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Implications of socioeconomic change for agrarian land and labour relations in rural Ghana

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1. Introduction

This article is concerned with how socioeconomic changes represented by increasing rates of youth schooling, declining rates of reciprocity in agrarian labour relations, and reduced migrant labour flows have contributed to changes in land and labour relations in smallholder commercial agricultural households in Ghana. Our central argument is that while private and public investments in education are indispensable, there are important household level labour market related opportunity costs associated with such investments, particularly for rural agrarian households in developing countries where agricultural production is still largely unmechanized. Therefore, we argue that accelerating the creation of opportunities for increasing returns to schooling is vital for ensuring that private investments in education, including forgone farm labour contributions of youth household members, is worthwhile even in the short to medium term.

Labour is a fundamental input for both agricultural and non-agricultural production. This is more so in rural sub-Saharan Africa (SSA) where the use of labour-saving and productivity-enhancing technologies is low. In a rural economy with abundant land and labour as well as limited off-farm employment opportunities, smallholder households have relied on own labour supply with little or no hired labour input. As land markets develop due to population growth, increased commercialisation of agriculture, among others, and as farming becomes more individualised, family labour becomes scarce and hired labour markets develop in rural areas (Amanor, 2010).

Rural-urban migration and labour movement from the agricultural to the non-agricultural sector during the process of economic transformation further boosts commercial agriculture, which leads to further land and labour commodification. At the same time, the less than optimum earnings from smallholder commercial agriculture compromises the ability to pay the level of wages and land rents that would support the development of healthy agricultural labour and land markets. This results in paradoxes such as agricultural labour shortages in contexts of high rural unemployment, and in elevated rates of tenure insecurities and land use conflicts. Therefore, as pointed out by Tsikata (2009), these changes in land and labour relations need to be discussed together rather than separately as is often the norm in the received literature.

Perceived returns to schooling influences both private and public investment decisions. Lessons from the Asian Green Revolution demonstrate that farm households tend to invest in children's education using income from increased productivity and commercialisation (Estudillo and Otsuka, 1999; Estudillo et al., 2006). In Ghana, a number of policies and programmes have been implemented by the state to encourage school enrolment. Examples include the capitation grant, the School Feeding Programme, and since 2017 the Free Senior High School policy known as Free SHS. In rural areas of Ghana where agriculture is the main economic activity, children contribute significantly to both farm and non-farm labour and income (Koomson and Asongu, 2016). One would thus expect the increase in demand for youth schooling to affect household farm labour availability. Schooling and child work are not always mutually exclusive, but Canagarajah and Coulombe (1999) found that increase in demand for schooling significantly lowers children's contribution to family labour. Indeed, one of the most important reasons offered by parents for their children not being in school was that they needed their labour (Ye and Canagarajah, 2002). In this article, we examine if and how increased demand for youth schooling has modified rural agricultural labour markets.

Exchange or reciprocal labour, the arrangement whereby farmers provide non-cash remunerated agricultural labour services to each other on a rotating basis, has been an important source of agricultural labour in rural agrarian economies for centuries (Moore, 1975). While there are social motives for labour exchange, the basic economic motivation arises in the presence of thin labour (and credit) markets, that is, when hired labour markets, for instance, are characterised by a small number of participants due to prohibitive cost of transactions. It has long been documented that changes in the socioeconomic environment influences the prevalence of labour exchange (Moore, 1975). In this article, we

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identify and analyse changes in agrarian labour exchange offerings and implications for rural agricultural labour markets and outcomes. We ask how farm households have been responding to the changes in agrarian land and labour markets, distinguishing between labour-related responses and non-labour-related ones.

We also examine gender, geography and migration status as sources of difference in land and labour relations, livelihood outcomes and social change. This is in keeping with a body of work which has drawn attention to these differences (Agbosu et al., 2007; Beals and Menezes, 1970; Britwum et al., 2014; Skinner, 2012). With regard to geography, while Ghana is heterogeneous in several respects, there is a conspicuous and well-researched north-south divide in social and economic development due to several factors including differences in insertion in the colonial political economy, agro-ecology and infrastructure. Because Ghana's agricultural production systems are predominantly rainfed, the agro-ecological variation has resulted in agricultural production potential differences that are conditioned by a unimodal rainfall pattern in the north compared with a bimodal pattern in the south. This dichotomy precipitated colonial and post-independence economic policies that treated the north as an area of migrant labour reserve for work in the south to boost the export economy that was centred mainly on cocoa and mining (Hear, 1984; Plange, 1979b; Scully and Britwum, 2019; Shepherd, 1981; Thomas, 1973). This dichotomy fits neatly as a microcosm of Samir Amin's description of Ghana as part of the coastal sub-region of *Africa of the colonial trade economy*, where, in our case, southern Ghana can be viewed as the 'rich' area, and the north as the hinterland that served as a labour pool for the south (Amin, 1972). The relative paucity of educational facilities and institutions in the north further fuelled labour migration southwards (Plange, 1979a).

Differentiation by gender is important because pervasive gender gaps persist against women with respect to access to and control of productive and reproductive resources and livelihood outcomes (Dzanku et al., 2021; Lambrecht et al., 2018). Women have long been reported to have more difficulty organizing unpaid labour for work on their farms than men (Okali, 1983). Such labour constraints faced by women have been reported in relation to access to family labour (Doss and Morris, 2001), particularly male labour (Andersson Djurfeldt, 2018; Hill and Vigneri, 2014). Indeed, such inequalities exist within farm households in Ghana where the provision of labour on the husband's farm is considered part of the woman's conjugal responsibilities (Apusigah, 2009; Tsikata, 2009). Given the above, one would expect the labour deficit created by increased demand for youth schooling and the declining availability of exchange labour to affect men and women differently.

The rest of the article is structured as follows. The second and third sections describe the study context and data collection procedures, respectively. The observed socioeconomic changes in the study areas and associated labour commodification issues are discussed in the fourth section. This is followed in the fifth section by analyses of farmers' responses to household and community level changes in labour availability, implications for farm labour markets, and changing labour arrangements. The penultimate section deals with gendered heterogeneity in farmers' response to labour and land scarcity and agricultural labour relations. The last section concludes.

2. The study context

In order to capture the geography and gender of social change and the effects on agricultural labour availability and labour relations, we situated our case studies in two districts in southern Ghana (Asunafo North and Kwaebibirem) and two in northern Ghana (Garu and East Gonja). Kwaebibirem and Asunafo are in the semi-deciduous forest zone, which has a bimodal annual rainfall regime. By contrast, East Gonja and Garu are in the Savannah zone where annual rainfall distribution is unimodal. The main commercial crops in the southern districts are cocoa, oil palm, cashew and citrus; maize, cassava, plantain and cocoyam serve a dual purpose of household consumption and cash income to varying degrees. In the northern study areas, commercial agriculture is based on food crop production – yam, rice, maize and cassava in East Gonja; maize, millet, sorghum, and vegetables (mainly onions and okra) in Garu.

Aside the north-south contrasts regarding agro-ecology, commercialisation, infrastructure, and economic welfare, there are also differences with respect to kinship and descent rules, and socio-cultural norms. Asunafo North and Kwaebibirem are Akan areas that traditionally operate under matrilineal descent rules where inheritance (particularly land) is from one's maternal uncle rather than from father. The opposite is true in Garu and East Gonja where inheritance is through the patrilineage. While these inheritance rules are dynamic, whether as a result of policy reforms such as the Intestate Succession Law[1] of 1985 or through increasing individualisation of descent rules or by dissent (Amanor, 2001), they have implications for land and labour relations because of the interrelationship between land and labour issues in agriculture (Tsikata, 2009).

Table 1 provides a summary of selected district level indicators based on Ghana Statistical Service data. Asunafo North is the largest of the four districts by population size. East Gonja has by far the lowest population density among the four districts; population density is highest in Kwaebibirem. The differences in population density have implications for agricultural land availability and labour market conditions.

The large north-south gap in the proportion of households headed by females is suggestive of differences in socio-cultural norms. The Kwaebibirem and Asunafo North districts have relatively large migrant population shares (31% and 39% respectively). This is, in part, due to historical labour migration from northern to southern Ghana, which has contributed substantially to the growth of the cash crop economy in the south (Beals and Menezes, 1970; Scully and Britwum, 2019). Aside the north-south movement of agricultural labour, there is also a south-south movement driven primarily by the demand for cocoa and oil palm land

Table 1
Selected district level characteristics.

Indicators	(1) Kwaebibirem	(2) Asunafo North	(3) East Gonja	(4) Garu
Population	121,698	150,198	117,755	71,774
Female (%)	50.6	49.2	48.9	52.0
Population density (persons/km^2)	151.3	105.2	27.7	106.2
Female headed households (%)	34.1	31.4	14.0	16.3
Migrant population (%)[†]	31.1	39.4	14.5	4.7
Youth in school (%)[†]	21.0	17.2	11.7	11.7
Female (%)	18.4	14.5	9.2	8.2
Male (%)	23.8	20.0	14.0	15.0
Economically active population (%)	72.2	75.1	72.4	77.2
Female (%)	70.8	73.1	67.9	77.6
Male (%)	73.6	77.1	76.9	76.7
Employed in agriculture (%)	39.6	60.3	77.3	85.2
Female (%)	33.7	57.7	66.5	82.8
Male (%)	45.6	62.8	86.4	88.4

Source: The population and population density figures are from the 2021 population and housing census. The rest were compiled from various district analytical reports of the 2010 census because those are not yet available from the 2021 census. [†]This is based on the definition of crossing and living outside the administrative boundary of one's birth.

