COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, CROP RESEARCH INSTITUTE (CSIR-CRI)

MecaWAT PROJECT, WORKING PAPER ONE (WP1) REPORT

ANALYSIS OF WORK ORGANIZATION ON PLANTAIN FARMS IN GHANA

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INTRODUCTION

In Ghana, small-scale farmers primarily rely on manual labor for land preparation and crop maintenance. Unlike in developed countries, where machinery performs most farm tasks, the use of motorized tools in Ghanaian agriculture is minimal. To address these challenges, the MecaWAT project, coordinated by the Council for Scientific and Industrial Research, Crop Research Institute (CSIR-CRI), seeks to promote agroecological agricultural systems in Ghana. The project's primary goal is to enhance labor productivity, alleviate manual tasks, and foster work arrangements that benefit women and young people. Since plantain farming in Ghana is largely manual, the "Mechanization and Work in Agroecological Transitions - MecaWAT" project specifically targets the mechanization of plantain farming. It focuses on increasing labor productivity, reducing the physical demands of farming, and supporting labor organization that is inclusive of women and young people. The project consists of several phases, of which Working Paper One (WP1) is one. It is against this background that WP1 conducted surveys among farms in the plantain production communities of Ghana to understand the strategies for organizing work and mechanization. The surveys aimed to analyze the social and technical division of labor, particularly focusing on the roles of vulnerable groups such as young people and women, and to assess how mechanization affects these dynamics. Additionally, the research sought to develop a typology of farms based on their work organization and mechanization strategies.

METHODOLOGY

1.1 Data collection

Data was collected through surveys administered to respondents involved in the study. The surveys were designed to gather information on various aspects of farm mechanization.

1.1 Data analysis

The data analysis mainly involved descriptive statistics. The initial step involved data cleaning to ensure accuracy and consistency. This process included identifying and correcting errors (e.g., rectifying the same tasks or equipment that had different spellings) and putting tasks into appropriate categories (seasonal, routine, and non-daily routine tasks). The datasets were then merged. Stata version 17 was employed to generate summary statistics. MS Excel was utilized for pivot tables and visualizations. After obtaining results from Stata, Excel was used to create charts and graphs to aid in the visual representation and interpretation of data.

Investigation Area

The study was conducted in the Asante Akim North Municipal District located in the Ashanti Region of Ghana. The study in the Asante Akim North Municipal District of Ghana focused on plantain farm mechanization. The results show that Agogo is the primary farming hub, with 81.6% of the total 38 farms located there, suggesting significant mechanization potential. Aberewampong and Hwediem have much smaller shares, with 15.8% and 2.6% of farms, respectively, indicating lesser involvement in plantain farming and mechanization. This distribution underscores Agogo's importance in the region's agricultural landscape.

Table 1: Distribution of farms across the villages/communities

Village	Number of farms	Percent
Aberewampong	6	15.8%
Agogo	31	81.6%
Hwediem	1	2.6%
Total	38	100.0%

Source: Field Data, 2024.

DEMOGRAPHICS

A- DESCRIPTIVE STATISTICS

1. Characteristics of the household members

Below are the descriptive statistics of all household members from all the farm surveyed. The total number of farms was thirty-eight (38) and since each farm had more than one individual in their household register, the total number of individuals was 237. The descriptive statistics depict a relatively equal representation of genders within the surveyed farms in Ghana. However, there is a slightly higher proportion of females (51.05%) compared to males (48.95%). This is quite contrary to previous studies (Vercillo, 2020) as men has been found to dominate in most farming activities in Ghana. However, current studies have reported that, men dominated activities in farming are now being caried out by females (Mensah & Fosu-Mensah, 2020). Also, Stuart, Amah & Teeken, (2020) supported this fact by saying that, there are relatively more women in plantain production than men in Ghana. Interestingly, a significant majority of individuals (62.87%) are not actively involved in agricultural activities, while a considerable portion (40.08%) engage in off-farm work, indicating a reliance on diversified income sources beyond farming.

Table 2 Descriptive statistics from the household roaster

Variables	Frequency	Percentage
Gender in household members		
Males	116	48.95
Females	121	51.05
Active in farming		
Not active	149	62.87
Active	88	37.13
Off farm work		
No	142	59.92
Yes	95	40.08
Daily Agricultural work		
No	233	98.31
Yes	4	1.69
Access to formal education		
No	133	56.12
Yes	104	43.88
Total	**237**	**100**

Source: Field survey, 2023

Moreover, daily farm work seems to be infrequent, with only 1.69% of individuals participating regularly. However, access to formal education remains a challenge for a notable portion of the population (56.12%). This is not surprising as past studies (Otoo et al., 2024; Lambon et al., 2023) have reported low education levels of farmers in Ghana.

The study surveyed 237 individuals across the selected households. The population composition reveals that 65 individuals (under 15 years) are categorized as the youth population, and 5 individuals are considered elderly (65 years and over). The working age population was 15 to 64 years and they were 167 individuals, forming the majority of the surveyed population.

Table 3 Composition of the surveyed households

Population type	Value
Total population surveyed	237
Youth population (under 15 years)	65
Elderly population (65 years and over):	5
Population of people of working age (15 to 64 years):	167
Total dependent population (young people + elderly people): 65+5	**70**
Total dependency rate: (70/167)×100	**42%**

Source: Field survey, 2023

The total dependents population is the sum of the youth and elderly which is 70 individuals. The total dependency rate was calculated as the ratio of the dependent population to the working-age population. This gave a dependency ratio of 42%. This indicates that for every 100 working-age individuals in the plantain growing zones, there are 42 dependents. This dependency ratio is quite high and could affect the amount of resources available to farmers to invest in plantain farming.

2.1. Relation to the farm manager

The relationship dynamics within the surveyed households reveal that the majority of household members are sons or daughters of the farm manager, accounting for 52.32% of the population. The farm managers themselves represents 15.61% of the total population. Wives or spouses make up 13.08%.

Table 4 Relationship of household members to the farm manager

Relation to the farm manager	Freq.	Percent (% ())
1 Farmer manager	37	15.61
2 Wife (or spouse)	31	13.08
3 Son/daughter	124	52.32
4 Nephew/niece	10	4.22
5 Father/mother	2	0.84
6 Brother/sister	1	0.42
7 Grandson/granddaughter	19	8.02
9 Child in care	1	0.42
10 Maid who lives with the family	8	3.38
11 Wage worker who lives with the family	4	1.69
Total	**237**	**100.00**

Other relatives, such as nephews/nieces, brothers/sisters, and grandchildren, contribute smaller proportions where each represents 4.22%, 0.42%, and 8.02%, respectively. Additionally, a few households include non-family members such as maids (3.38%) and wage workers (1.69%) who live with the family. The presence of these various relationships illustrates a diverse support system within the plantain farming households.

3- Profile of farm managers

We further delved deeper into the profiles of farm managers to get a wholistic view of their socioeconomic situation since this could affect their farm management abilities. The majority of farm managers (97.3%) fall within the working-age range of 15 to 64 years. It is only 2.7% of the farm managers that are 65 years or older. In terms of gender, 56.76% of the farm managers are male, while 43.24% are female. It means that, males dominate the farm management roles even though females do also take up farm management roles. Several studies have revealed the dominance of males in farm management roles in Ghana (Tham-Agyekum et al., 2023).

Table 5 Profile of farm managers

Variable	Freq.	Percent (%)
Age range		
15 to 64	36	97.3
65 and above	1	2.7
Total	**37**	**100**
Gender		
Male	21	56.76
Female	16	43.24
Total	**37**	**100**
Education		
No formal education (cannot read/write)	37	100
Total	**37**	**100**

Education levels among the farm managers show that none have received formal education, with 100% unable to read or write. This highlights a significant challenge in terms of literacy, which could impact their ability to adopt new agricultural technologies or mechanization practices effectively. This call for extensive training to make the mechanization efforts successful.

4- Marital status for farm managers

The majority (58.33%) of farm managers are married in monogamous marriages living with their spouses. Polygamous households where the farm manager is married and living with multiple spouses, make up only 11.11%. The same percentage (11.11%.) was recorded for households where a woman heads the household while her partner lives elsewhere. Households with individuals who are separated, divorced, or widowed and living without a spouse account for

13.89%. Additionally, there are small percentages of single individuals (2.78%) and unmarried individuals living with a partner (2.78%).

Table 6 Household types of farm managers

Household_Type	Freq.	Percent (%)
Single	1	2.78
Monogamous married living with spouse	21	58.33
Married polygamous living with spouses	4	11.11
Married, one woman heads the household, her partner lives elsewhere	4	11.11
Separated/divorced/widowed and living without a spouse	5	13.89
Other, specify (unmarried but living with partner)	1	2.78
Total	**36**	**100.00**

B- ENGAGEMENT IN OFF FARM ECONOMIC ACTIVITIES

1- Off farm activities of farm manager

The data on engagement in off-farm economic activities among farm managers indicates that 62.16% of farm managers participate in off-farm activities, while 37.84% do not engage in any off-farm activities. This suggests that a majority of farm managers supplement their income or diversify their economic activities beyond their primary farming operations.

Table 7 Farm managers involvement in off-farm economic activities

Engagement in Off farm activity	Number of fam managers	Percent (%)
No off farm activity	14	37.84
Does off farm activities	23	62.16
Total	**37**	**100.00**

Specific off farm activities done by farm managers

Among the farm managers who engage in off-farm activities, 56.5% are involved in trading, making it the most common off-farm activity. Similarly, Ankrah et. el., (2023) reported trading as the commonest off-farm economic activity in Ghana. Hairdressing is the next most frequent activity, with 8.7%. Other activities include casual work, contract jobs, masonry, security personnel, carpentry, driving, and welding, each representing 4.3% of the off-farm activities. It implies that, trading is the predominant off-farm activity, while a variety of other roles are less common.

