform, land tenure security and land registration. Aldershot, UK: Ashgate Publishing Limited.

De Schutter, O. (2011). How not to think of land-grabbing: Three critiques of large-scale investments in farmland. Journal of Peasant Studies, 38(2), 249–279.

DiNardo, J. (2008). Natural experiments and quasi-natural experiments. In: Durlauf, S. N. & Blume, L. E. (Eds.). The New Palgrave Dictionary of Economics. 2nd edition. Palgrave Macmillan, 2008.

Escobal, J. A., & Cavero, D. (2012). Transaction costs, institutional arrangements and inequality outcomes: Potato marketing by small producers in rural Peru. World Development, 40(2), 329–341.

Feder, G., & Nishio, A. (1998). The benefits of land registration and titling: Economic and social perspective. Land Use Policy, 15(1), 25–43.

Feder, G., & Onchan, T., (1987). Land ownership security and farm investment in Thailand. American Journal of Agricultural Economics, 69(2), 311–320.

Fenske, J. (2011). Land tenure and investment incentives: Evidence from West Africa. Journal of Development Economics, 95, 137–156.

Ferrer-i-Carbonell, A. & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? Economic Journal, 114(497), 641–659.

Field, E. (2007). Entitled to work: Urban property rights and labor supply in Peru. The Quarterly Journal of Economics, 122(4), 1561–1602.

Fold, N. (2008). Transnational sourcing practices in Ghana's perennial crop sectors. Journal of Agrarian Change, 8(1), 94–122.

Fold, N., & Whitfield, L. (2012). Developing a palm oil sector: The experiences of Malaysia and Ghana compared. DIIS Working Paper Series 2012:08. Retrieved from http://subweb.diis.dk/graphics/Publications/WP2012/WP2012-08-Palm-Oil-Malaysia-Ghana-Whitfield-Fold-web.pdf, [accessed on 1 March 2014].

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? Journal of Economic Literature, 40(2), 402–435.

Galiani, S., & Schargrodsky, E. (2010). Property rights for the poor: Effects of land titling. Journal of Public Economics, 94, 700–729.

Gavian, S., & Fafchamps, M. (1996). Land tenure and allocative efficiency in Niger. American Journal of Agricultural Economics, 78(2), 460–471.

German, L. Schoneveld, G., & Mwangi, E. (2013). Contemporary processes of large-scale land acquisition in Sub-Saharan Africa: Legal deficiency or elite capture of the rule of law? World Development, 48, 1–18.

Glover, D. J. (1984). Contract farming and smallholder outgrower schemes in less-developed countries. World Development, 12(11/12), 1143–1157.

Gobien, S. (2014). "Dancing every day": Land allocation and subjective economic well-being in Cambodia. Unpublished Manuscript.

Goldstein, M., & Udry, C. (2008). The profits of power: Land rights and agricultural investments in Ghana. Journal of Political Economy, 116(6), 981–1022.

GOPDC (n.d.). Outgrower contract.

GOPDC (2013). Company Profile. http://www.gopdc-ltd.com/, [Accessed on March 1 2014].

Görgen, M., Rudloff, B., Simons, J., Üllenberg, A., Väth, S. J., & Wimmer, L. (2009). Foreign direct investment (FDI) in land in developing countries. Eschborn: GTZ.

Govereh, J., & Jayne, T. S. (2003). Cash cropping and food crop productivity: Synergies or trade-offs? Agricultural Economics, 28(1), 39–50.

Grootaert, C. (1983). The conceptual basis of measures of household welfare and their implied survey data requirements. Review of Income and Wealth, 29(1), 1–21.

Grosh, B. (1994). Contract farming in Africa: An application of the New Institutional Economics. Journal of African Economies, 3(2), 231–61.

Gyasi, E. A. (1994). The adaptability of African communal land tenure to economic opportunity: The example of land acquisition for oil palm farming in Ghana. Journal of the International African Institute, 64(3), 391–405.

HLPE (2011). Land tenure and international investments in agriculture. Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome: FAO.

Holden, S. T., Deininger, K., & Ghebru, H. (2009). Impacts of low-cost land certification on investment and productivity. American Journal of Agricultural Economics, 91(2), 359–373.

Huddleston, P. S. (2004). Old crop, new crop: Contracting out oil palm production in Ghana. The Australasian Review of African Studies, 26(2), 86–91.