[1] This law mandated that a significant share of a man's property should be inherited by his children, which was in conflict with the matriliny.

as well as to offer labour in richer agricultural areas.

The GSS data shows that secondary and higher education attendance was higher in the south than in the north, and there were gender gaps in favour of males in all districts (Table 1). Economic activity was marginally higher among males in all districts except Garu. Since such statistics do not include reproductive work, women's labour contributions to social and economic well-being are underreported. Except in Kwaebibirem, agriculture employed far more than half (60–85%) of the economically active population in all the districts. Agriculture is more important for employment in the north (and among males) than in the south (and among females). These gender gaps must be considered within contexts where women make substantial labour contributions to agricultural and home production, most of which are unremunerated (Raney et al., 2011).

3. Data collection

This paper draws on qualitative and two rounds of household panel data collected in 10 villages (Fig. 1) across the four districts described in section 2. Between January and March 2016, we carried out district and community level qualitative interviews using three data collection techniques: key informant interviews, in-depth interviews and focus group discussions (separately for men and women). The key informant interviews involved institutions at the district capitals as well as community leaders. The in-depth interviews and focus group discussions involved men, women, and youth. In all, we conducted 27 interviews at the district level and 138 at the community level (24 focus group discussions and 114 in-depth and key informant interviews). The sampling scheme ensured that diverse demographic groups based on gender, age, ethnicity, and migration status were represented. About 44% of the qualitative interview respondents were female.

In March 2017, we carried out a household survey in all the communities after a census of all households to generate a sampling frame. Depending on village population, we randomly sampled between 22 and 75 households from each community to obtain a representative sample, yielding a total survey sample of 484 farm households containing 2,586 individuals of which 53% were female. Based on the household census in each community, we ensured that female-headed households and male-headed households were adequately represented. In March 2020, we carried out a follow-up survey to the same households and successfully reinterviewed 87% of the original households. We also sampled 348 new households for the purpose of studying contract farming, bringing the total sample for the 2020 survey was 770 households and 4,269 individuals. Thus the pooled sample contains 1,254 and 6,855 household and individual observations, respectively.

4. Socioeconomic changes and rising labour commercialisation

We focus on education as a key socioeconomic variable and examine how changes in educational investments and expected returns by households influence land and labour relations in contrasting rural agrarian societies of northern and southern Ghana. In particular, we focus on school attendance by youth (15–24-year-old) household members who could otherwise be an important source of agrarian labour and the implications for various land and labour arrangements. Our argument here is not that schooling is the cause of rural agricultural labour market imperfections, particularly given that unemployment and underemployment are still serious problems in rural Ghana (Adeniran et al., 2020; Dzanku and Hodey, 2022) due, in part, to the persistent seasonality and uncertainties in agricultural production under rainfed conditions (Charlton et al., 2021). However, our aim is to analyse the opportunity costs of schooling and implications for family farm labour relations in order to draw attention to why there is the need to raise marginal returns to youth schooling under the present conditions of high youth unemployment across the African continent.

4.1. Youth schooling

Education is widely considered an investment in human capital, which is expected to yield returns that include improved well-being in general. Indeed, governments, households, and individuals are widely believed to expect educational investments to yield high rates of return (Rolleston and Oketch, 2008; Schultz, 1961). Yet, there are important trade-offs between youth schooling and labour market participation that need to be recognised. Aside from state policies aimed at reducing cost-related school dropouts, our qualitative interviews revealed high private demand and investments in children's education. This demand for schooling comes partly from sensitisation campaigns by various Civil Society Organizations (CSOs) and Non-Governmental Organizations (NGOs), some of which have been targeted at eliminating child labour in cocoa production. However, while children's education was reported to have become a higher priority for many families than it was in the past, it has also become a source of financial pressures because of the seasonal character of agricultural earnings. An assemblyman and farmer from a community in the Kwaebibirem district observed[2]

People are spending a lot on school fees. If you come here again and see that I have still not completed my new house, it is because school fees is killing me.

The paradox here is a growing sense that increasingly high levels of education does not deliver the expected levels of entry into work outside agriculture. This is creating disenchantment with education as a source of alternative livelihoods for the next generation, although this has not translated into a reduction in school attendance and an increased availability of household labour for agriculture. Educational studies have found that young people with some schooling, no matter the length of time spent in education are not likely to take up agricultural as permanent work (Sumberg et al., 2017).

How prevalent is school attendance by household members who could contribute to family farm labour? The survey collected information on schooling for those aged 15 years and older. Here, we focus on school attendance by youth (15–24-year-olds) – the age at which they are normally expected to be in second cycle and higher educational institutions. There was a gender balance in the proportion of youth in the sample (50.3% females and 49.7% males). Nationally representative rural survey samples show that youth schooling increased from almost 24% in 2017 to about 31% in 2019 (Table 2). About 29% of youth belonging to households in our pooled survey sample were attending secondary school and above; the rate of youth schooling was seven percentage points less in the north than in the south (p-value = 0.020). There was a statistically significant increase of approximately 12 percentage points in youth schooling between 2017 and 2020 in our survey sample (Table 2). This increase could be associated with the Free SHS policy. Table 2 shows statistically significant gender gaps at the 5% level in youth schooling in favour of boys in both the nationally representative samples and in our own survey sample in 2017. However, the gender differences narrowed by 2019/20 in all cases and became statistically not different from zero except in the northern sample where the gender gap more than doubled.

4.2. Youth schooling, declining migrant labour flows and rising labour costs

Labour migration, including seasonal labour movements from the north to the south for work on cocoa farms, has historically been an important resource for growth in the cocoa sector (Amanor, 2010; Beals and Menezes, 1970; Hill, 1997; Miracle and Berry, 1970). Migrant labour from northern Ghana has been particularly important in Asunafo where commercial agriculture is synonymous with cocoa production.

[2] It must be noted that this was before the introduction of the Free Senior High School education policy in 2017.

Fig. 1. Map of Ghana showing the study communities.

However, the narrative from our qualitative interviews suggests that the increasing rate of youth schooling has had an impact on labour movements from the north:

In the past, people could hire vehicles, go to the north, and bring young men here to work as labourers. Now such things can no longer be done because parents are making sure that their children stay in school. This has affected labour availability in this community. (63-year-old widow and retired farmer, Asunafo North).

However, we noted that the youth schooling effect on labour availability is not a phenomenon only in the southern cocoa growing area; we also found similar narratives of increasing labour scarcity due to increasing rates of youth schooling in the northern study areas:

The labour situation in this area is tough because most children are in school and do not get enough time to help their parents on the farm. (Elite male farmer, Garu).

There is a general rise in land-labour ratio in Ghana (Diao et al., 2014). In theory, this should lead to rising labour cost. Some households argued that the family labour deficit created by absent youth, the reduced flow of migrant labour from the north, and the concomitant labour scarcities have led to rising cost of hired labour. During FGDs, however, while some interpreted the scarcity of hired labour to mean shortage of labourers, others argue that it is more an issue of escalating wage rates than availability:

Labourers are there; it is only their price that has increased. If I need one right now, I will get. (53-year-old migrant farmer, Asunafo North, Southern Ghana).

If you have money, getting your work done is very simple, but if there is no money, they [labourers] *will be there but you cannot hire them.* (27-year-old male farmer, East Gonja, Northern Ghana).

With lower levels of family labour and higher commercialisation

Table 2
Average school attendance by 15–24-year-olds (percent).

	Demeter sample				
	(1)	(2)	(3)	(4)	(5)
	National	Overall	South	North	South – North
2017					
Overall	23.5	22.7	26.1	20.9	5.2
Boys	26.4	25.5	30.7	23.0	7.7
Girls	20.1	20.0	22.2	18.6	3.6
Sex gap	6.3	5.5	8.5	4.4	4.1
2020					
Overall	31.2	34.6	44.2	31.0	13.2
Boys	31.8	38.5	48.0	35.8	12.2
Girls	30.6	30.5	41.4	25.0	16.4
Sex gap	1.2	8.0	6.6	10.8	−4.2

Note: The national average figures for 2017 are from the rural sample of the 7th round (2016/17) of the Ghana Living Standards Survey (GLSS7); those for 2020 are from the 3rd round of Ghana Socioeconomic Panel Survey (2019).
Source: Household survey, 2017 & 2020.

rates in the south,[3] we expected the employment of and expenditure on hired labour to be higher in the south, which is what Fig. 2 shows based on our survey data.[4] The north-south difference in hired labour demand is reflected in the cost thereof (Table 3). For example, although the *by-day* (daily-paid labour wage) rates in all the districts were above the statutory national daily minimum wage of US$1.86, a daily-paid farm worker in the north only received between 28% and 43% of what was received in the south.