Table 8 ***Specific off-farm activities done by farm managers***

Type of off-farm activity	Freq.	Percent
Agro input dealer	1	4.3%
Casual worker	1	4.3%
Contract job	1	4.3%
Hairdresser	2	8.7%
Masonry	1	4.3%
Security personnel	1	4.3%
Trader	13	56.5%
Carpenter	1	4.3%
Driver	1	4.3%
Welder	1	4.3%
Total	**23**	**100.00**

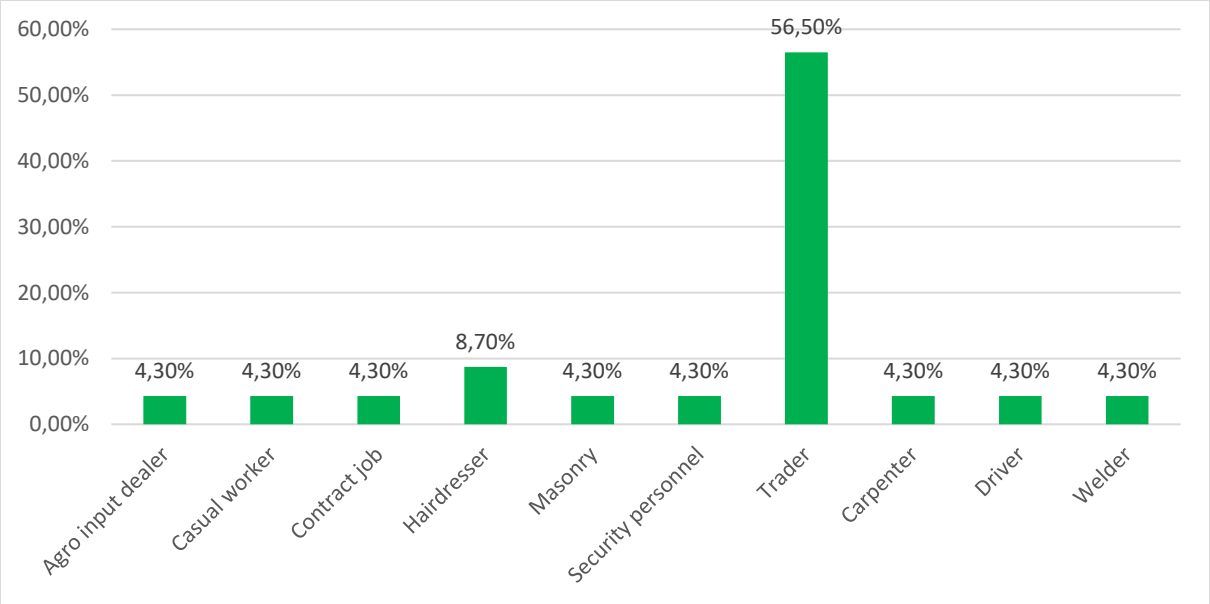

Figure 1 ***Specific off-farm activities done by farm managers***

The figure above is a graphical representation of the specific types of off-farm economic activities engaged in by farm managers in the surveyed area.

TYPES OF WORKFORCES

D-COMPOSITION OF THE WORKFORCE

1- Family labor

Below is a detailed overview of the roles and gender distribution within the family workforce. The majority of household members in the family workforce are farm managers with a total of 36 individuals (87.8%). Wives or spouses comprise 27 individuals (65.9%), males (39.0%) and females (26.8%). Sons and daughters also have a prominent presence, with a similar gender balance to the farmer manager role. Other relationships of the family workforce such as nephews/nieces, fathers/mothers, and brothers/sisters are less common.

Table 9 Composition of family workforce

Variable	Males		Females		Total	
	Freq	%	Freq	%	Freq	%
Farmer manager	19	46.3%	17	41.5%	36	87.8%
Wife (or spouse)	16	39.0%	11	26.8%	27	65.9%
Son/daughter	19	46.3%	17	41.5%	36	87.8%
Nephew/niece	2	4.9%	3	7.3%	5	12.2%
Father/mother	1	2.4%	1	2.4%	2	4.9%
Brother/sister	1	2.4%	0	0.0%	1	2.4%
Grandson/granddaughter	3	7.3%	4	9.8%	7	17.1%
Child in care	0	0.0%	1	2.4%	1	2.4%
Maid who lives with the family	1	2.4%	2	4.9%	3	7.3%
Wage worker who lives with the family	1	2.4%	1	2.4%	2	4.9%
Total					**120**	**100%**

Nephews and nieces make up 12.2% of the workforce, with a slight female majority, while fathers and mothers, along with brothers and sisters, are involved to an even lesser extent. Grandsons and granddaughters make up 17.1% of the workforce, with a slight female majority. Roles such as child in care, maids, and wage workers who live with the family are rarely represented, with child in care being the least common role and maids and wage workers showing a slightly higher presence of females.

2- Permanent workforce

The data shows that 9 out of 38 farms (23.68%) utilize a permanent workforce. Clearly, the usage of permanent workforce is low possibly because of the seasonal nature of farming activities in Ghana. Dadson et al. (2020) explained that, this seasonal nature of farming emanates from the reliance on open rainfall, making all year round farming impossible. On average, these farms employ 2 permanent workers. This indicates variability in the number of permanent workers across

farms, ranging from none to a maximum of 6 permanent workers. The mean value of 2 suggests a modest reliance on permanent labor.

Table 10 Number of permanent workers

Variable	Mean	Std. Dev.	Min	Max
Number of Permanent workers per farm	2	1.692	0	6

Source: Field survey, 2023

Among permanent workers on surveyed farms in Ghana, the gender distribution shows a predominance of males, accounting for 93.75% of the workforce, while females represent only 6.25%.

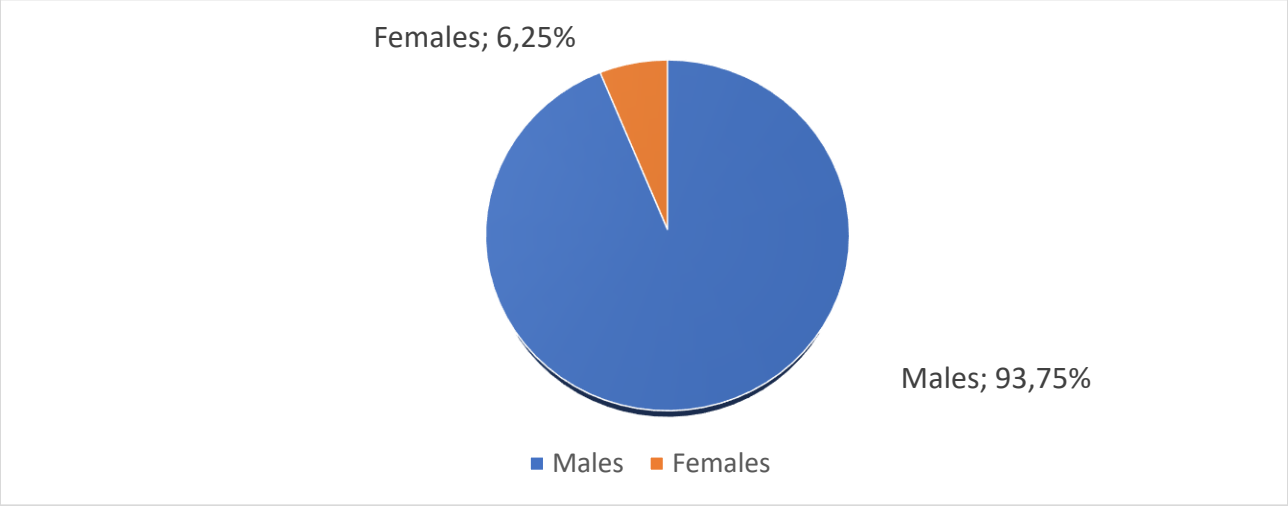

Figure 2 Gender distribution of Permanent workers

Source: Field survey, 2023

The average number of permanent workers per farm shows less reliance of farmers on permanent workers. This result has been similarly reported by (Amfo, Osei Mensah, & Aidoo, 2021) in their studies. Among permanent workers on surveyed farms in Ghana, the gender distribution shows a predominance of males, accounting for 93.75% of the workforce, while females represent only 6.25%. This gender disparity in the agricultural labor force reflects broader societal norms and gender roles prevalent in rural communities of Ghana s observed by (Fapohunda, 2023).

Table 11 Activities by Permanent workers

Activities	Freq.	Percent
Crops related	15	93.75

Livestock related	Nill	Nill
Both crops and livestock	1	6.25

Types of Activities by Permanent workers
Source: Field survey, 2023

Permanent workers on surveyed farms in Ghana primarily engage in crop-related activities, accounting for 93.75% of their tasks. This includes activities such as planting, cultivation, harvesting, and post-harvest handling of crops. Interestingly, there are no permanent workers dedicated solely to livestock-related tasks. However, a small percentage (6.25%) of permanent workers are involved in both crop and livestock-related activities, indicating a degree of diversification in farm tasks.