Huddleston, P. S. (2006). Contract farming in oil palm. The case of Ghana and the Philippines. Perth: University of Western Australia.

Huddleston, P. S., & Tonts, M. (2007). Agricultural development, contract farming and Ghana's oil palm industry. Geography, 92(3), 266–278.

Huq, M. M., Khan, A., Jahan, M. S., & Haque, M. A. (2007). Effects of land ownership on psychological well-being of the poor farmers of the northern parts of Bangladesh. Journal of Life and Earth Science, 2(2), 43–46.

Jacoby, H. G., & Minten, B. (2007). Is land titling in Sub-Saharan Africa cost-effective? Evidence from Madagascar. World Bank Economic Review, 21(3), 461–485.

Johnson, M., McKay, A., & Round, J. (1990). Income and expenditure in a system of household accounts: Concepts and estimation. Social dimensions of adjustment in Sub-Saharan Africa, World Bank Working Paper, 10, Washington D.C.: World Bank

Kasanga, K., & Kotey, N. (2001). Land Management in Ghana: Building on tradition and modernity. London: IIED.

Key, N., & Runsten, D. (1999). Contract farming, smallholders, and rural development in Latin America: The organization of agroprocessing firms and the scale of outgrower production. World Development, 27(2), 381–401.

Kirsten, J., & Sartorius, K. (2002). Linking agribusiness and small-scale farmers in developing countries: Is there a new role for contract farming? Development Southern Africa, 19(4), 503–529.

Kronmal, R. A. (1993). Spurious correlation and the fallacy of the ratio standard revisited. Journal of the Royal Statistical Society, A 156(3), 379–392.

Krueger, A. B., & Schkade, D. A. (2008). The reliability of subjective well-being measures. Journal of Public Economics, 92(8–9), 1833–1845.

Lajili, K., Barry, P. J., Sonka, S. T., & Mahoney, J. T. (1997). Farmers' preferences for crop contracts, Journal of Agricultural and Resource Economics, 22(2), 264–280.

Landeghem, van B., Swinnen, J., & Vranken, L. (2013). Land and Happiness. Eastern European Economics, 51(1), 61–85.

Little, P. D., & Watts, M. J. (1994). Living under contract: contract farming and agrarian transformation in sub-Saharan Africa. University of Wisconsin Press.

MacKerron, G. (2012). Happiness economics from 35 000 feet. Journal of Economic Surveys, 26 (4), 705–735.

Michelson, H., Reardon, T., & Perez, F. (2012). Small farmers and big retail: trade-offs of supplying supermarkets in Nicaragua. World Development, 40(2), 342–354.

Minten, B., Randrianarison, L., & Swinnen, J. F. M. (2009). Global Retail Chains and Poor Farmers: Evidence from Madagascar. World Development, 37(11), 1728–1741.

Miyata, S., Minot, N., & Hu, D. (2009). Impact of contract farming on income: Linking small farmers, packers, and supermarkets in China. World Development, 37(11), 1781–1790.

Narayanan, S. (2014). Profits from participation in high value agriculture: Evidence of heterogeneous benefits in contract farming schemes in Southern India. Food Policy, 44, 142–157.

Nolte, K., & Väth, S.J. (2013). Interplay of land governance and large-scale agricultural investment: Evidence from Ghana and Kenya. MAGKS Joint Discussion Paper Series No. 50-2013.

Osei-Amponsah, C., Vissera, L., Adjei-Nsiah, S., Struik, P.C., Sakyi-Dawson, O., & Stomph T.J. (2012). Processing practices of small-scale palm oil producers in the Kwaebibirem District Ghana: A diagnostic study. NJAS - Wageningen Journal of Life Sciences, 60(3), 49–56.

Otsuka, K., Chuma, H., & Hayami, Y. (1992). Land and labor contracts in agrarian economies: Theories and facts. Journal of Economic Literature, 30(4), 1965–2018.

Pagliettie, L., & Sabrie, R. (2012). Outgrower schemes: Advantages of different business models for sustainable crop intensification: Ghana case studies. FAO Investment Centre. Retrieved from http://www.fao.org/fileadmin/user_upload/tci/docs/LN1-Ghana_Outgrower%20schemes.pdf, [accessed on 1 March 2014].

Palmer, D. (1998). Security, risk and registration. Land Use Policy, 15(1), 83–94.

Place, F., & Otsuka, K. (2001). Tenure, agricultural investment, and productivity in the customary tenure sector of Malawi. Economic Development and Cultural Change, 50(1), 77–99.