4.3. Dwindling reciprocity?

Exchange labour has been an important source of labour in Ghana's agriculture and was even adopted by the state as a model of rural development in the 1970s (Dadson, 1988). Takane (2000) distinguished between two kinds of exchange labour. The first is when a farmer works on another's farm *ad hoc* without strict obligations; these are often task-specific such as the breaking of cocoa pods in cocoa growing areas. The second is when well-organized exchange groups are formed with a specified number of members who offer labour services to each other on a rotating basis.

With declining availability of family labour, exchange labour could be a substitute, but exchange labour availability could also be affected by the absence of youth that could contribute to their household's exchange labour pool. The increasing commercialisation of land and labour relations has led to the altering of reciprocal labour services into cash-based labour arrangements Amanor (2010), which explains the rise in hired labour and sharecropping. A middle-aged cocoa farmer in the Kwaebibirem district explains:

Most people are not involved in exchange labour anymore because people are now conscious of money and they want to get money from every activity.

Even tasks such as breaking cocoa pods and conveying cocoa beans to the drying point, which were done using exchange labour, have become commercialised in some areas as indicated by a 47-year old farmer in Asunafo North:

My father had a large cocoa farm but other farmers helped with harvesting and cracking the [cocoa] *pods, but now, we hire labour for cracking the pods and carrying the beans.*

With the higher rates of input (land and labour) and output commercialisation in the south (driven mainly by cocoa and oil palm production) than in the north, one would expect exchange labour availability to be higher in the north. Our qualitative interviews show that, indeed, this is the case. For example, a 60-year-old female farmer in Grushie Zongo (East Gonja) who has nine grown children living outside her community explains:

Sometimes, I use hired labour when my children send me money, but I do not have money most of the time so I use exchange labour. With exchange labour, I only prepare food for the workers.

We found that even with the observed decline in exchange labour use in the southern communities, the phenomenon is more common among migrant farmers from the north than among natives. A 45-year-old second-generation migrant farmer in Asunafo North whose parents migrated from Navrongo in the Upper East Region explains:

Exchange labour is not common now as it was when I was a little boy, but for us the northerners, we know ourselves, so we sometimes engage in exchange labour.

It must be noted, however, that there were also narratives of declining availability of exchange labour in the northern study areas, although to a lesser extent than the south. This was pointed out in some of our in-depth interviews as indicated by a 51-year old married female farmer and trader in Garu:

The labour situation has changed. At first, there was a lot of exchange labour, but now by-day (daily-paid labour) is in the lead.

The north-south gap in exchange labour availability indicated by the qualitative data is observed in the survey data too (Fig. 3); even then, only about a third of all households reported using some exchange labour in the north, compared with about 9% in the south.

With increased demand for schooling, and changing agricultural labour markets and arrangements induced by the increasing commodification of land and labour relations, how have households responded to the real or apparent labour shortages? It is to this question that we now turn.

5. Households' responses to social change and labour scarcity

Here, we ask how households are responding to the family labour scarcity due to the increasing demand for child schooling, the scarcity or rising cost of hired labour, and the declining reciprocal labour availability exacerbated by increasing individualisation and commodification of land and labour relations. The observed responses can be grouped into labour and non-labour responses.

5.1. Labour-related responses

There have been a number of labour-related responses to the reported scarcity of labour. By labour-related, we mean responses associated with farm labour decisions that adjust for the family labour deficit. These include a more intensive use of available household labour, employing more hired labour, uptake of labour-saving technologies, and substituting less labour intensive crops for labour demanding crops. We examine some of these options by using the survey data to analyse differences in external labour resources and labour-saving technology use between those with and without youth in school.

First, we test the null hypothesis that the availability of family farm labour is identical between households with and without youth in school. Consistent with our a priori expectation, the results (Table 4) show that male adult equivalent (MAE)[5] family labour was about 18% less for households with youth in school than those without youth

[3] Male adult equivalent labour available was higher in the north (2.5) than in the south (1.8). Using the ratio of the gross value of crop sales to the gross value of crops produced as a measure of level of commercial agriculture, our pooled survey data shows that the mean level of commercialisation in the north was only 46% of the level in the south.

[4] Here, and elsewhere, the error bars on the graphs are indicative that the difference between the groups is statistically significant at the 5% level if the bars do not overlap.

[5] In calculating male-equivalent farm labour, a teen and an adult female farmer labour was estimated to be equivalent to 0 0.75 of an adult male's labour based on FAO (1999).

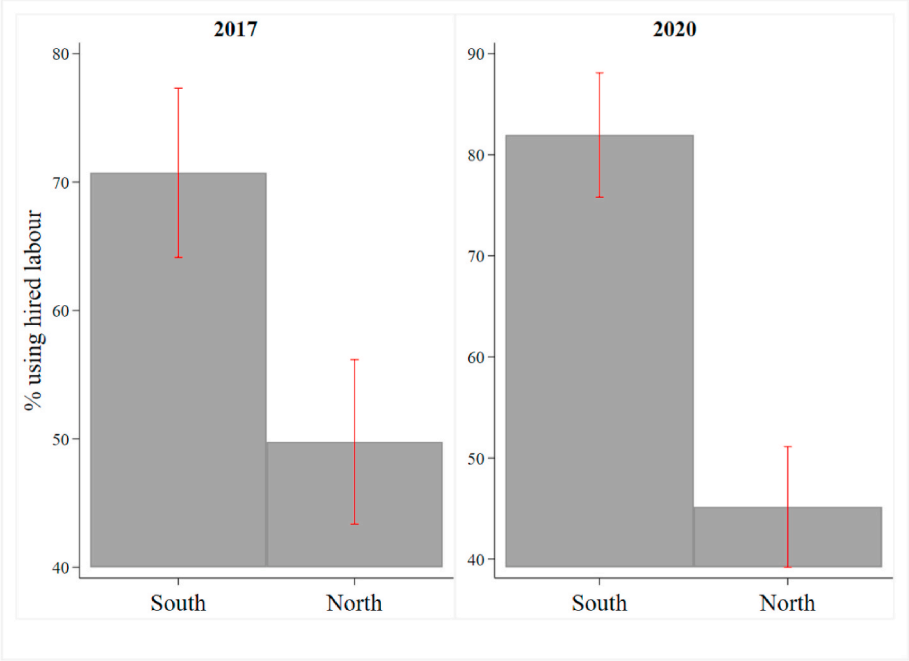

Fig. 2. Hired labour use is significantly higher in the south than in the north.

Table 3
Cost of hired farm labour.

District	Contract labour (US $/acre)	*By-day* (daily-paid) casual labour (US$)
Kwaebibirem	16.28	5.81
Asunafo North	13.37	4.07
East Gonja	7.56	1.74
Garu	7.56	1.63

Source: Demeter qualitative interviews, 2016

schooling (p-value = 0). This labour deficit is, however, only statistically significant in the southern sample where the difference is about 21%.

Next, we examine whether those with youth in school used their available household labour more intensively and relied more on external sources of labour (exchange and hired) for maintaining their farms owing to the shortfall in household labour supply. We find that the results depend on the geographic location of the household. For those located in the north youth schooling is not significantly correlated with any of the outcomes except the likelihood of using hired labour, which was significantly higher in 2020 for households with youth in school. The fact that most of the outcomes show no significant difference in the north could be expected because farming is generally less intensive in

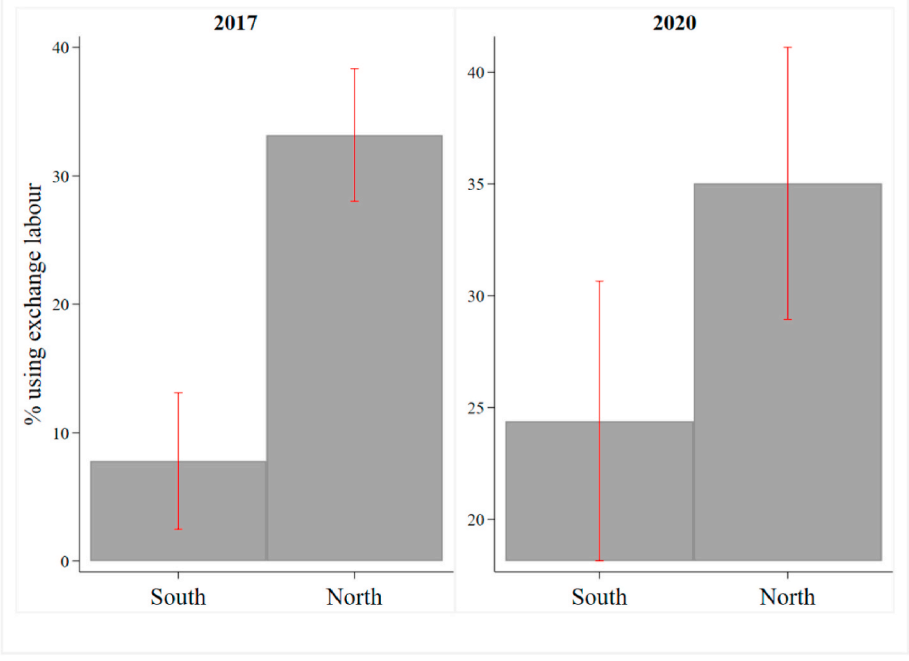

Fig. 3. The use of exchange labour is significantly higher in the north than in the south.