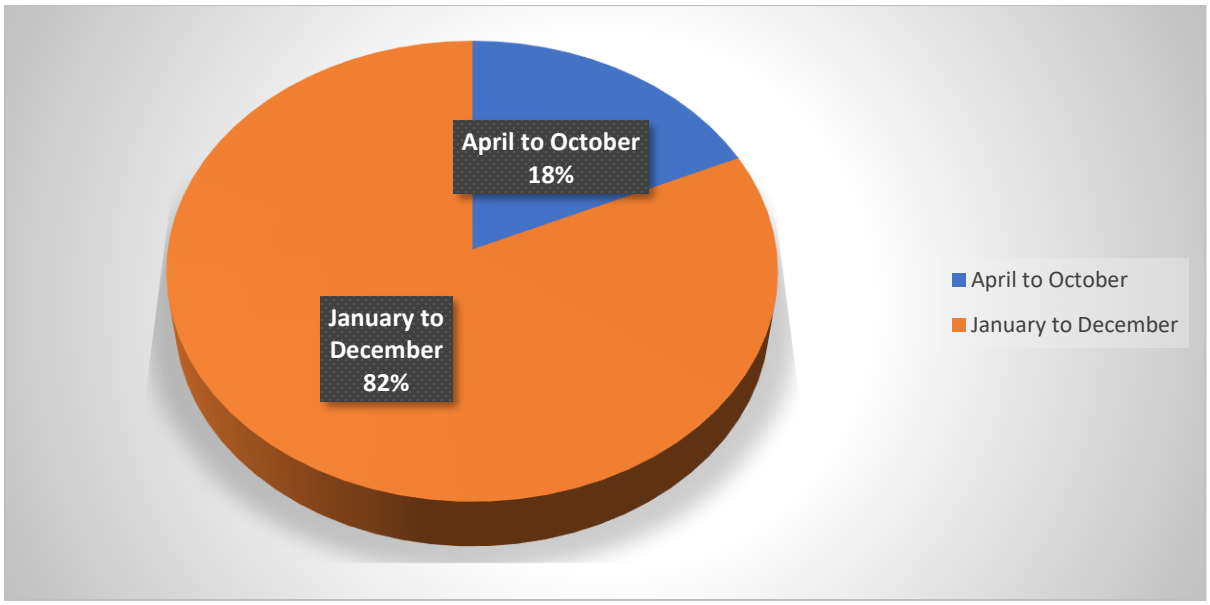

Figure 3 Distribution of work period for permanent workers

Source: Field survey, 2023

The work period for permanent workers on surveyed farms in Ghana is predominantly from January to December, constituting 81.82% of their employment duration. This indicates year-round employment for the majority of permanent workers, likely corresponding to the continuous nature of agricultural activities throughout the year. In contrast, a smaller percentage of permanent workers, 18.18%, are employed from April to October, suggesting seasonal employment patterns aligned with specific agricultural activities or cropping seasons. Amfo, Osei Mensah, & Aidoo, (2021) reported that permanent workers once hired, must be available throughout the year to carry out any farming activity.

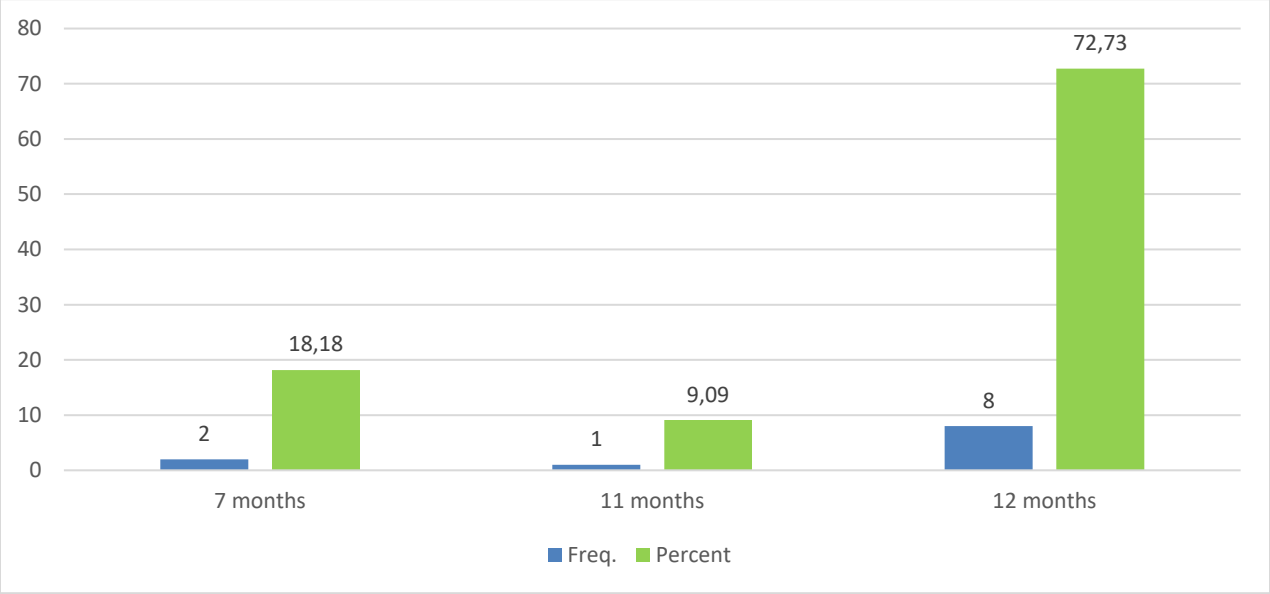

Figure 4 Duration of Permanent Work (Months)

Source: Field survey, 2023

The duration of permanent work for workers on surveyed farms in Ghana varies, with the majority (72.73%) employed for the full duration of 12 months. This indicates year-round employment for most permanent workers. A smaller proportion of workers (18.18%) are employed for a duration of 7 months, likely corresponding to seasonal or specific agricultural activities. Additionally, 9.09% of workers are employed for 11 months, reflecting a slightly shorter but still substantial employment period.

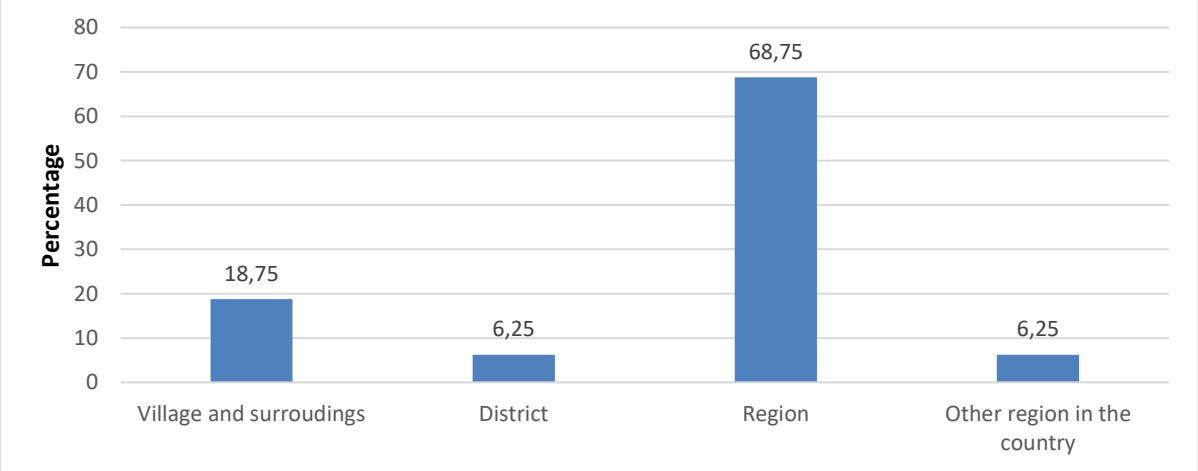

Figure 5 Origin of Permanent workers
Source: Field survey, 2023

The origin of permanent workers on surveyed farms in Ghana varies and the majority (68.75%) hails from the same region where the farm is located. This suggests a reliance on local labor for agricultural activities, potentially driven by factors such as proximity, familiarity with local conditions, and ease of recruitment. Additionally, 18.75% of permanent workers originate from villages and surroundings within the same region, indicating a preference for sourcing labor from nearby communities. A smaller proportion (6.25%) comes from other regions within the country, while an equally small percentage (6.25%) originates from districts outside the immediate vicinity of the farm.

3- Temporary labor

37 out of 38 (97%) farms employ temporary workforce. Hiring temporary workers throughout the year is a common practice, with the vast majority (97.3%) of farms opting to employ temporary labor from January to February.

During the start of the farming season, a significant proportion (70.27%) of farms hire temporary workers, while the remainder (29.73%) do not. This seasonal pattern in temporary labor recruitment indicates a strategic approach by farms to meet the increased labor demand during critical periods of agricultural activity initiation. The practical implication is that farms need to plan ahead and anticipate labor needs, ensuring timely recruitment and onboarding of temporary workers to kickstart agricultural operations effectively.

Table 12 Temporary Workforce

VARIABLE	PERCENT
Hire Temporary workers (January to December)	
No	2.7
Yes	97.3
Total	**100%**
Hire Temporary workers (During start of farm)	
Did not hire	29.73
Hired	70.27
Total	**100%**

Origin of temporary workers	
Village and surroundings	19.44
District	33.33
Region	41.67
Other region in the country	5.56
Total	**100%**
Difficulty in hiring temporary workers	
Not difficult	78.38
Difficult	21.62
Total	**100%**

Source: Field survey, 2023

The origin of temporary workers show that, a considerable proportion (41.67%) comes from the same region as the farm, followed by 33.33% from the district, and 19.44% from villages and surroundings. A smaller percentage (5.56%) originates from other regions within the country. The practical implication of this diverse geographical distribution is the need for farms to establish effective recruitment networks and partnerships within local communities to access a pool of skilled and reliable temporary labor. Additionally, farms may need to consider transportation logistics and accommodation arrangements for temporary workers coming from distant areas.

Despite the prevalence of hiring temporary workers, a notable proportion (21.62%) of farms report difficulty in recruitment. While the majority (78.38%) do not encounter challenges, this finding emphasises the importance of addressing barriers to accessing temporary labor, such as competition for labor, wage expectations, and availability of skilled workers. The practical implication is the need for farms to implement proactive recruitment strategies, offer competitive wages and incentives, and build positive relationships with local communities to overcome recruitment challenges and ensure a reliable workforce supply during critical period.