Poku, J. A., & Asante, F. A. (2008). Palm oil production in Ghana. German Technical Co-operation (GTZ) and Ministry of Food and Agriculture, Accra.

Porter, G., & Phillips-Howard, K. (1997). Comparing contracts: An evaluation of contract farming schemes in Africa. World Development, 25(2), 227–238.

Rao, E. J. O., & Qaim, M. (2011). Supermarkets, Farm Household Income, and Poverty: Insights from Kenya. World Development, 39(5), 784–796.

Ray, D. I. (1996). 'Divided sovereignty: Traditional authority and the state in Ghana'. Journal of Legal Pluralism, 37/38, 181–202.

Republic of Ghana (1976). Land Registry as No. 1258/1976. Accra.

Republic of Ghana (2008). Eastern Region Lands Commission, Deeds Registry as No. 2538/2008. Koforidua.

Sahn, D. E., & Stifel, D. (2003). Exploring alternative measures of welfare in the absence of expenditure data. Review of Income and Wealth, 49(4), 463–489.

Saenger, C., Qaim, M., Torero, M., & Viceisza, A. (2013). Contract farming and smallholder incentives to produce high quality: Experimental evidence from the Vietnamese dairy sector. Agricultural Economics, 44(3), 297–308.

Schoneveld, G., German, L., & Nutakor, E. (2011). Land-based investments for rural development? A grounded analysis of the local impacts of biofuel feedstock plantations in Ghana. Ecology and Society, 16(4), 10.

SIAT (2013). Company Profile. http://www.siat.be, [accessed on 1 March 2014].

Simmons, P., Winters, P., & Patrick, I. (2005). An analysis of contract farming in East Java, Bali, and Lombok, Indonesia. Agricultural Economics, 33(s3), 513–525.

Singh, S. (2002). Contracting out solutions: Political economy of contract farming in the Indian Punjab. World Development, 30(9), 1621–1638.

Sivramkrishna, S., & Jyotishi, A. (2008). Monopsonistic exploitation in contract farming: Articulating a strategy for grower co-operation. Journal of International Development, 20(3), 280–96.

Sjaastad, E., & Cousins, B. (2008). Formalisation of land rights in the South: An overview. Land Use Policy, 26, 1–9.

Ubink, J.M., & Quan, J.F. (2008). How to combine tradition and modernity? Regulating customary land management in Ghana. Land Use Policy, 25(2), 198–213.

Väth, S.J. (2013). Gaining neighbours or big losers – What happened when large-scale, land-based investment in the Ghanaian oil palm sector met the local population on the ground? LDPI Working Paper, 24. Retrieved from http://www.iss.nl/fileadmin/ASSETS/iss/Research_and_projects/Research_networks/LDPI/LDPI_WP_24.pdf, [accessed on 1 March 2014].

Von Braun, J., & Meinzen-Dick, R. (2009). “Land Grabbing” by foreign investors in developing countries: Risks and opportunities. IFPRI Policy Brief, 13. Washington D.C.: IFPRI. Retrieved from http://www.ifpri.org/sites/default/files/publications/bp013all.pdf, [accessed on 1 March 2014].

Warning, M., & Key, N. The social performance and distributional consequences of contract farming: An equilibrium analysis of the Arachide de Bouche program in Senegal. World Development, 30(2), 255–63.

Watts, M.J. (1994). Life under contract: contract farming, agrarian restructuring, and flexible accumulation. In: Little, P.D. & Watts, M.J. (Eds.): Living under Contract: Contract farming and agrarian transformation in Sub-Saharan-Africa. Madison: The University of Wisconsin Press.

White, B. (1997). Agroindustry and contract farmers in upland West Java. Journal of Peasant Studies, 24(3), 100–136.

Wisborg, P. (2012) Justice and sustainability: Resistance and innovation in a transnational land deal in Ghana. Paper presented at World Bank Conference on Land and Poverty, 23.-26. April, Washington D.C.

World Bank (1994). Project completion report Ghana: Oil palm development project, phase II (Credit 1498-GH). Report 13818.

World Bank (2008). World development report: Agriculture for development. World Bank, Washington, D.C.

Yaro, J.A. & Tsikata, D. (2013). Savannah fires and local resistance to transnational land deals: the case of organic mango farming in Dipale, northern Ghana. African Geographical Review, 32(1), 72–87.