Table 4
Differences in various labour responses between households with and without youth in school.

Indicator	2017				2020			
	Overall	South	North	Diff.	Overall	South	North	Diff.
Family labour available (mae)								
Overall	2.2	1.9	2.5	**−0.5**	2.1	1.7	2.6	**−0.9**
In school	2.0	1.7	2.5	−0.8	2.0	1.6	2.6	−1.1
Not in school	2.3	2.1	2.5	−0.4	2.4	1.9	2.6	−0.8
Diff.	**−0.3**	**−0.4**	0.1	**−0.5**	**−0.4**	**−0.3**	−0.0	**−0.3**
Family labour (person-days/mae)								
Overall	119.4	162.8	78.4	**84.4**	150.3	218.3	86.0	**132.4**
In school	138.7	177.1	78.5	98.6	179.9	236.4	86.8	149.7
Not in school	110.7	153.7	78.4	75.3	118.9	183.4	85.5	97.9
Diff.	**28.0**	**23.4**	0.1	**23.3**	**60.9**	**53.0**	1.3	**51.7**
Exchange labour use (%)								
Overall	20.9	7.8	33.2	**−25.4**	29.9	24.4	35.0	**−10.6**
In school	13.0	3.8	27.5	−23.7	26.3	22.2	32.9	−10.7
Not in school	24.4	10.4	34.9	−24.5	33.7	28.6	36.3	−7.7
Diff.	**−11.4**	**−6.7**	−7.5	0.8	**−7.4**	−6.3	−3.4	−3.0
Hired labour use (%)								
Overall	60.0	70.7	49.8	**21.0**	63.0	82.0	45.2	**36.8**
In school	68.7	76.3	56.9	19.4	76.5	90.4	53.7	36.7
Not in school	56.0	67.2	47.6	19.6	48.8	65.7	40.0	25.7
Diff.	**12.7**	**9.0**	9.3	−0.2	**27.7**	**24.7**	**13.7**	**11.0**
Hired labour expenditure (US$/ha)								
Overall	81.9	132.3	34.4	**97.8**	135.3	216.1	59.1	**157.0**
In school	40.8	56.9	15.5	41.4	58.6	72.4	35.8	36.7
Not in school	26.1	38.8	16.5	22.3	33.1	48.4	25.1	23.3
Diff.	**14.7**	**18.1**	−1.0	**19.1**	**25.5**	**24.0**	10.7	13.3
Weedicides expenditure (US$)								
Overall	17.6	25.0	10.6	**14.3**	35.7	46.6	25.5	21.1
In school	24.2	32.5	11.3	21.2	41.9	52.7	24.0	28.7
Not in school	14.6	20.2	10.4	9.8	29.3	34.7	26.4	8.3
Diff.	**9.6**	**12.3**	0.9	**11.4**	**12.6**	**18.0**	−2.5	**20.4**

Note: The numbers in bold font means that the mean difference is statistically significant at the 5% level. A positive difference of the differences means that the gender gap is wider in the south.
Source: Household survey, 2017 & 2020.

northern Ghana because of the longer dry spell under rainfed conditions. In the southern pooled sample, however, consistent with our proposition, we find that, on average, households with youth in school used their available labour more intensively (about 27% higher) and had access to significantly less exchange labour (7 percentage points less in 2017 but not 2020) than households without youth schooling. Exchange labour use may be less common among households with youth in school due to the reciprocity involved.

With other conditions remaining the same, households with youth in school are expected to hire in more labour since they have less access to exchange and family labour than their counterparts do. Indeed, the incidence of farm labour hiring was about nine percentage points higher in 2017 and increased to about 25 percentage points in 2020 among household with youth in school in the south than among those without such members in school. The difference in average hired labour expenditure per hectare between households with and without youth schooling is significant and increased in real terms from about US$18 in 2017 to US$24.

What about the use of labour-saving technologies in response to labour scarcity? A common narrative during our qualitative interviews was the substitution of weedicides for labour during land clearing in response to family labour scarcity and the rising cost of hired labour. In the qualitative study, the use of weedicides in response to labour scarcity and the rising cost of labour was mentioned in all study locations:

In the past, I had to pay so much to hire labour to clear the land with cutlass, but now it is easier and cheaper to clear the land by spraying with chemicals. (40-year-old male farmer, Kwaebibirem).

With the introduction of the chemicals, farmers and their children can spray the farm themselves, they do not need to hire labour for land clearing. (Middle-aged female farmer, East Gonja).

The survey data shows that, although weedicide expenditures were significantly higher in the south where labour was scarcer (Fig. 4), expenditures grew faster in the north between 2017 and 2020 – real expenditures increased by about 86% in the south compared with 140% in the north over the period. Table 4 shows a statistically significant difference in weedicide use between households with and without youth in school in the southern sample, and this difference increased by about 46% between 2017 and 2018 (from about US$12 to US$18).

The associations between schooling and the various indicators presented in Table 4 could be spurious because we did not adjust the results for factors other than youth schooling that could drive the differences. Therefore, we evaluate the associations using regression analysis, which allows us to account for factors such as household socioeconomic and demographic characteristics, commercialisation rates, unobserved household-specific heterogeneity or village fixed effects that capture unmeasured community-specific characteristics.[6]

The marginal effects associated with youth schooling (after adjusting for confounding factors) are shown in Table 5. In the overall sample, the effect of youth schooling had a statistically significant effect on three outcomes: about 27% less available household labour, about 29% higher family labour use intensity, and about US$/ha expenditure on hired labour. For two of the outcomes (family labour availability and use intensity), unlike the results reported in Table 4, the youth schooling

[6] The general form of the regressions is $y_{it,j} = \alpha + \delta school_{it} + \beta' x_{it} + c_i + \varepsilon_{it}$, where $y_{it,j}$ is the value of the jth indicator of interest for household i in time t; $school_{it}$ is the indicator variable that takes on the value 1 if the household has a youth in school and 0 if not; δ is the estimate of interest which shows the effect of youth schooling on y; x_{it} is a vector that contains other factors that could influence the value of y besides school attendance; the corresponding parameter vector associated with x_{it} is represented by β; c_i is the household-specific unobserved heterogeneity, which in the absence of panel data constitutes an omitted variable; ε_{it}, is the idiosyncratic error term.

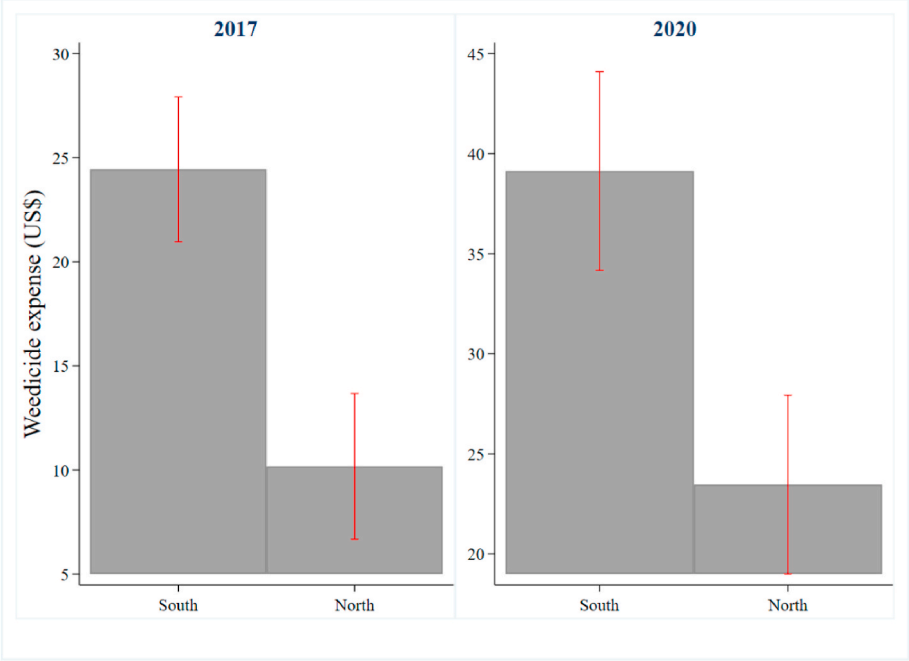

Fig. 4. The use of weedicides as a labour-saving technology is higher in the south.

Table 5
Marginal effects of youth absence due to schooling on selected outcomes.

Dependent variable	(1)	(2)	(3)
	Overall	South	North
Family labour available (mae)	−0.269***	−0.156**	−0.317***
	(0.049)	(0.067)	(0.070)
Family labour use intensity (log)	0.293***	0.182**	0.386***
	(0.065)	(0.091)	(0.096)
Use of exchange labour	0.004	0.014	0.011
	(0.060)	(0.082)	(0.053)
Hired labour expenditure (US$/ha)	8.537**	22.148***	3.132
	(4.154)	(7.464)	(3.672)
Weedicide expenditure (US$/ha)	0.733	5.519***	−1.644*
	(0.994)	(1.792)	(0.880)
Observations	844	410	434

Note: The results are from household fixed effects regressions that allow us to model household-specific unobserved heterogeneity. Cluster robust standard errors are in parentheses. ***; **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively. All the estimates adjust for household demographic characteristics (sex of household head, age, level of education, child dependency ratio), wealth, off-farm employment, scale of production, and sources of labour.

effects were statistically significant in both the north and south subsamples (columns 2 and 3), which shows the importance of adjusting for other confounders using regression analysis.