ANIMALS

E- ANIMALS

The analysis uncovers that, 14 out of 38 (36.8%) farms have livestock and an average of approximately 43 animals per farm. This variance indicates significant diversity in livestock holdings, ranging from relatively small-scale operations to larger-scale enterprises. While some farmers possess only a few animals, others manage livestock herds of up to 200 animals.

Table 13 Distribution of livestock

Number of farmers	Average number of livestock	Std. Dev.	Minimum Number of livestock	Maximum number of livestock
19	43	47	4	200

Source: Field survey, 2023

This diversity emphasizes the complex nature of livestock management within rural farming communities, shaped by factors such as land availability, economic resources, cultural practices, and market opportunities. However, the boxplots showed that farmers that had 200 animals and above were outliers.

Number of farms having specific types of livestock

The next table below outlines the distribution of livestock types across farms. Specifically, 1 farm (2.63%) keeps sheep, and 6 farms (15.79%) raise goats. Poultry is the most common type, present on 11 farms (28.95%). Pigs are also kept on 1 farm (2.63%). This distribution indicates that poultry is the most prevalent livestock type among the farms, while sheep, pigs, and goats are less commonly raised.

Table 14 Specific types of livestock

Code	Livestock type	Number of farms	Percent (%)
3	Sheep	1	2.63%
4	Goat	6	15.79%
5	Poultry	11	28.95%
6	Pigs	1	2.63%

Note: Own a specific livestock is not mutually exclusive.

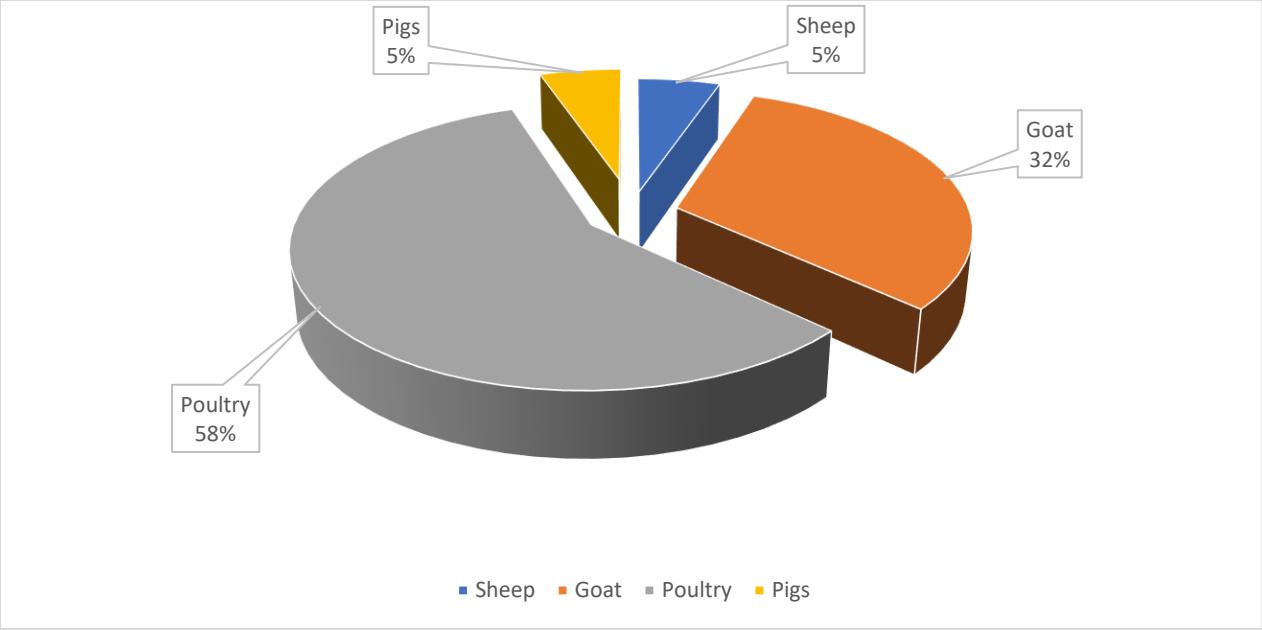

Figure 6 Specific types of livestock

This heavy reliance on poultry suggests that farms could be vulnerable to income fluctuations due to market changes or disease. Diversifying livestock types, such as incorporating goats or pigs, could mitigate this risk by creating additional revenue streams and enhancing financial stability. Thus, exploring a broader range of livestock options could improve income resilience and profitability for farms.

PLOTS/CROPS

F- PLOTS / CROPS

1- Method of acquiring plots

Ownership accounts for 11.61% of fields, indicating a minority of farms outrightly owning their land. This suggests a significant reliance on alternative tenure arrangements. Rented land comprises the majority, with 53.57% of fields being rented. This result in in line with that of (Akugre et al., 2021). This reflects a prevalent practice of land rental, which could stem from factors like land scarcity, mobility, or economic considerations. Other tenure arrangements encompass 33.93% of fields. These were specified in the dataset to include: forest/government/community and family lands. Such other arrangements have been documented in the literature (Donkor, Frimpong, & Owusu, 2023; Gyapong, 2021; Vanderpuye, Darkwah, & Živělová, 2020).

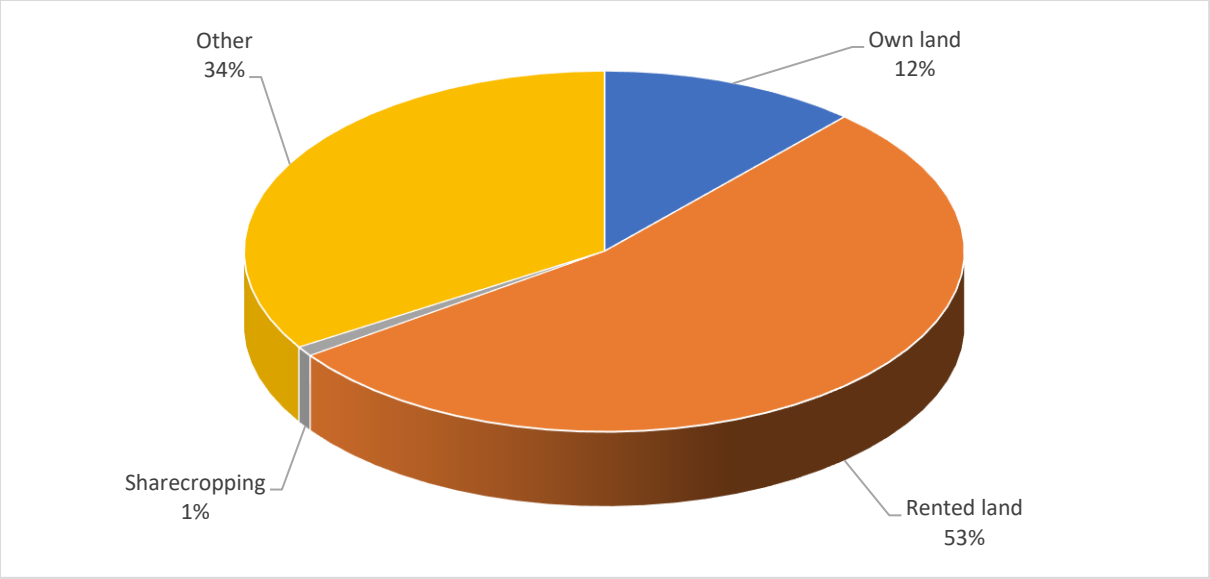

Figure 7 Tenure of fields
Source: Field survey, 2023

2- Means of transport

Cars are the most commonly used mode of transport, accounting for 45.54% of the total frequency. This indicates a significant reliance on private vehicles for commuting to fields, potentially reflecting the availability of automobiles among farming households or the accessibility of road infrastructure in rural areas. Motorbikes represent the second most popular mode of transport, with 34.82% of the total frequency. Motorbikes offer a convenient and cost-effective means of transportation, particularly for navigating rough terrain or accessing remote field locations where cars may not be suitable. Tricycles account for a smaller proportion, comprising 8.04% of the total frequency. While less common than cars and motorbikes, tricycles may still serve as a practical mode of transport for transporting goods or navigating narrow pathways within agricultural landscapes. Walking is also a significant mode of transport, with 11.6% of the total frequency. This emphasises the importance of pedestrian mobility, especially for short distances or in areas where motorized vehicles may not be feasible or available.

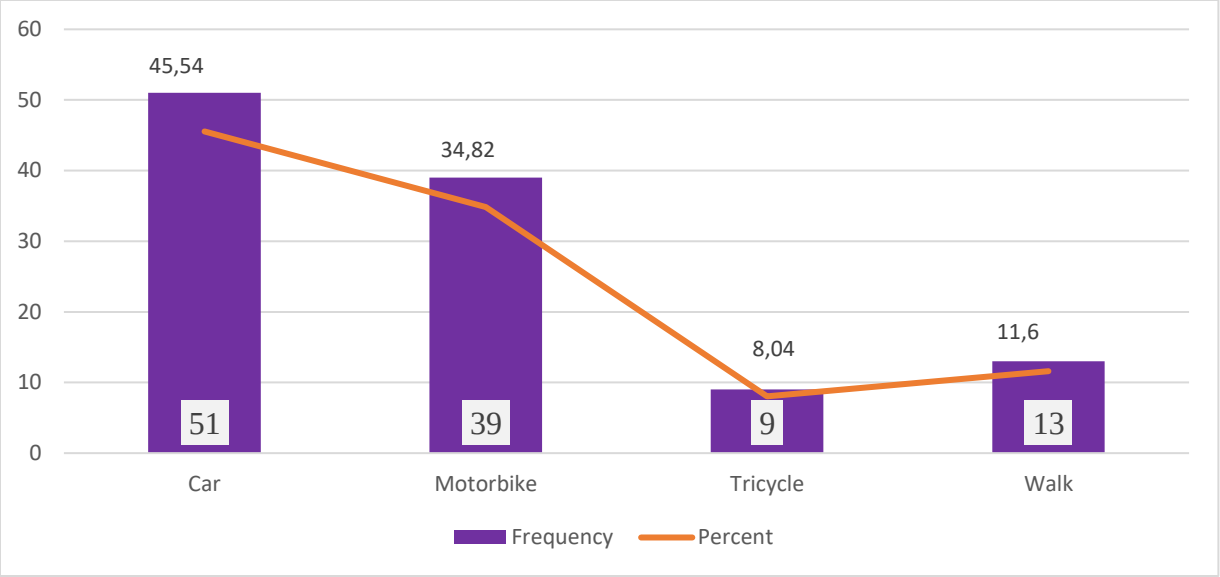

Figure 8 Means of transport to the fields
Source: Field survey, 2023.