Appendix A: Full models

Table 7

Estimations at household level

	(1)	(2)	(3)	(4)	(5)	(6)
	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Future security	Agric. income (log)
VARIABLES	OLS	OLS	OLS	OLS	OLS	OLS
Outgrower dummy	0.414***	0.405***			2.220***	-0.397***
	(0.102)	(0.100)			(0.216)	(0.104)
Size of contract land (log)			0.0532***			
			(0.0113)			
Years of holding contract				0.0204***		
				(0.00504)		
% of land with right to sell and use as collateral					0.486*	0.756***
					(0.281)	(0.170)
% of land with right to use as collateral					0.387	0.418**
					(0.316)	(0.180)
Own land in acres (log)					0.0197	-0.00999
					(0.0303)	(0.0159)
Cultivated land in acres (log)					0.225*	0.464***
					(0.129)	(0.103)
Applying improved techniques						0.0351
						(0.128)
Use of hired labor						-0.0153
						(0.187)
Use of household labor						-0.0978
						(0.0892)
1st occupation not in agric.		0.408**	0.410**	0.388**	0.238	-0.368***
		(0.157)	(0.158)	(0.156)	(0.421)	(0.106)
Head: absence > 6 months/yr		0.0410	0.0280	0.0600		0.0247
		(0.167)	(0.168)	(0.164)		(0.143)
Taken a loan within last year		0.0519	0.0396	0.0627	0.0682	0.0784
		(0.123)	(0.122)	(0.120)	(0.257)	(0.116)
Member of a self-help group		0.240***	0.234***	0.245***	0.239	0.109
		(0.0569)	(0.0570)	(0.0575)	(0.154)	(0.0865)
Subjective household income					-0.0251	
					(0.0757)	
Years of schooling head	0.0281***	0.0233**	0.0221**	0.0228**	-0.0284*	-0.0240***
	(0.00982)	(0.00917)	(0.00935)	(0.00915)	(0.0156)	(0.00750)
Age of head	0.00929	0.0128	0.0104	0.0126	-0.0116	0.0375**
	(0.0195)	(0.0199)	(0.0197)	(0.0191)	(0.0397)	(0.0153)
Squared age of head	-0.000118	-0.000143	-0.000127	-0.000144	4.20e-05	-.000347**
	(0.000171)	(0.000173)	(0.000172)	(0.000167)	(0.000375)	(0.000151)
Female-headed household	-0.316**	-0.312*	-0.319*	-0.301*	0.677***	-0.0370
	(0.145)	(0.160)	(0.162)	(0.155)	(0.183)	(0.159)
Head married	0.274*	0.310*	0.315*	0.323*	-0.207	0.186
	(0.143)	(0.181)	(0.182)	(0.179)	(0.203)	(0.122)
Household is not Akan	-0.141	-0.177*	-0.178*	-0.180*	0.161	-0.0733
	(0.106)	(0.103)	(0.102)	(0.101)	(0.193)	(0.0903)
Household number	0.0732***	0.0752***	0.0691***	0.0787***	-0.106***	-0.0177
	(0.0174)	(0.0173)	(0.0170)	(0.0173)	(0.0386)	(0.0115)

Big village (>5,000)	0.184**	0.175*	0.175**	0.176*	0.196	0.0210
	(0.0889)	(0.0888)	(0.0863)	(0.0897)	(0.214)	(0.0906)
Small village(>1,000)	-0.201*	-0.203*	-0.209*	-0.191*	0.105	-0.0148
	(0.109)	(0.109)	(0.108)	(0.107)	(0.216)	(0.112)
Traditional area: Bosome	-0.136	-0.163	-0.150	-0.142	-0.178	0.0838
	(0.106)	(0.111)	(0.110)	(0.102)	(0.356)	(0.113)
Traditional area: Kotoku	-0.171**	-0.160**	-0.159**	-0.130	0.219	0.0130
	(0.0788)	(0.0767)	(0.0756)	(0.0800)	(0.189)	(0.0830)
Constant	5.811***	5.596***	6.050***	5.594***	4.550***	7.667***
	(0.461)	(0.511)	(0.518)	(0.486)	(1.202)	(0.527)
Observations	824	824	824	824	824	824
R-squared	0.176	0.192	0.201	0.190	0.218	0.132
Adjusted r-squared	0.164	0.176	0.185	0.174	0.198	0.107
Test of joint significance	F(12,46)=	F(16,46)=	F(16,46)=	F(16,46)=	F(20,46)=	F(23,46)=
	24.87***	26.18***	27.17***	29.10***	20.36***	15.63***
Highest vif (without age)	1.76	2.08	2.08	2.09	3.26	3.28
Ramsey's RESET test (p-val.)	0.607	0.888	0.508	0.967	0.984	0.241