As we found earlier, however, the schooling effects on hired labour and labour-saving technology were only statistically significant at the 1% level in the south subsample (column 2) – youth schooling was associated with an average of about US$22/ha extra expenditure on hired labour, and almost about US$5/ha more on weedicides as substitute for labour.

5.2. Non-labour-related responses

Aside labour-related responses, farm households could adopt non-labour responses in the face of labour scarcity, and by non-labour we mean responses that are not directly associated with farm labour use, including farm size reduction, increased non-farm participation, and exiting agriculture altogether. Of course, there are constraints associated with these responses too; non-farm jobs, for example, may not be available, may be precarious, or household members may not have the required skills.

On farm size, data from the qualitative interviews provided mixed results about changing farm sizes and why. In the south, land scarcity seemed relatively more important than labour shortages in driving declining farm sizes. This view is exemplified by a 45-year old male migrant farmer and trader in a Kwaebibirem community who held 4.5 ha under cocoa, oil palm and rice:

Now, land has become very scarce in this community and that is why my farm is small; if land were available, I would have a bigger farm. Even the land I have now I got it because I am hardworking and people have given good testimonies about me.

Similar views were expressed during focus group discussions in the Asunafo North communities where land was scarcer than in Kwaebibirem because of the relatively older cocoa farms and land exhaustion:

Our fathers came to acquire the lands and they have now divided it among their children, so now lands belonging to individuals are smaller than what people had in the past. All the lands that were acquired by our fathers are finished, the sizes of farms belonging to individuals are becoming smaller. (Male FGD, Asunafo North).

Using the survey data, we examine whether there are significant differences in farm size and non-farm employment between households with and without youth in school. The results (Table 6) show no evidence of youth schooling associated reduction in farm sizes. In fact, we observe in the overall sample that mean farm size was significantly larger for households with youth members in school, a result that is driven by the southern subsample, but is not surprising because of specialization in the production of perennial crops (cocoa and oil palm) in the south, which is less likely to be affected by current education of young household members. In the north where annual crops dominate households' crop portfolio, mean farm size is smaller for households with youth in school, but the differences in both panel years are statistically insignificant.

We also observe that off-farm participation and income are significantly higher among households with youth in school. The results show some temporal and spatial nuances – in 2017 the off-farm income difference was driven primarily by the north subsample and by the south

Table 6
Differences in farm size and off-farm income among households with and without youth in school.

Indicators	2017				2020			
	Overall	South	North	*Diff.*	Overall	South	North	*Diff.*
Farm size (ha)								
Overall	3.2	4.1	2.4	**1.6**	3.5	4.2	2.9	**1.3**
In school	3.8	4.8	2.4	2.4	3.8	4.4	2.8	1.7
Not in school	3.0	3.7	2.5	1.2	3.3	3.8	3.0	0.8
Diff.	**0.9**	**1.1**	−0.1	**1.2**	**0.6**	0.6	−0.2	0.8
Off-farm income participation (%)								
Overall	72.7	87.8	58.5	**29.3**	71.3	91.2	52.5	**38.7**
In school	78.6	90.0	60.8	29.2	78.8	92.6	56.1	36.5
Not in school	70.1	86.4	57.8	28.6	63.4	88.6	50.4	38.2
Diff.	**8.5**	3.6	3.0	0.6	**15.4**	4.0	5.7	−1.7
Off-farm income (US$)								
Overall	715.3	1030.8	417.3	**613.4**	704.0	1114.1	316.5	**797.7**
In school	933.6	1064.9	727.7	337.1	892.4	1197.9	389.4	808.5
Not in school	617.1	1009.0	322.0	687.0	504.5	952.6	272.2	680.4
Diff.	**316.5**	55.9	**405.7**	−349.8	**387.9**	**245.3**	117.2	128.1

Note: The numbers in bold font means that the mean difference is statistically significant at the 5% level. A positive difference of the differences means that the gender gap is wider in the south.
Source: Household survey, 2017 & 2020.

subsample in 2020 (Table 6).

It must be noted that these results do not establish causality since both observed and unobserved factors that drive off-farm income could be correlated with youth schooling. We, in part, mitigate against the risk of spurious correlations by regressing farm size and off-farm income on youth schooling and other covariates that may be correlated with the outcomes using the fixed effects regression, which allows correlation between household specific heterogeneity and youth schooling (and other covariates). The results (Table 7) show that although youth schooling seemed associated with smaller mean farm size, the association is not strong enough to achieve statistical significance. The effects of youth schooling on off-farm participation and income are only significant in the south subsample where youth schooling is associated with a 6-percentage point higher off-farm participation and about 52% larger off-farm income. In sum, we observe trade-offs associated with investments in youth schooling but, as with labour-related responses, most of the strong effects are observed in the southern study areas where agricultural production is more intensive.

The above results show the presence of household level farm-related opportunity costs associated with the absence of youth household members due to schooling. However, investments in education are expected to yield benefits that outweigh these costs (Raju and Younger, 2022). Nonetheless, the high rates of unemployment, even among educated youth (Baah-Boateng, 2015), could reduce expected economic returns to education. The 2021 population census shows that about 17% of male and 22% of female youth (aged 15–35 years) in the labour force were unemployed (Ghana Statistical Service, 2022) – this rate of unemployment was higher than the rate in the general population, which was 12% for males and 16% for females.

It is important to emphasize that youth schooling is not the only cause of labour shortages, and that there is some contradiction in the fact that while households complain about labour shortages and the cost thereof, the 2021 census shows that a sizable proportion of the rural population are unemployed (about 12% of the population 15 years and older and about 19% of 15–35 year-olds).

In sum, the issue of returns to schooling is vital as Ghanaian parents generally expect to reap future benefits in the form of remittances, for example, from private investments in their children's education (Ahiakpor and Swaray, 2015; Lloyd and Gage-Brandon, 1994). However, our qualitative interviews show that private investments in child education does not always yield the expected private returns in the short to medium term, as lamented by a 50-year-old single mother, trader and farmer in Kwaebibirem:

> *I spent so much on my daughter's school fees in nursing training. I had to stop by building along the way to concentrate on her school fees, but she is still unemployed and at home two years after graduation … she still depends on me* [financially].

Table 7
Marginal effects of youth schooling on farm size and off-farm employment.

Dependent variable	(1)	(2)	(3)
	Overall	South	North
Farm size (log)	−0.084	−0.137	−0.065
	(0.064)	(0.106)	(0.084)
Off-farm participation	0.077	0.064**	0.027
	(0.055)	(0.032)	(0.093)
Off-farm income (log)	0.308	0.522**	0.164
	(0.235)	(0.261)	(0.341)
Observations	844	410	434

Note: The results are from household fixed effects regressions that allow us to model household-specific unobserved heterogeneity. Cluster robust standard errors are in parentheses. ***; **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The estimates adjust for household demographic characteristics (sex of household head, age, level of education, household composition), wealth, sources of labour, and time effect.

6. Gendered heterogeneity

Here, we assess whether the articulated social change in terms of the burden of child schooling and the attendant farm labour deficits are different for men and women. We also examine gender gaps, if any, in farm labour availability and demand for hired labour as well as explore gender differences in farmers' response to labour scarcity. Where the survey data allows, we examine both intra– and inter-household gender differences, with the later distinguished by household headship.

6.1. Gendered land and labour arrangements

Gender roles in agriculture are dynamic, with some evidence from Ghana (Lambrecht et al., 2018) suggesting that some changes have occurred. For instance, both men and women are venturing into the production of crops that were hitherto considered men or women's crops. Here, we first examine gender differences in farm size and the various farm labour arrangements (Table 8). As could be expected, female-headed households (FHHs) cultivated less land than male-headed households (MHHs) – the gender gap was about 59% in 2017 and increased to 84% in 2020. The gender gaps are significant in

Table 8
Comparison of selected indicators between male– and female-headed households.