3- Dimensions of farms

Results on the distance to the field show that, the average time taken to arrive a farm is about 50 minutes. Distances range from a minimum of 8 minutes to a maximum of 120 minutes. This wide range indicates considerable variation in travel times to the fields, which could affect operational efficiency and transportation costs for farms. It is important to note that some outliers were removed (distances of up to 300 minutes were identified as outliers based on box plots)

Table 15 Time spent to the farms

Variable	Obs	Mean	Std. Dev.	Min	Max
Distance to the field (min)	113	50.277	32.914	8	120

Next, we present the age distribution of all the farms surveyed. The age distribution of the farms reveals that the majority are relatively young. Specifically, 37.84% of farms are less than 15 years old, and 45.95% fall within the 15-30 year range. Farms aged between 31-45 years make up 8.11%, while those between 46-55 years account for 5.41%. Only 2.70% of farms are older than 55 years. This distribution indicates that most farms are relatively new or in their early stages, with fewer farms being significantly older.

Table 16 ***Age distribution of the farms***

Age category of farms	Number of farms	Percent (%)
<15	14	37.84
15-30	17	45.95
31-45	3	8.11
46-55	2	5.41
>55	1	2.70
Total	**37**	**100.00**

The data on field characteristics shows that, on average, farms manage 3 fields, with the number ranging from 1 to 9 fields. The average field size is 4.20 hectares, with sizes varying from 0.1 to 20 hectares.

Table 17 Land/Field Characteristics

Field Characteristic	Mean	Std. Dev.	Min	Max
Number of fields	3	1.687	1	9
Area of field (hectares)	4.2032	4.1268	0.1	20
Distance to field (min)	50.277	32.914	8	120

Source: Field survey, 2023

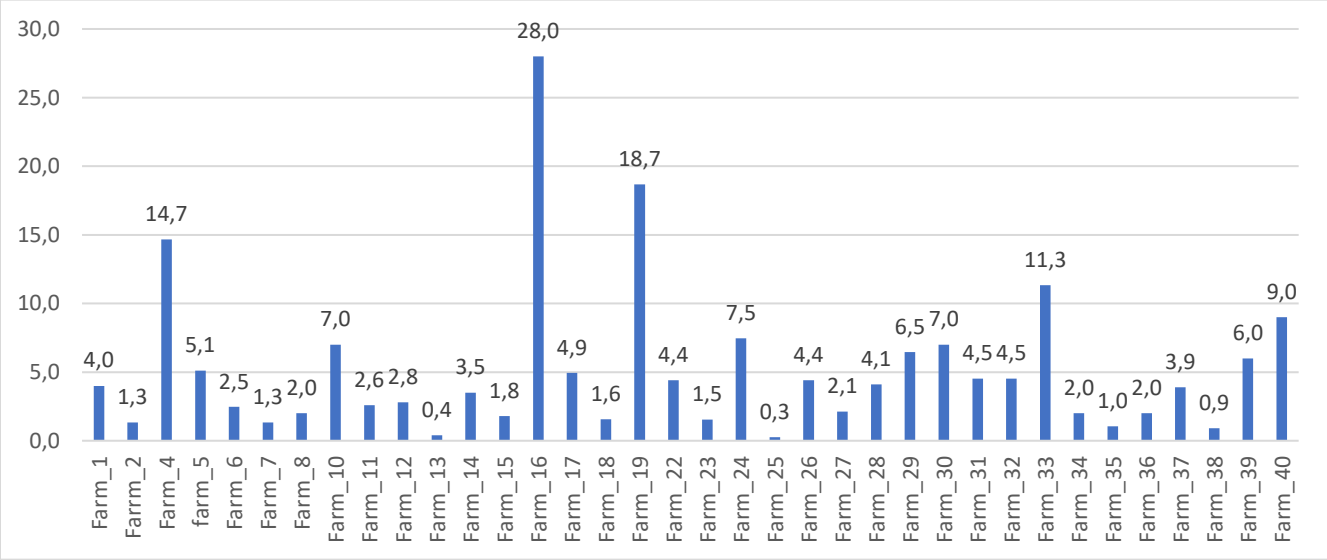

Figure 9 *: Areas cultivated by all farms surveyed*

4- Distribution of crops produced on farms

The most common crops in the surveyed farms are plantain, maize, and tomatoes. Plantain dominates with 92.1% of farms cultivating it, followed by maize at 26.3%, and tomatoes at 23.7%. Plantain was the most common crop possibly because the study purposively selected a plantain growing zone in Ghana. According to Osei (2024), Asante Akyim, Agogo North municipal is an area where plantain farming is much concentrated. Maize is the most consumed staple food in Ghana (Mwambo et al., 2020; Prah et al., 2023) and that is why it possibly appeared dominant in plantain growing zones as well.

Table 18 Distribution of crops concerned in seasonal work

Crop	Count of Farms	Percent
Cassava	8	21.1%
Beans	1	2.6%
Cabbage	1	2.6%
Cocoyam	1	2.6%
Cocoa	3	7.9%
Maize	10	26.3%
Onion	3	7.9%
Plantain	35	92.1%
Okro	3	7.9%
Pepper	6	15.8%
Tomatoes	9	23.7%
Watermelon	1	2.6%

SEASONAL WORK

G- SEASONAL WORK (TS)AND DISTRIBUTION OF TASKS

1- Seasonal work for all crops

We first present the list of all seasonal tasks done on all the farms as aggregate, then we procced to break it down by each crop. On a farm-wide bases, the most frequent seasonal tasks are weedicide application and manual weeding each representing 19.87% and 11.65% of seasonal tasks respectively. Other important and frequent seasonal tasks on all farms are harvesting (10.33%) and burning (5.30%). It is important to note that, the same tasks can either be seasonal or non-daily routine task depending on the situation. For instance, pesticide application on tomatoes farms only comes in seasons but when the season comes, the chemicals are then applied

every week. Thus, pesticide application on tomatoes plots can be both seasonal and non-daily routine work. This case is similar for tasks like weedicide application, harvesting and other tasks.

Table 19 ***Seasonal tasks for all crops***

Task name	Freq.	Percent
Assembling of corn	1	0.13
Fermentation	1	0.13
Gathering of harvest	1	0.13
Gathering of suckers	1	0.13
Germination monitoring	1	0.13
Land preparation	1	0.13
Levelling of beds	1	0.13
Minimum tillage	2	0.26
Par-boiling	1	0.13
Re-moulding of beds	3	0.40
Seedling collection	1	0.13
Shedding	1	0.13
Sucker gathering	1	0.13
Sucker uprooting	2	0.26
Slash/burn	1	0.13
Weedicide/pesticides application	1	0.13
Bed creation	4	0.53
Breaking of trees	1	0.13
Burning	40	5.30
De-leveling	1	0.13
De-suckering	4	0.53
Debris cleaning	2	0.26
Drying	8	1.06
Fertilizer application	35	4.63
Firebelt /Firebeds creation	9	1.19
Gathering of suckers	1	0.13
Harvesting	78	10.33
Hoeing	1	0.13
Land clearing	4	0.53
Land preparation	2	0.26
Laying of cassava cuttings	2	0.26
Manual weeding	1	0.13
Minimum tillage	4	0.53
Mounding	5	0.66
Nursery	20	2.65
Packaging	17	2.25
Pesticide application	34	4.50
Pesticide/fertilizer application	1	0.13
Planting	65	8.61

Plowing	25	3.31
Podding	1	0.13
Pruning	5	0.66
Ridging	5	0.66
Ridging/mounding	1	0.13
Seed replacement	2	0.26
Seed selection	2	0.26
Seed selection and replacement	2	0.26
Shelling	4	0.53
Slash and burn	19	2.52
Staking	1	0.13
Sucker collection	1	0.13
Sucker replacement	19	2.52
Sucker sorting	1	0.13
Threshing	1	0.13
Tillage	1	0.13
Transplanting	17	2.25
Transport	43	5.69
Tree cutting	4	0.53
Uprooting suckers	1	0.13
Watering	2	0.26
Weedicide application	150	19.87
Weeding	88	11.65
Winnowing	1	0.13
Total	**755**	**100.00**

Distribution of seasonal work with all crop production (men/days per year)

Subsequently, the contribution of the various categories of workers to the above seasonal tasks is presented below. We first examined the categories of workers who carry out the seasonal tasks on all farms. Following that, we present a similar analysis by each crop in the subsequent sections. The table below shows that on average, wives contribute 36.623 days of work per year to all crop farms. Family labor from women averages 6.75 days, while family labor from men averages 35.574 days. Permanent male workers contribute an average of 102.128 days per year, and permanent female workers contribute 23.833 days. Temporary women workers average 151.5 days, and temporary men workers average 164.402 days. Contractor labor averages 38.512 days per year, while mutual aid received averages 1.56 days. No farms reported giving mutual aid. The two most dominant workforces for seasonal tasks on all farms are temporary male and female workers, contributing an average of 164.402 and 151.5 days per year, respectively.