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1; for dummies: yes = 1, no = 0, where not stated differently values within a range from 0-1. Sample contains only household heads. Reference categories, where not self-explanatory: contractual treatment : independent farmer, occupation: farmer, ethnicity: Akan, village: small, traditional area: Abuakwa. Dummy for improved techniques = 1 if household uses cover crops, applies fertilizer at least once a year, and prunes at least twice a year. Subjective income is self-assessed on a scale of 0 to 5. Variance inflation factors above 10: age and age squared around 40.

Table 8

Estimations at plot level

	(1)	(2)
	All plots	Independent plots
	Profit per acre (log)	Profit per acre (log)
VARIABLES	OLS	OLS
Plot under outgrower contract	-0.272***	
	(0.0596)	
Outgrower dummy		-0.0778
		(0.0895)
% of land with right to sell and use as collateral	0.423***	
	(0.102)	
% of land with right to use as collateral	0.0330	
	(0.0896)	
Own land in acres (log)	-0.00297	
	(0.00795)	
Cultivated land in acres (log)	-0.242***	
	(0.0492)	
Sharecropping factor 1/3 for landlord (plot level)	-0.131*	
	(0.0791)	
Sharecropping factor 1/2 for landlord (plot level)	-0.658***	
	(0.142)	
Average plot size (in acres)	0.0190**	
	(0.00904)	
Minutes to walk to plot	-0.000252	
	(0.000625)	
Age of trees (plot level)	0.0221***	
	(0.00543)	
Applying improved techniques	0.0942	
	(0.0690)	
Use of hired labor	0.299**	
	(0.147)	

Use of household labor	-0.0537	
	(0.0578)	
1st occupation not in agric.	0.0606	
	(0.114)	
Head: absence > 6 months/yr	-0.0862	
	(0.116)	
Taken a loan within last year	0.0977	
	(0.0848)	
Member of a self-help group	0.137**	
	(0.0584)	
Years of schooling head	-0.0164***	-0.0117
	(0.00564)	(0.00732)
Age of head	0.0104	0.0133
	(0.0114)	(0.0154)
Squared age of head	-0.000140	-0.000156
	(0.000101)	(0.000138)
Female-headed household	-0.405***	-0.433***
	(0.102)	(0.135)
Head married	-0.0417	-0.143
	(0.0829)	(0.107)
Household is not Akan	-0.0989	-0.0833
	(0.0648)	(0.0809)
Household number	-0.0219*	-0.0199
	(0.0123)	(0.0145)
Big village (>5,000)	0.0772	0.125
	(0.0644)	(0.0894)
Small village(>1,000)	0.0200	0.0197
	(0.0724)	(0.0882)
Traditional area: Bosome	0.140	-0.136
	(0.120)	(0.174)
Traditional area: Kotoku	-0.0851	-0.178**
	(0.0588)	(0.0750)
Constant	7.120***	6.834***
	(0.346)	(0.423)
Observations	761	537
R-squared	0.220	0.044
Adjusted r-squared	0.191	0.020
Test of joint significance	F(28,463) = 14.8***	F(12, 273) = 2.22**
Highest vif (without age)	2.20	1.72
Ramsey's RESET test (p-val.)	0.73	0.32

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1; for dummies: yes = 1, no = 0, where not stated differently values within a range from 0-1. Sample contains only household heads. Reference categories, where not self-explanatory: contractual treatment: independent farmer, occupation: farmer, ethnicity: Akan, village: small, traditional area: Abuakwa. Dummy for improved techniques = 1 if household uses cover crops, applies fertilizer at least once a year, and prunes at least twice a year. Subjective income is self-assessed on scale of 0 to 5. Variance inflation factors for age and age squared around 40.