Indicators	2017				2020			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	South	North	*Diff.*	Overall	South	North	*Diff.*
Farm size (ha)								
Male	3.7	5.0	2.8	**2.2**	4.1	5.2	3.4	**1.8**
Female	2.3	2.9	1.3	**1.6**	2.2	2.8	1.3	**1.4**
Diff	**1.4**	**2.1**	**1.5**	0.6	**1.9**	**2.4**	**2.0**	0.4
Family labour available (mae)								
Male	2.5	2.1	2.7	**−0.6**	2.4	1.8	2.8	**−1.0**
Female	1.7	1.7	1.6	0.1	1.7	1.5	2.1	**−0.7**
Diff	**0.8**	**0.5**	**1.1**	**−0.7**	**0.7**	**0.3**	**0.7**	−0.3
Exchange labour use (%)								
Male	23.9	9.2	34.1	**−24.9**	32.6	26.8	36.9	**−10.1**
Female	14.3	5.8	29.8	**−24.0**	23.7	20.7	28.6	−7.8
Diff	**9.6**	3.4	4.3	−0.9	**9.0**	6.1	8.3	−2.2
Hired labour expenditure (US$/ha)								
Male	31.6	53.8	15.9	**37.9**	42.7	62.2	28.4	**33.8**
Female	28.6	34.8	17.3	**17.4**	54.0	67.3	31.7	**35.7**
Diff.	2.9	**19.1**	−1.4	**20.5**	−11.3	−5.2	−3.3	−1.9
Weedicide expenditure (US$/ha)								
Male	7.9	13.3	4.2	**9.1**	11.9	15.3	9.5	**5.8**
Female	7.7	9.2	4.9	**4.2**	7.8	7.3	8.7	−1.3
Diff	0.3	4.1	−0.8	4.9	**4.1**	**8.0**	0.8	**7.2**

Note: Boldface numbers indicates statistically significant difference at the 5% level or less. A positive difference of the differences means that the gender gap is wider in the south.

both the north and south subsamples.

Table 8 compares mean values of various types of labour input and labour-saving technology use between MHHs and FHHs. In general, female farmers in Ghana tend to have less access to family farm labour than men (Doss and Morris, 2001), particularly male family labour (Andersson Djurfeldt, 2018; Hill and Vigneri, 2014). Thus, factors that reduce the availability of family labour such as youth schooling could either increase women's family labour deficits or affect them less than men, supposing they have equal access to substitute labour. In the overall sample, FHHs had less family farm labour available, participated less in exchange labour, spent about US$19/ha less on hired labour in the south in 2017, and spent about US$8/ha less on weedicides as a labour-saving technology in the south in 2020.

Table 8 also shows geography-specific differences. We expected the gender gaps to be wider in the north than in the south because of more binding sociocultural norms against women in the north (Ragsdale et al., 2018) as well the confluence between the scarcity and cost of labour and the enforcement of sociocultural norms given that the recourse to norms that exclude some social groups particularly women tend to be higher when resources are scarce, (Hazarika et al., 2015). However, we did not find any significant consistent pattern of north-south differences in the gender gaps – some of the gender gaps are significantly wider in the north (male labour in 2017) while others are wider in the south (hired labour in 2017 and labour-saving technology in 2020).

Looking within the household (Table 9), we observe, as could be expected, that women's plots are smaller than men's are. Comparing the gender gaps in farm size (Tables 8 and 9), we observe that the *between household* gender gaps are wider than the *within household* gaps. As Hill

Table 9
Mean intra-household gender differences.

Indicators	2017				2020			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	South	North	*Diff.*	Overall	South	North	*Diff.*
Plot size (ha)								
Men's plot	1.8	2.2	1.5	0.7	1.7	2.0	1.4	0.6
Women's plot	1.3	1.5	1.0	0.5	1.1	1.4	0.8	0.6
Diff.	**0.6**	**0.7**	**0.5**	**0.2**	**0.6**	**0.7**	**0.6**	0.0
Person-days of family labour								
Men's plot	78.6	101.3	56.6	44.8	82.3	114.5	54.6	59.9
Women's plot	65.7	74.4	52.2	22.2	71.2	89.1	49.0	40.1
Diff.	**12.9**	**27.0**	4.4	**22.6**	**11.2**	**25.4**	5.6	**19.8**
Exchange labour use (%)								
Men's plot	15.5	6.0	24.6	−18.6	21.7	18.7	24.3	−5.6
Women's plot	11.7	4.1	23.4	−19.3	17.8	12.7	24.2	−11.6
Diff.	**3.8**	1.9	1.2	0.7	**3.9**	**6.0**	0.1	6.0
Hired labour expenditure (US$/ha)								
Men's plot	30.8	45.9	16.1	29.9	41.9	65.7	21.4	44.3
Women's plot	50.6	70.3	19.9	50.5	36.9	47.7	23.5	24.3
Diff.	−19.8	−24.4	−3.8	−20.6	5.1	**18.0**	−2.0	**20.1**
Using weedicide (%)								
Men's plot	46.2	60.4	32.4	28.0	60.8	51.1	69.2	−18.1
Women's plot	40.4	44.5	34.0	10.5	44.1	38.0	51.6	−13.6
Diff.	**5.8**	**15.9**	−1.6	**17.5**	**16.8**	**13.2**	**17.6**	−4.5

Note: Boldface numbers indicates statistically significant difference at the 5% level of less. A positive difference of the differences means that the gender gap is wider in the south.

and Vigneri (2014), we find that women have access to smaller quantities of family labour than men but that the gender gap is statistically significant only in the southern subsample where labour is scarcer.

On external sources of farm labour, we found that exchange labour was more commonly used on men's plots than women's plots in the overall sample. In the region-specific samples, however, the gender difference is only statistically significant in the south in 2020 (column 6 of Table 9). In addition, while average hired labour expenditure on women's plot was higher by about US$20 in the overall sample in 2017, the intra-household gender differences are not statistically significant. In 2020, however, hired labour expenditures on men's plot were higher than on women's plots, particularly in the southern subsample where there was a statistically significant US$18/ha more expenses on hired labour on men's plots, on average.

The use of labour-saving technology was also significantly higher by about 16 percentage points on men's plot in 2017; in 2020 the gaps were significantly larger on men's plots in both the south (about 13 percentage points) and north (almost 18 percentage points) subsamples. As others (Andersson Djurfeldt, 2018; Doss and Morris, 2001; Hill and Vigneri, 2014), our results so far suggest that women have fewer claims over household and exchange labour, which triggers their need to hire in more labour than men did in 2017. However, it seems that women could not sustain the use of more hired labour on their plots three years hence.

Conventional wisdom suggests that women's participation in paid agricultural labour markets are limited. Our qualitative data suggest that women's participation in hired farm labour markets could be constrained by factors that include preference for male hired labour. This is the case even in situations of reported increasing labour scarcity. A common response from the in-depth interviews and FGDs to the question of why male hired labour is generally preferred was that 'women cannot weed because they are not strong enough'. Yaro et al. (2017) reported similar views in relation to agricultural related tasks in western Ghana. A 46-year-old male migrant farmer in Asunafo North whose household cultivated 4 ha to cocoa, plantain and citrus stated:

I do not work with women on my farm. Women can weed but they are not that strong and they take more days to work.

We found such sentiments more prevalent in the south than in the north. In fact, we found in some villages in the north that the most common hired labour groups are constituted by women, but this was reported as a recent development.

In terms of by-day labour [daily-paid labour]*, women are in the majority, from sowing to harvesting. I know the terrain very well so I know what is happening.* (Assemblyman, Garu).

There is an underlying reason for this; our in-depth interviews show large gender gaps in land ownership and control in favour of men in communities where female farm labourers are common. If women have access to land at all, their portions tend to be much smaller than men's. This suggests that women are 'forced' to make a living by hiring out their labour on contracts. An elite commercial farmer in Garu stated:

Apart from family labour, women are the most commonly used labourers because they are readily available and ready to work for money. They are common because most of them do not have lands and only make income from hiring out their labour on by-day basis.

In keeping with the evidence from the qualitative survey, we found gender gaps in plot ownership and size to be widest in Garu where female hired labourers are most common. The survey collected data on whether plots were operated by husbands, wives or jointly. We found that, in the overall sample, only 11% of the 672 plots cultivated within couple households were operated by wives (74% were operated by husbands and 14% jointly).[7] Fig. 5 plots the share of cultivated land operated by wives within the household.

We observed that the proportions were lowest in the northern study

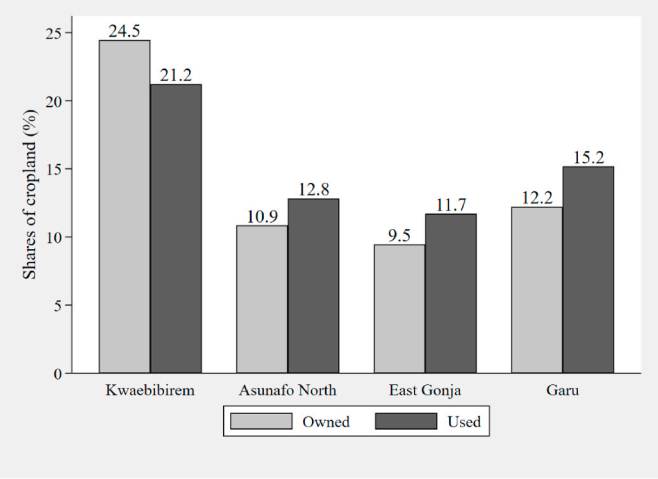

Fig. 5. Percent of cropland owned and used by women in heterosexual couple households.

areas, and that within each region, the shares were lower in districts with relatively more severe land and labour scarcity. Thus, the qualitative and quantitative findings told a similar story, that women were hiring-out their labour more in areas where they had less control over land, other factors remaining similar.