Table 20 ***Distribution of seasonal work with all crop production (men/days per year)***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	756	36.62	56.02	0.00	189.00
Total Work, Family Women	756	6.75	20.68	0.00	78.00
Total Work Family Men	756	35.57	167.63	0.00	1067.00
Total Work, Permanent Men	756	102.13	282.99	0.00	1435.00
Total Work Temporary Women	756	151.50	270.85	0.00	1414.00
Total Work, Temporary Men	**756**	**164.40**	**139.29**	**3.00**	**708.00**
Total Contractors	756	38.51	63.37	0.00	323.00
Total Received Mutual Aid	756	1.56	5.17	0.00	24.00
Total Given Mutual Aid	756	0.00	0.00	0.00	0.00
Total Work, Permanent Women	756	23.83	89.55	0.00	401.00

2- Seasonal work related to plantain

On plantain farms/plots, weedicide/herbicide application (30.54%), planting (11.07%), and harvesting (10.40%) are the most frequent seasonal tasks. Another significant seasonal task on plantain farms/plots is replacing suckers that were unable to survive after planting. This task accounts for about 5.70% of all seasonal tasks on plantain farms. The rest of the seasonal tasks on plantain farms are presented in the table below.

Table 21 ***Seasonal work related to plantain***

Task name	Freq.	Percent
Gathering of suckers	1	0.34
Minimum tillaege	1	0.34
Sucker gathering	1	0.34
Sucker uprooting	2	0.67
Slash/burn	1	0.34
Bed creation	1	0.34
Burning	19	6.38
De-leveling	1	0.34
De-suckering	4	1.34
Firebelts/Firebelt creation	8	2.68
Gathering of suckers	1	0.34
Harvesting	31	10.40
Land clearing	3	1.01
Manual weeding	1	0.34
Minimum tillage	2	0.67
Nursery	1	0.34
Planting	33	11.07

Ploughing/tillage	1	0.34
Plowing	12	4.03
Pruning	2	0.67
Pruning and land clearing	1	0.34
Pruning and weeding	1	0.34
Prunning	1	0.34
Seed selection	2	0.67
Seed selection and replacement	1	0.34
Slash and burn	6	2.01
Sucker collection	1	0.34
Sucker replacement	17	5.70
Sucker sorting	1	0.34
Transplanting	1	0.34
Transport	16	5.37
Transportation of harvest	1	0.34
Tree cutting	2	0.67
Uprooting suckers	1	0.34
Watering	1	0.34
Weedicide application	91	30.54
Weeding	28	9.40
Total	**298**	**100.00**

Table 22 details the seasonal working times for plantain plots, measured in days per year. With regards to only plantain farms, temporary male and female workers are the most dominant where each does 129.465 and 119.866 days of seasonal work, respectively. Also, wives contribute an average of 28.017 days annually, while family labor from women averages 4.284 days and from men 30.769 days. Permanent male workers contribute 65.629 days, and permanent female workers 18.552 days. Temporary male workers average 129.465 days, and temporary female workers 119.866 days. Contractors provide an average of 31.545 days, with mutual aid received averaging 1.662 days.

Table 22 ***Distribution of seasonal working times for plantain plots (days/year)***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	299	28.02	45.24	0.00	189.00
Total Work, Family Women	299	4.28	15.38	0.00	78.00
Total Work Family Men	299	30.77	150.91	0.00	1067.00
Total Work, Permanent Men	299	65.63	231.04	0.00	1435.00
Total Work Temporary Women	299	119.87	225.18	0.00	1414.00
Total Work, Temporary Men	**299**	**129.47**	**125.47**	3.00	708.00
Total Contractors	299	31.55	61.11	0.00	323.00

Total Received Mutual Aid	299	1.66	5.41	0.00	24.00
Total Given Mutual Aid	299	0.00	0.00	0.00	0.00
Total Work, Permanent Women	299	18.55	78.43	0.00	401.00

3- Seasonal work related to cocoa

Regarding cocoa, the top dominant seasonal tasks are weeding (13.04%) and pesticide application (17.39%). Pesticides applications are possibly most frequent due to the prevalence of pests and diseases like the black pod and the swollen shoot disease of cocoa plants in Ghana (Ameyaw et al., 2024)

Table 23 ***Seasonal work related to cocoa***

Task name	Freq.	Percent
Fermentation	1	4.35
Seedling collection	1	4.35
Breaking of trees	1	4.35
Drying	2	8.70
Firebelt creation	1	4.35
Harvesting	2	8.70
Nursery	1	4.35
Packaging	1	4.35
Pesticide application	4	17.39
Podding	1	4.35
Slash and burn	1	4.35
Transplanting	2	8.70
Transport	1	4.35
Weedicide application	1	4.35
Weeding	3	13.04
Total	**23**	**100.00**

Table below outlines the distribution of seasonal working times for cocoa farms. It was revealed that Temporary male workers are the most dominant workforce, with an average of 216.348 days. In more details, wives contribute an average of 6.957 days. Family labor from men averages 19.609 days per year on cocoa farms. Permanent male workers contribute no days. Temporary female workers average 102.391 days, and temporary male workers contribute 216.348 days. Contractors average 20.565 days annually. Mutual aid received averages 9.565 days, with no mutual aid given.

Table 24 ***Distribution of seasonal working times (days/year) for cocoa***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	23	6.96	13.50	0.00	32.00
Total Work, Family Women	23	0.00	0.00	0.00	0.00
Total Work Family Men	23	19.61	20.94	0.00	41.00
Total Work, Permanent Men	23	0.00	0.00	0.00	0.00
Total Work Temporary Women	23	102.39	34.86	51.00	146.00
Total Work, Temporary Men	**23**	**216.35**	**65.99**	94.00	254.00
Total Contractors	23	20.57	21.96	0.00	43.00
Total Received Mutual Aid	23	9.57	10.22	0.00	20.00
Total Given Mutual Aid	23	0.00	0.00	0.00	0.00
Total Work, Permanent Women	23	0.00	0.00	0.00	0.00

4- Seasonal work related to tomatoes

The data on seasonal work for tomatoes shows that fertilizer application is the most common task, accounting for nearly 15% of the work. Harvesting and weeding are also common, each making up around 10% of seasonal tasks on tomato plots. Other tasks like pesticide application and transplanting are moderately common, while tasks such as bed creation and hoeing are less frequent.

Table 25 *Seasonal work related to tomatoes*

Task name	Freq.	Percent
Re-moulding of beds	3	3.19
Bed creation	1	1.06
Burning	3	3.19
Debris cleaning	1	1.06
Fertilizer application	14	14.89
Harvesting	9	9.57
Hoeing	1	1.06
Mounding	4	4.26
Nursery	8	8.51
Packaging	2	2.13
Pesticide application	11	11.70
Planting	2	2.13
Plowing	2	2.13
Ridging	4	4.26
Ridging/mounding	1	1.06
Slash and burn	4	4.26
Transplanting	7	7.45

Transport	3	3.19
Weedicide application	5	5.32
Weeding	9	9.57
Total	**94**	**100.00**

Wives contribute an average of 9.775 days, whereas there is no contribution from female family labor. Male family labor averages 0.169 days. Permanent male workers contribute 15.211 days on average. Temporary female workers average 77.746 days, while temporary male workers contribute 111.296 days. Contractors contribute an average of 3.197 days. There is no mutual aid reported for either giving or receiving. The most significant labor input on tomatoes farms comes from temporary male workers, with an average of 111.296 days.

Table 26 ***Distribution of seasonal working times (days/year) for tomatoes***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	71	9.8	15.2	0.0	34.0
Total Work, Family Women	71	0.0	0.0	0.0	0.0
Total Work, Family Men	71	0.2	0.4	0.0	1.0
Total Work, Permanent Men	71	15.2	34.0	0.0	90.0
Total Work, Temporary Women	71	77.7	44.9	6.0	146.0
Total Work, Temporary Men	**71**	**111.3**	62.2	19.0	254.0
Total Contractors	71	3.2	5.9	0.0	16.0
Total Received Mutual Aid	71	0.0	0.0	0.0	0.0
Total Give Mutual Aid	71	0.0	0.0	0.0	0.0
Total Work, Permanent Women	71	0.0	0.0	0.0	0.0

5- **Seasonal work related to** Maize

The tasks related to maize farming, based on the data, show that weedicide application is the most frequent activity accounting for 22.62% of all tasks. Planting is the next most common task at 11.90%, followed by harvesting and weeding, each at 9.52%. Other notable tasks include fertilizer application and transport, each at 5.95%. Less frequent tasks include burning, plowing, shelling, and pesticide application, each making up 4.76% of the total.

Figure 10 *Distribution of seasonal work related to Maize*

Task name	**Freq.**	**Percent**
Assembling of corn	1	1.19

Gathering of harvest	1	1.19
Burning	4	4.76
Drying	3	3.19
Fertilizer application	5	5.95
Harvesting	8	9.52
Land preparation	2	2.38
Packaging	4	4.76
Pesticide application	4	4.76
Planting	10	11.90
Plowing	4	4.76
Shelling	4	4.76
Slash and burn	2	2.38
Transport	5	5.95
Weedicide application	19	22.62
Weeding	8	9.52
Total	**84**	**100.00**

Male permanent workforce can work up to 1435 days, with an average of 238.75 days. The average contribution from temporary workers is 256.44 days for female workers and 219.679 days for male workers. An average of 32 days are contributed by contractors each year. There were no reports of mutual aid given or received. With an average of 256.44 days, temporary female workers and permanent male workers lead the labor force, with an average of 238.75 days each.