Table 9

Estimations of likelihood of engaging in non-farm business at household level

Non-farm business	(1)	(2)
VARIABLES	Logit	Logit
Outgrower dummy	0.0974***	0.0925***
	(0.0330)	(0.0343)
% of land with right to sell and use as collateral		0.0179
		(0.0723)
% of land with right to use as collateral		-0.157
		(0.154)

Own land in acres (log)		0.00240
		(0.00687)
Cultivation land in acres (log)		0.0229
		(0.0318)
Applying improved techniques		-0.0302
		(0.0348)
Use of hired labor		0.133**
		(0.0522)
Use of household labor		0.0289
		(0.0413)
Head absence > six months per year		-0.0548
		(0.0705)
Taken a loan within last year		-0.0175
		(0.0449)
Membership in a self-help group		0.0104
		(0.0384)
Years of schooling of head	0.00420	0.00332
	(0.00369)	(0.00383)
Age of head	0.00161	-0.00193
	(0.0103)	(0.0106)
Squared Age of head	-9.26e-05	-6.53e-05
	(9.26e-05)	(9.50e-05)
Female-headed household	0.102	0.0976
	(0.0634)	(0.0698)
Head is married	0.0114	-0.00805
	(0.0552)	(0.0634)
Household is not Akan	-0.0191	-0.0163
	(0.0400)	(0.0402)
Household number	0.0116	0.0104
	(0.00795)	(0.00785)
Big village (>5,000)	0.110***	0.106***
	(0.0298)	(0.0320)
Small village(>1,000)	-0.00301	-0.0104
	(0.0408)	(0.0412)
Traditional area: Bosome	0.131**	0.141**
	(0.0544)	(0.0576)
Traditional area: Kotoku	-0.0352	-0.0382
	(0.0280)	(0.0286)
Observations	824	824
Wald's chi^2	$chi^2(12) = 88.56$***	$chi^2(22) = 197.09$***
Pseudo R-squared	0.054	0.065

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1; for dummies: yes = 1, no = 0, where not stated differently values within a range from 0-1. Sample contains only household heads. Reference categories, where not self-explanatory: contractual treatment: independent farmer, occupation: farmer, ethnicity: Akan, village: small, traditional area: Abuakwa. Dummy for improved techniques = 1 if household uses cover crops, applies fertilizer at least once a year, and prunes at least twice a year. Subjective income is self-assessed on scale of 0 to 5. Variance inflation factors for age and age squared around 40.

Appendix B: Robustness checks

Table 10

Alternative estimations of perceived future security of household heads

	(1)

VARIABLES	Ologit
Outgrower dummy	1.882***
	(0.202)
% of land with right to sell and use as collateral	0.344
	(0.239)
% of land with right to use as collateral	0.325
	(0.254)
Socio-demographic and village characteristics	yes
Land-related and other controls	yes
Observations	824
Wald's chi^2	$chi^2(20) = 388.06$***
Pseudo r-squared	0.055

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics upon request.

Table 11

Estimations of absolute plot profit

	(1)	(2)
	All plots	Independent plots
	Profit per plot (log)	Profit per plot (log)
VARIABLES	OLS	OLS
Plot under outgrower contract	-0.355***	
	(0.0701)	
Outgrower dummy		-0.0317
		(0.112)
Right to sell plot and use as collateral	0.454***	
	(0.156)	
Right to use plot as collateral	-0.00795	
	(0.103)	
Socio-demographic and village characteristics	yes	yes
Land-related and other controls	yes	no
Observations	762	539
R-squared	0.338	0.039
Adjusted r-squared	0.313	0.017
Test of joint significance	F(28,460)= 20.51***	F(12,271)= 2.23**
Highest variance inflation factor (without age)	2.20	1.8
Ramsey's RESET test (p-val.)	0.325	0.313

Note: Clustered standard errors at household level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics upon request. Variance inflation factors above 10: age and age squared around 40.

Table 12

Estimations at household level excluding extreme landowners (>30 acres)

	(1)	(2)	(3)	(4)	(5)	(6)
	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Agg. assets (log)	Future security	Agric. income (log)
VARIABLES	OLS	OLS	OLS	OLS	OLS	OLS
Outgrower dummy	0.406***	0.391***			2.264***	-0.416***
	(0.105)	(0.101)			(0.219)	(0.101)
Size of contract land (log)			0.0507***			