We used the survey data to seek further evidence of association between control over land and female participation in hired labour market as labourers. Although we cannot show causality, we can show whether a correlation exists or not. One would expect more female hired labour service in the north, particularly in Garu where women's ownership and control over land was lowest. It is striking that indeed the highest incidence of female hired labour services occurs in Garu even though the same was not true in East Gonja (Fig. 6), because farm sizes were relatively larger in East Gonja and women supply relatively more labour to their husband's plots than in Garu. Our qualitative studies found that in East Gonja, many women were using their husband's fallow lands to grow their own crops.

6.2. *Are the opportunity costs of youth schooling gendered?*

Because of the relatively lower levels of family labour available to FHHs and on plots operated by women, one could conjecture that the social change related to youth schooling could affect women and men differently. As we have shown, the opportunity costs of youth absence

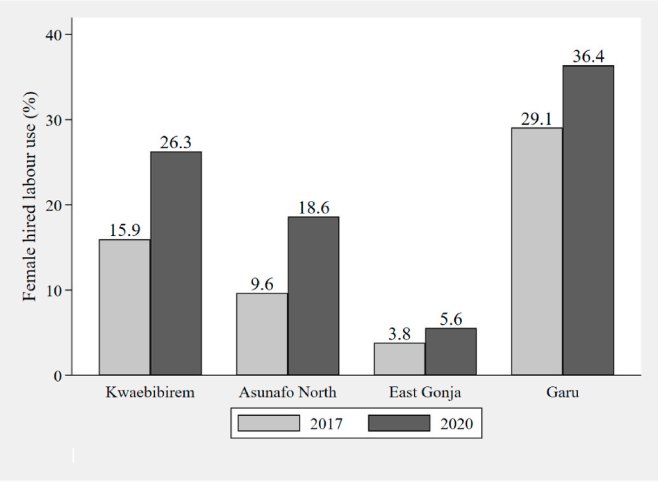

Fig. 6. Incidence of females hired farm labour services.

[7] A plot operator is considered the person who 'owns' the crops on the plot and is in charge of managing the plot.

due to schooling could manifest in the form of smaller farm sizes, higher expenditures on hired labour, and higher dependence on labour-saving technologies. The link with farm size is harder to establish even with panel data, particularly for perennial crops, since it is possible that the farms were established before school enrolment of youth in our sample.

Our hypothesis is that women bear a higher cost of absent household members due to schooling, conditional on scale of production, wealth, and the availability of household and external labour. We test this hypothesis by estimating regression models with farm size, hired labour expenditure per hectare, and labour-saving technology use as dependent variables. The explanatory variable of interest is an interaction term between youth schooling and gender represented by either sex of household head or sex of plot operator.[8] This specification allows us to compare the average marginal effects across groups with and without youth members in school.

Table 10 reports the results that evaluate the presence of gender differences in the effect of youth schooling on farm size and expenditures on hired labour and labour-saving technology (weedicides). Column 1 shows the estimated differences in effect between FHHs and MHHs; column 2 reports the corresponding differences between female managed plots (FMP) and male managed plots (MMP) within the same households. If gender gaps are present, the estimate of δ should be significantly different from zero, if not then we conclude that there is no evidence of a gender gap. After adjusting for household-specific heterogeneity and other covariates, we find evidence of neither inter– nor intra-household gender differences in the opportunity costs of youth schooling (Table 10). That is, we cannot reject the null hypothesis that the effect of youth schooling on farm size, hired labour and labour-saving technology expenditures are not different for women and men. In sum, these results show that the opportunity cost of youth schooling, in terms of potential farm labour forgone, is not significantly different for women than for men.

Table 10
Gender gaps in the opportunity cost of youth schooling.

	Inter-household		Intra-household	
	(1)	(2)	(3)	(4)
	South	North	South	North
Panel A: Farm size (log)				
Female (γ_1)	−0.299**	−0.368***	−0.448***	−0.510***
	(0.150)	(0.104)	(0.125)	(0.119)
School (γ_2)	−0.188	−0.089	−0.099	0.033
	(0.118)	(0.074)	(0.068)	(0.088)
Female x School (δ)	0.032	0.214	0.094	−0.033
	(0.155)	(0.142)	(0.100)	(0.155)
Panel B: Hired labour (US$)				
Female (γ_1)	−3.614	−0.223	7.853	4.223
	(8.670)	(6.366)	(11.372)	(4.091)
School (γ_2)	18.586**	7.264	23.291***	3.848
	(8.739)	(5.016)	(8.177)	(3.433)
Female x School (δ)	9.409	−3.766	−2.792	−2.685
	(12.860)	(8.781)	(19.756)	(6.058)
Panel C: Weedicides (US$)				
Female (γ_1)	−3.405	−7.222***	−6.009	−1.821
	(2.365)	(1.240)	(4.505)	(1.776)
School (γ_2)	6.911***	−1.701	4.211	−1.423
	(2.301)	(1.076)	(4.229)	(1.624)
Female x School (δ)	−3.314	0.727	−2.590	0.996
	(2.828)	(1.391)	(5.579)	(2.897)
Observations	410	434	582	712

Note: The standard errors (in parentheses) are robust to household clustering in the intra-household level analysis. ***; **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively. All the estimates adjust for household demographic characteristics (age of household head/plot holder, level of education, child dependency ratio), wealth, off-farm employment, scale of production, sources of labour.

7. Conclusion

In this article, we have used qualitative and quantitative methods to show important social and economic changes in the structure and conduct of agrarian land and labour markets. We show that some of the observed changes and implications are associated with farm household investments in child schooling beyond the basic level, which is precipitated by expected private returns and state programmes. We have demonstrated that, as expected, the increased demand for youth schooling has affected farm labour availability for smallholder farming because post-basic education and youth contribution to family labour are competitors. In effect, the increased demand for schooling has significantly lowered youth family labour contributions.

Moreover, the demand for schooling in northern Ghana has also contributed to a decline in the flow of migrant labour from northern Ghana, a region that has long served as a labour reserve for commercial agricultural growth in the south. At the same time, reciprocal labour exchange arrangements have all but dried up, particularly in southern Ghana, due to increasing individualisation and commodification of land and labour relations. These changes have led to rising cost of hired labour, triggering responses from agricultural households.

Youth schooling was associated with smaller mean farm sizes, higher intensity of family labour use, lower likelihood of exchange labour use, higher mean expenditures on hired labour, and higher likelihood of labour-saving technology uptake. Thus, we have shown that youth schooling (beyond the basic level) is associated with significant household-level opportunity costs. We show that most of the findings exhibit difference across female and male headed households, between wives and husbands in the same household, and between the north and south. Our qualitative evidence showed that the opportunity cost of youth schooling was higher for women than for men; that where there are gender gaps with respect to the opportunity cost of youth schooling, land and labour scarcity tended to exacerbate them. However, the qualitative evidence of gendered opportunity cost of youth schooling did not hold up in the quantitative analysis after adjusting for household specific heterogeneity, suggesting that both men and women bear similar opportunity costs of the absence of youth household members due to post-basic education.

A number of lessons could be distilled from our study for agricultural and rural development policy and practice. The first is the need for accelerating Ghana's policy agenda of agricultural modernisation, particularly labour-saving technology availability and access as agricultural labour becomes scarcer. While the observed family labour scarcity has led to increased agricultural wage rates, as would be expected, this has not necessarily increased the supply of agricultural wageworkers as many young people migrate or prefer non-farm work, including artisanal and small-scale mining, where available. Besides, some evidence shows that youth do not see small-scale farming in its current form as compatible with 'modern life' because they are better educated than their parents (Sumberg et al., 2017).

Second, systematic efforts such as expanding labour intensive sectors of the economy (including the rural economy) through prudent capital investments in rural infrastructure and agroindustry could help increase private returns to schooling by reducing youth unemployment. Indeed, if agriculture is sufficiently modernized to remove the drudgery, educated young people could see the sector as one that is compatible with 'modern life' (Sumberg et al., 2017).

[8] The general form of the model is: $y_{it} = \alpha + \gamma_1 female_{it} + \gamma_2 school_{it} + \delta(female_{it} \times school_{it}) + \beta' X_i + c_i + \varepsilon_i$, where y_{it} is the response variable of interest (i.e., farm size, per hectare hired labour expenditure, and the use of labour-saving technology) either at the household or plot levels, ***female*** is the gender indicator captured as sex of household head in the inter-household analysis or sex of plot user in the intra-household analysis. If there is a gender gap δ should be significantly different from zero.

Third, as others (e.g., Bryceson, 2019) have shown, the persistent inter– and intra-household gender gaps with respect to access, ownership and control over productive resources including labour point to the need for relentless campaigns that discourage retrogressive gender norms and practices. The practice whereby available household labour is disproportionally distributed within the household with a focus on the husband's plot although women contribute significantly to child schooling means that women face the rising prices in hired labour markets disproportionally. Aside raising awareness about the regressive nature of such gender norms, empowering women by boosting their capacity for gainful employment in non-farm rural enterprises is essential as non-farm earnings help moderate the gender gaps. The fact that gender inequality in child education within households has narrowed considerably could help create an environment for more equitable gender norms.

Credit author statement

Fred Mawunyo Dzanku: Conceptualization, Methodology, Formal analysis, First draft preparation.; **Dzodzi Tsikata**: Conceptualization, Reviewing and Editing

Data statement

The data employed for this article is available from the authors upon request.