Table 27 ***Distribution of seasonal working times (days/year) for*** *Maize*

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	84	20.49	38.58	0.00	126.00
Total Work, Family Women	84	0.00	0.00	0.00	0.00
Total Work, Family Men	84	1.71	4.98	0.00	16.00
Total Work, Permanent Men	84	238.75	445.22	0.00	1435.00
Total Work, Temporary Women	**84**	**256.44**	410.64	41.00	1414.00
Total Work, Temporary Men	84	219.68	193.84	58.00	708.00
Total Contractors	84	32.00	47.80	0.00	159.00
Total Received Mutual Aid	84	0.00	0.00	0.00	0.00
Total Give Mutual Aid	84	0.00	0.00	0.00	0.00
Total Work, Permanent Women	84	43.50	124.60	0.00	401.00

6- Seasonal work related to Cassava

In cassava farming, weedicide application is the most frequent task (29.63%). Weeding follows is the next common task taking 20.37%, while planting accounts for 12.96% of the tasks.. Tasks like

laying of cassava cuttings, minimum tillage, packaging, and seed replacement are the least frequent, each contributing 1.85% to the total.

Table 28 ***Seasonal work related to Cassava***

Task_name	Freq.	Percent
Burning	4	7.41
Harvesting	6	11.11
Laying of cassava cuttings	1	1.85
Minimum tillage	1	1.85
Packaging	1	1.85
Planting	7	12.96
Seed replacement	1	1.85
Slash and burn	3	5.56
Transport	3	5.56
Weedicide application	16	29.63
Weeding	11	20.37
Total	**54**	**100.00**

For cassava production, the average seasonal working times are displayed in the following table. It can be seen that, temporary male workers spend an average of 144.667 days working on maize farms. Contractors contribute an average of 30.852 days, and mutual aid received averages 2.889 days. The most common labor forces on cassava plots are temporary male workers, with an average of 144.667 days, and wives, with an average of 62.685 days.

Table 29 ***Distribution of seasonal working times (days/year) for Cassava***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	54	62.69	74.75	0.00	189.00
Total Work, Family Women	54	17.33	32.73	0.00	78.00
Total Work, Family Men	54	0.00	0.00	0.00	0.00
Total Work, Permanent Men	54	58.50	86.87	0.00	209.00
Total Work, Temporary Women	54	56.02	26.40	1.00	100.00
Total Work, Temporary Men	**54**	**144.67**	65.94	9.00	281.00
Total Contractors	54	30.85	40.34	0.00	100.00
Total Received Mutual Aid	54	2.89	7.55	0.00	24.00
Total Give Mutual Aid	54	0.00	0.00	0.00	0.00
Total Work, Permanent Women	54	33.33	95.17	0.00	300.00

7- Seasonal work related to pepper

Nursery, weeding and fertilizer application are the most common seasonal tasks on pepper farms/plots.

Table 30 ***Seasonal work related to pepper****:*

Task_name	Freq.	Percent
Land preparation	1	1.56
Minimum tillage	1	1.56
Par-boiling	1	1.56
Transplant	1	1.56
Burning	3	4.69
Drying	4	6.25
Fertilizer application	6	9.38
Harvesting	6	9.38
Land preparation	1	1.56
Nursery	6	9.38
Packaging	4	6.25
Pesticide application	3	4.69
Planting	1	1.56
Plowing	3	4.69
Seedling replacement	1	1.56
Tillage	1	1.56
Transplanting	4	6.25
Transport	4	6.25
Watering	1	1.56
Weed control	1	1.56
Weedicide application	4	6.25
Weeding	7	10.94
Total	**64**	**100.00**

For pepper production, the seasonal working times are as follows: wives contribute an average of 57.766 days per year. Family labor from men averages 34.453 days. Permanent male workers average 372.141 days annually, while temporary female workers contribute 376.594 days. Temporary male workers average 253.031 days. Contractors average 51.391 days. The most dominant labor forces are temporary female workers, with an average of 376.594 days, and permanent male workers, with an average of 372.141 days.

Table 31 ***Distribution of seasonal working times (days/year) for pepper***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	64	57.77	56.04	0.00	126.00
Total Work, Family Women	64	0.00	0.00	0.00	0.00
Total Work, Family Men	64	34.45	48.85	0.00	126.00
Total Work, Permanent Men	64	372.14	544.67	0.00	1435.00
Total Work, Temporary Women	**64**	**376.59**	509.96	33.00	1414.00
Total Work, Temporary Men	64	253.03	239.55	53.00	708.00
Total Contractors	64	51.39	55.23	1.00	159.00
Total Received Mutual Aid	64	0.00	0.00	0.00	0.00
Total Give Mutual Aid	64	0.00	0.00	0.00	0.00
Total Work, Permanent Women	64	75.89	157.42	0.00	401.00

ROUTINE WORK

H - ROUTINE WORK (TA) AND DISTRIBUTION OF TASKS

The next type of work examined is routine tasks. These are tasks performed on a daily basis possibly, throughout the year, they are measure in hours per day. These tasks are tabulated below. First of all, feeding poultry was the most frequent task among all the other routine tasks on the farms. It makes up 42.11%, followed by cleaning pens and field inspection, 10.53% each. Fetching water, feeding animals, feeding goats, feeding sheep, and field supervision each occurred at 5.26%.

1- Routine tasks related to all animals/crops

Table 32 Routine tasks related to all animals/crops

Task name	Freq.	Percent
Fetching of water	1	5.26
Cleaning pens	2	10.53
Feeding animals	1	5.26
Feeding of goats	1	5.26
Feeding of poultry	8	42.11
Feeding poultry	2	10.53
Feeding sheep	1	5.26
Field inspection	2	10.53
Field supervision	1	5.26
Total	**19**	**100.00**

In the routine work for plant and animal production, wives of farm managers contribute the most, averaging 0.474 hours per day. Other categories, including family women, family men, and

permanent male workers, contribute significantly less, each averaging around 0.1 hours per day. Notably, temporary male workers and both permanent and temporary female workers show no contribution at all. This suggests that routine tasks are primarily managed by the farm manager's wife, with minimal involvement from other family members or external workers.

Table 33 *Distribution of Routine work (hours/day) with all plant/animals production (hrs/day)*

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	**19**	**0.47**	**1.07**	0.00	4.00
Total Work, Family Women	19	0.11	0.32	0.00	1.00
Total Work, Family Men	19	0.11	0.32	0.00	1.00
Total Work, Permanent Men	19	0.16	0.47	0.00	1.50
Total W Temporary Women	19	0.11	0.46	0.00	2.00

NON-DAILY ROUTINE WORK

I- NON-DAILY ROUTINE WORK AND DISTRIBUTION OF TASKS

1- Non-daily routine work for all crops

Non-daily routine tasks refers to those tasks that occur at regular intervals but not on a daily basis. The table below presents such tasks on all crops and the subsequent tables presents same tasks related to only plantain. For all crops concerned, weeding, de-trashing and weedicide application are most common non-daily routine tasks.

Table 34 *Non-daily routine work for all crops*

Task name	**Freq.**	**Percent**
Inspection of plots	1	1.22
Planting of plantain seedlings	1	1.22
Sucker replacement	1	1.22
Tuber replacement	1	1.22
De-trashing	8	9.76
Destumping	2	2.44
Harvesting	6	7.32
Minimum tillage	1	1.22
Nursery	1	1.22
Pesticide application	4	4.88
Pruning	10	12.2
Sucker replacement	6	7.32
Transplanting	2	2.44
Water carting	1	1.22
Weedicide application	8	9.76
Weeding	29	35.37
Total	**82**	**100.00**

For non-daily routine work across all crops, temporary male workers contribute the most, with an average of 3.195 hours per day. Wives of farm managers also play a significant role, contributing an average of 2.659 hours per day. Other groups, such as family men and permanent male workers, contribute less, with averages of 1.561 and 1.695 hours per day, respectively. Family women and permanent female workers contribute the least, averaging 0.329 and 0.488 hours per day. This distribution highlights the importance of temporary male labor and the significant involvement of the farm manager's wife in non-daily tasks, while the contributions from other groups are relatively modest.

Table 35 Distribution of Non-daily routine work (hours/day) for all crops

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, wife	82	2.66	3.89	0.00	12.00
Total Work family Women	82	0.33	1.70	0.00	9.00
Total Work family Men	82	1.56	4.26	0.00	17.00
Total Work perm MEN	82	1.70	3.61	0.00	13.00
Total Work temp WOMEN	82	1.98	2.72	0.00	9.00
Total Work Temporary Men	**82**	2.66	3.89	0.00	12.00
Total W perm WOMEN	82	0.33	1.70	0.00	9.00
Total W temp MEN	**82**	1.56	4.26	0.00	17.00

2- Non-daily on-call work related to plantain

On plantain plots, de-trashing is the dominant non-daily routine task and it accounts for about 25% of all these categories of tasks on plantain plots. Pesticides application and sucker replacement are also common. Sucker replacement are necessary because some of the planted suckers may die due to drought and other reasons (Lienou et al., 2022). Farmers therefore need to occasionally check and replace those dead suckers.

Table 36 Non-daily routine work for plantain

Task name	Freq.	Percent
Plantain of plantain seedlings	1	5.00
De-trashing	5	25.00
Harvesting	1	5.00
Pesticide application	1	5.00
Pruning	4	20.00
Pruning of Plantain	1	5.00
Pruning	1	5.00
Sucker replacement	3	15.00
Weedicide application	2	10.00
Weeding	1	5.00
Total	**20**	**100.00**

In non-daily routine work for plantain, the farm manager's wife contributes the most, with an average of 2.95 hours per day. Family men are also notably involved, averaging 2.55 hours. Temporary women and men workers contribute about 1.7 and 1.65 hours, respectively. Family women participate less, with an average of 1.35 hours, while permanent male workers contribute just 0.5 hours. Permanent female workers have minimal involvement, contributing only 0.2 hours on average. This suggests that non-daily tasks are primarily handled by the farm manager's wife and family men, with relatively limited input from permanent workers.