			(0.0115)			
Years of holding contract				0.0205***		
				(0.00512)		
% of land with right to sell and use as collateral					0.419	0.704***
					(0.278)	(0.169)
% of land with right to use as collateral					0.313	0.359*
					(0.318)	(0.191)
Socio-demographic and village characteristics	yes	yes	yes	yes	yes	yes
Other controls	no	yes	yes	yes	yes	yes
Observations	809	809	809	809	809	809
R-squared	0.168	0.187	0.195	0.187	0.217	0.125
Adjusted r-squared	0.156	0.170	0.179	0.170	0.198	0.100
Test of joint significance	F(12,45)= 20.33***	F(16,45)= 25.53***	F(16,45) = 26.29***	F(16,45)= 29.95***	F(20,45)= 16.51***	F(23,45)= 12.90***
Highest vif (without age)	1.79	2.13	2.13	2.14	3.25	3.27
Ramsey's RESET test (p-val.)	0.675	0.579	0.327	0.725	0.693	0.081*

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics upon request. Variance inflation factors above 10: age and age squared around 40.

Table 13

Estimations at plot level excluding extreme landowners (>30 acres)

	(1)	(2)
	All plots	Indep. plots
	Profit per acre (log)	Profit per acre (log)
VARIABLES	OLS	OLS
Plot under outgrower contract	-0.264***	
	(0.0623)	
Outgrower dummy		-0.0892
		(0.0919)
Right to sell plot and use as collateral	0.418***	
	(0.103)	
Right to use plot as collateral	0.0322	
	(0.0904)	
Socio-demographic and village characteristics	yes	yes
Land-related and other controls	yes	no
Observations	743	524
R-squared	0.218	0.045
Adjusted r-squared	0.187	0.023
Test of joint significance	F(28,455)= 14.42***	F(12,267)= 2.22**
Highest variance inflation factor (without age)	2.23	1.7
Ramsey's RESET test (p-val.)	0.702	0.370

Note: Clustered standard errors at household level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics upon request. Variance inflation factors above 10: age and age squared around 40.

Table 14

Estimations at household level split by landownership

	(1)	(2)	(3)	(4)	(5)	(6)
	Agg. assets (log)	Agg. assets	Future security	Future security	Agricultural income	Agricultural income (log)

VARIABLES	landowner OLS	(log) landless OLS	landowner OLS	landless OLS	(log) landowner OLS	landless OLS
Outgrower dummy	0.417***	0.442***	2.249***	2.198***	-0.391**	-0.470***
	(0.142)	(0.129)	(0.285)	(0.318)	(0.149)	(0.129)
% of land with right to sell and use as collateral			0.562		0.964***	
			(0.400)		(0.253)	
% of land with right to use as collateral			0.527		0.615**	
			(0.425)		(0.291)	
Socio-demographic and village characteristics	yes	yes	yes	yes	yes	yes
Other controls		yes	yes	yes	yes	yes
Observations	479	345	479	345	479	345
R-squared	0.233	0.174	0.247	0.240	0.098	0.189
Adjusted r-squared	0.207	0.133	0.214	0.200	0.052	0.139
Test of joint significance	F(16,43)= 13.93***	F(16,42)= 12.88***	F(20,43)= 9.37***	F(17,42)= 11.59***	F(23,43)= 11.98***	F(20,42)= 37.02***
Highest vif (without age)	2.31	1.89	3.90	1.55	3.94	1.9
Ramsey's RESET test (p-val.)	0.57	0.837	0.156	0.892	0.314	0.044**

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, oil palm specifics, labor characteristics, security mechanisms, and socio-demographic and village level characteristics upon request. Variance inflation factors above 10: age and age squared around 40.

Table 15

Estimations of logged plot profit per acre split by landownership

VARIABLES	(1) All plots landowner OLS	(2) All plots landless OLS
Outgrower dummy	-0.319***	-0.201**
	(0.0835)	(0.0903)
Right to sell plot and use as collateral	0.368***	
	(0.118)	
Right to use plot as collateral	0.0184	
	(0.0958)	
Socio-demographic and village characteristics	yes	yes
Land-related and other controls	yes	yes
Observations	419	342
R-squared	0.245	0.236
Adjusted r-squared	0.191	0.175
Test of joint significance	F(28,262)= 11.18***	F(25,200) =6.50***
Highest vif (without age)	2.58	1.90
Ramsey's RESET test (p-val.)	0.93	0787

Note: Clustered standard errors at village level; significance levels at: *** p<0.01, ** p<0.05, * p<0.1. Controls for land-related characteristics, oil palm specifics, labor characteristics, access to security mechanisms, and socio-demographic and village level characteristics upon request, due to too little degrees of freedom only the effects for independently managed plots of landless households can be estimated. Variance inflation for age and age squared around 40.