The codes for replicating the results contained in the article are available from fdzanku@ug.edu.gh.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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References

Adeniran, A., Ishaku, J., Yusuf, A., 2020. Youth employment and labor market vulnerability in Ghana: aggregate trends and determinants. In: McLean, M.L. (Ed.), West African Youth Challenges and Opportunity Pathways. Palgrave Macmillan, Cham, Switzerland, pp. 187–211.

Agbosu, L., Awumbila, M., Dowuona-Hammond, C., Tsikata, D., 2007. Customary and Statutory Land Tenure and Land Policy in Ghana. Institute of Statistical Social and Economic Research (ISSER), University of Ghana, Accra technical publication No. 70.

Ahiakpor, F., Swaray, R., 2015. Parental expectations and school enrolment decisions: evidence from rural Ghana. Rev. Dev. Econ. 19, 132–142.

Amanor, K., 2001. Land, Labour and the Family in Southern Ghana: a Critique of Land Policy under Neo-Liberalisation. Nordic Africa Institute.

Amanor, K.S., 2010. Family values, land sales and agricultural commodification in south-eastern Ghana. Africa. Journal of the International African Institute 80, 104–125.

Amin, S., 1972. Underdevelopment and dependence in black Africa: historical origin. J. Peace Res. 9, 105–119.

Andersson Djurfeldt, A., 2018. Assets, gender, and rural livelihoods. In: Andersson Djurfeldt, A., Dzanku, F.M., Isinika, A. (Eds.), Agriculture, Diversification, and Gender in Rural Africa: Longitudinal Perspectives from Six Countries. Oxford University Press, Oxford, UK, pp. 54–80.

Apusigah, A.A., 2009. The gendered politics of farm household production and the shaping of women's livelihoods in Northern Ghana. Feminist Africa 12, 51–67.

Baah-Boateng, W., 2015. Unemployment in Ghana: a cross sectional analysis from demand and supply perspectives. African Journal of Economic and Management Studies 6, 402–415.

Beals, R.E., Menezes, C.F., 1970. Migrant labour and agricultural output in Ghana. Oxf. Econ. Pap. 22, 109–127.

Britwum, A.O., Tsikata, D., Akorsu, A.D., Ako, M.A., 2014. Gender and Land Tenure in Ghana: A Synthesis of the Literature. ISSER, Institute of Statistical, Social & Economic Research, University of Ghana.

Bryceson, D.F., 2019. Gender and generational patterns of African deagrarianization: evolving labour and land allocation in smallholder peasant household farming, 1980–2015. World Dev. 113, 60–72.

Canagarajah, S., Coulombe, H., 1999. Child Labor and Schooling in Ghana. The World Bank.

Charlton, D., Rutledge, Z., Taylor, J.E., 2021. Chapter 77 - evolving agricultural labor markets. In: Barrett, C.B., Just, D.R. (Eds.), Handbook of Agricultural Economics. Elsevier, pp. 4075–4133.

Dadson, J., 1988. The need for cooperative reorientation: the Ghanaian case. In: Hedlund, H. (Ed.), Cooperatives Revisited. Scandinavian Institute of African Studies, Uppsala, p. 173.

Diao, X., Cossar, F., Houssou, N., Kolavalli, S., 2014. Mechanization in Ghana: emerging demand, and the search for alternative supply models. Food Pol. 48, 168–181.

Doss, C.R., Morris, M.L., 2001. How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. Agric. Econ. 25, 27–39.

Dzanku, F.M., Hodey, L.S., 2022. Livelihood Outcomes of Agricultural Commercialisation, Women's Empowerment and Rural Employment. APRA Working Paper 92. Future Agricultures Consortium, Brighton, UK.

Dzanku, F.M., Tsikata, D., Ankrah, D.A., 2021. The gender and geography of agricultural commercialisation: what implications for the food security of Ghana's smallholder farmers? J. Peasant Stud. 1–30.

Estudillo, J.P., Otsuka, K., 1999. Green revolution, human capital, and off-farm employment: changing sources of income among farm households in central Luzon, 1966-1994. Econ. Dev. Cult. Change 47, 497–523.

Estudillo, J.P., Sawada, Y., Otsuka, K., 2006. The Green Revolution, development of labor markets, and poverty reduction in the rural Philippines, 1985–2004. Agric. Econ. 35, 399–407.

FAO, 1999. Agricultural Censuses and Gender Considerations - Concept and Methodology. Food and Agriculture Organization of the United Nations, Rome, Italy.

Ghana Statistical Service, 2022. Ghana 2021 Population and Housing Census General Report Volume 3E: Economic Activity. Ghana Statistical Service, Accra, Ghana.

Hazarika, G., Jha, C.K., Sarangi, S., 2015. The Role of Historical Resource Scarcity in Modern Gender Inequality. Louisiana State University Baton Rouge, LA.

Hear, N.V., 1984. 'By-day'boys and dariga Men: casual labour versus Agrarian capital in Northern Ghana. Rev. Afr. Polit. Econ. 11, 44–56.

Hill, P., 1997. The Migrant Cocoa-Farmers of Southern Ghana: A Study in Rural Capitalism. LIT Verlag Münster.

Hill, R.V., Vigneri, M., 2014. Mainstreaming gender sensitivity in cash crop market supply chains. In: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), Gender in Agriculture: Closing the Knowledge Gap. Springer, Dordrecht, The Netherlands, pp. 315–342.

Koomson, I., Asongu, S.A., 2016. Relative contribution of child labour to household farm and non-farm income in Ghana: simulation with child's education. Afr. Dev. Rev. 28, 104–115.

Lambrecht, I., Schuster, M., Samwini, S.A., Pelleriaux, L., 2018. Changing gender roles in agriculture? Evidence from 20 years of data in Ghana. Agric. Econ. 49, 691–710.

Lloyd, C.B., Gage-Brandon, A.J., 1994. High fertility and children's schooling in Ghana: sex differences in parental contributions and educational outcomes. Popul. Stud. 48, 293–306.

Miracle, M.P., Berry, S.S., 1970. Migrant labour and economic development. Oxf. Econ. Pap. 22, 86–108.

Moore, M., 1975. Co-operative labour in peasant agriculture. J. Peasant Stud. 2, 270–291.

Okali, C., 1983. Cocoa and Kinship in Ghana: the Matrilineal Akan of Ghana. Routledge.

Plange, N.K., 1979a. 'Opportunity cost'and labour migration: a misinterpretation of proletarianisation in northern Ghana. J. Mod. Afr. Stud. 17, 655–676.

Plange, N.K., 1979b. Underdevelopment in northern Ghana: natural causes or colonial capitalism? Rev. Afr. Polit. Econ. 6, 4–14.

Ragsdale, K., Read-Wahidi, M.R., Wei, T., Martey, E., Goldsmith, P., 2018. Using the WEAI+ to explore gender equity and agricultural empowerment: baseline evidence among men and women smallholder farmers in Ghana's Northern Region. J. Rural Stud. 64, 123–134.

Raju, D., Younger, S.D., 2022. Benefits and Costs of Public Schooling in Ghana. Policy Research Working Paper;10017. World Bank, Washington, DC.

Raney, T., Anríquez, G., Croppenstedt, A., Gerosa, S., Lowder, S.K., Matuschke, I., Skoet, J., 2011. The Role of Women in Agriculture. Food and Agriculture Organization of the United Nations.

Rolleston, C., Oketch, M., 2008. Educational expansion in Ghana: economic assumptions and expectations. Int. J. Educ. Dev. 28, 320–339.

Schultz, T.W., 1961. Investment in Human Capital. The American economic review, pp. 1–17.

Scully, B., Britwum, A.O., 2019. Labour reserves and surplus populations: northern Ghana and the eastern cape of South Africa. J. Agrar. Change 19, 407–426.

Shepherd, A., 1981. Agrarian change in northern Ghana: public investment, capitalist farming and famine. J., H., P., R., G., W. In: Rural Development in Tropical Africa. Palgrave Macmillan, London, pp. 168–192.

Skinner, E.P., 2012. Labour migration and its relationship to socio-cultural change in mossi society. Africa 30, 375–401.
Sumberg, J., Yeboah, T., Flynn, J., Anyidoho, N.A., 2017. Young people's perspectives on farming in Ghana: a Q study. Food Secur. 1–11.
Takane, T., 2000. Incentives embedded in institutions: the case of share contracts in Ghanaian cocoa production. Develop. Econ. 38, 374–397.
Thomas, R.G., 1973. Forced labour in British west Africa: the case of the northern territories of the gold coast 1906–1927. J. Afr. Hist. 14, 79–103.
Tsikata, D., 2009. Gender, land and labour relations and livelihoods in sub-Saharan Africa in the era of economic liberalisation: towards a research agenda. Feminist Africa 12, 11–30.
Yaro, J.A., Teye, J.K., Torvikey, G.D., 2017. Agricultural commercialisation models, agrarian dynamics and local development in Ghana. J. Peasant Stud. 1–17.
Ye, X., Canagarajah, S., 2002. Efficiency of Public Expenditure Distribution and beyond: a Report on Ghana's 2000 Public Expenditure Tracking Survey in the Sectors of Primary Health and Education. World Bank.