Table 37 ***Distribution of Non-daily routine work (hours/day) for plantain***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total W wife	**20**	**2.95**	4.19	0.00	11.00
Total W family WOMEN	20	1.35	3.30	0.00	9.00
Total W family MEN	20	2.55	5.59	0.00	17.00
Total W perm MEN	20	0.50	1.57	0.00	6.00
Total W temp WOMEN	20	1.70	2.47	0.00	7.00
Total W temp MEN	20	**2.95**	4.19	0.00	11.00
Total W perm WOMEN	20	1.35	3.30	0.00	9.00
Total W temp MEN	20	2.55	5.59	0.00	17.00

LEVEL OF MECHANIZATION

J- LEVEL OF MECHANIZATION

1- Mechanized tools used for seasonal work

Table 38 ***Mechanized tools used for seasonal work***

Equipment	**Rented**		**Owned**		**Total**
	Count	**%**	**Count**	**%**	**Count**
Knapsack Sprayer	22	58%	25	66%	47
Tricycle	26	68%	5	13%	31
Tractor	24	63%	2	5%	26
Kia Truck	20	53%	2	5%	22

Sheller	1	3%	0	0%	1

Note : *Renting and owning an equipment is not mutually exclusive*

Usage of motorized Equipment for seasonal work (all farms and specifically on plantain farms)

Motorized tools	**Usage (all farms)**	**Usage (only plantain farms)**
Knapsack sprayer	36 (94.7%)	18 (47.4%)
Tricycle	15 (39.5%)	7 (18.4%)
Tractor	19 (50.0%)	12 (31.6%)
Auger	18 (47.4%)	8 (21.1%)
Kia truck	10 (26.3%)	6 (15.8%)
Sheller	1 (2.6%)	0 (0.0%)

Table 39 ***Seasonal tasks performed by motorized tools***

Equipment	**Task name**	**Total number of plots**
Auger	Bed creation	1
	Planting	17
	Sucker replacement	9
	Transplanting	1
Knapsack sprayer	Weedicides application	29
	Pesticide application	28
Spraying machine	Pesticide application	4
	Weedicide application	3
Tractor	Land preparation	2
	Ploughing/tillage	1
	Plowing	23
	Shelling	3
	Tillage	1
	Transportation of harvest	1
	Weeding	1
Tricycle	Transport	21
Truck	Seedling collection	1
	Transport	15

A- SEASONAL WORK (TS) WITH EQUIPMENT

A1- KNAPSACK SPRAYER

For farms using the knapsack for weedicide/pesticide application, which is 35 out of 38 farms (92.1%), the average seasonal working times are: Wives contribute 29.543 days per year. Family labor from women averages 3.457 days, and from men, 37.486 days. Permanent male workers average 71.429 days. Temporary female workers contribute 128.286 days, while temporary male workers average 132.686 days. Contractors contribute 32.743 days annually. Mutual aid received averages 1.457 days, with no mutual aid given. Temporary male workers are the most frequent users, with averages of 132.686 days/year.

Table 40 *Table: Seasonal working time for all farms (Plantain and other crops) using the knapsack for weedicide/pesticide application*

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	35	29.54	46.18	0.00	189.00
Total Work, Family Women	35	3.46	14.87	0.00	78.00
Total Work, Family Men	35	37.49	180.75	0.00	1067.00
Total Work, Permanent Men	35	71.43	253.78	0.00	1435.00
Total Work, Temporary Women	35	128.29	251.57	0.00	1414.00
Total Work, Temporary Men	**35**	**132.69**	136.58	3.00	708.00
Total Contractors	35	32.74	64.98	0.00	323.00
Total Received Mutual Aid	35	1.46	5.25	0.00	24.00
Total Give Mutual Aid	35	0.00	0.00	0.00	0.00
Total Work, Permanent Women	35	20.17	83.42	0.00	401.00

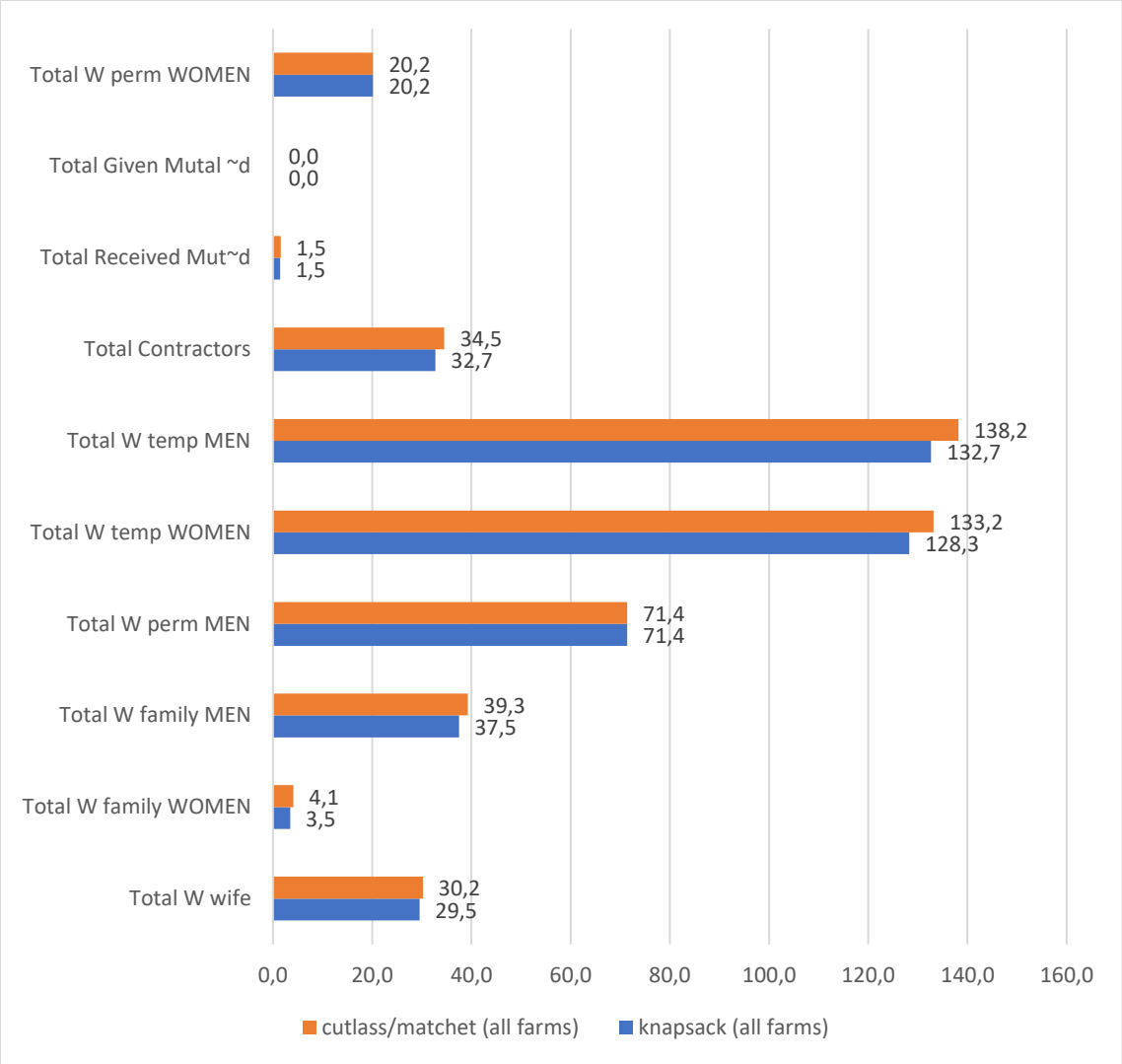

Figure 11 Distribution of seasonal work (weeding) done by the different categories of workers when it is mechanized by the knapsack sprayer(blue) and manually (yellow)

The figure above shows the distribution of seasonal work (weeding) done by the different categories of workers when it is mechanized by the knapsack sprayer(blue) and manually (yellow) by using cutlass/matchet. The results showed that, most of the seasonal weeding tasks is done manually even though a significant amount of the same task is done by using the knapsack sprayer. This shows that farmers tend to combine both manual and mechanized methods of controlling weeds on their farms. It implies that, there is still a gap in mechanizing weeding on these farms.

Knapsack sprayer usage for seasonal work (days/year) **on only plantain farms**

For plantain farms using the knapsack sprayer, which is 19 out of 38 farms (50%), the average

seasonal working times are as follows: Wives contribute 25.789 days per year. Family labor from women averages 2.263 days, while family labor from men averages 12.053 days. Permanent male workers average 5.158 days. Temporary female workers contribute 65.053 days, and temporary male workers average 88.526 days. Contractors contribute 13.474 days annually. Mutual aid received averages 2.316 days, with no mutual aid given.

Table 41 ***Knapsack sprayer usage for seasonal work*** *(days/year)* ***on only plantain farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	19	25.8	37.8	0.0	117.0
Total Work, Family Women	19	2.3	9.9	0.0	43.0
Total Work, Family Men	19	12.1	32.1	0.0	126.0
Total Work, Permanent Men	19	5.2	22.5	0.0	98.0
Total Work, Temporary Women	19	65.1	44.4	0.0	157.0
Total Work, Temporary Men	**19**	**88.5**	73.6	3.0	260.0
Total Contractors	19	13.5	15.3	0.0	45.0
Total Received Mutual Aid	19	2.3	7.0	0.0	24.0
Total Give Mutual Aid	19	0.0	0.0	0.0	0.0
Total Work, Permanent Women	19	15.8	68.8	0.0	300.0

According to the results, temporary workforce-men carry out the greatest share of all mechanized seasonal work on plantain farms. This resonates with (Atsriku, 2020) who emphasized the greater involvement of men in usage of farm machinery in Ghana.

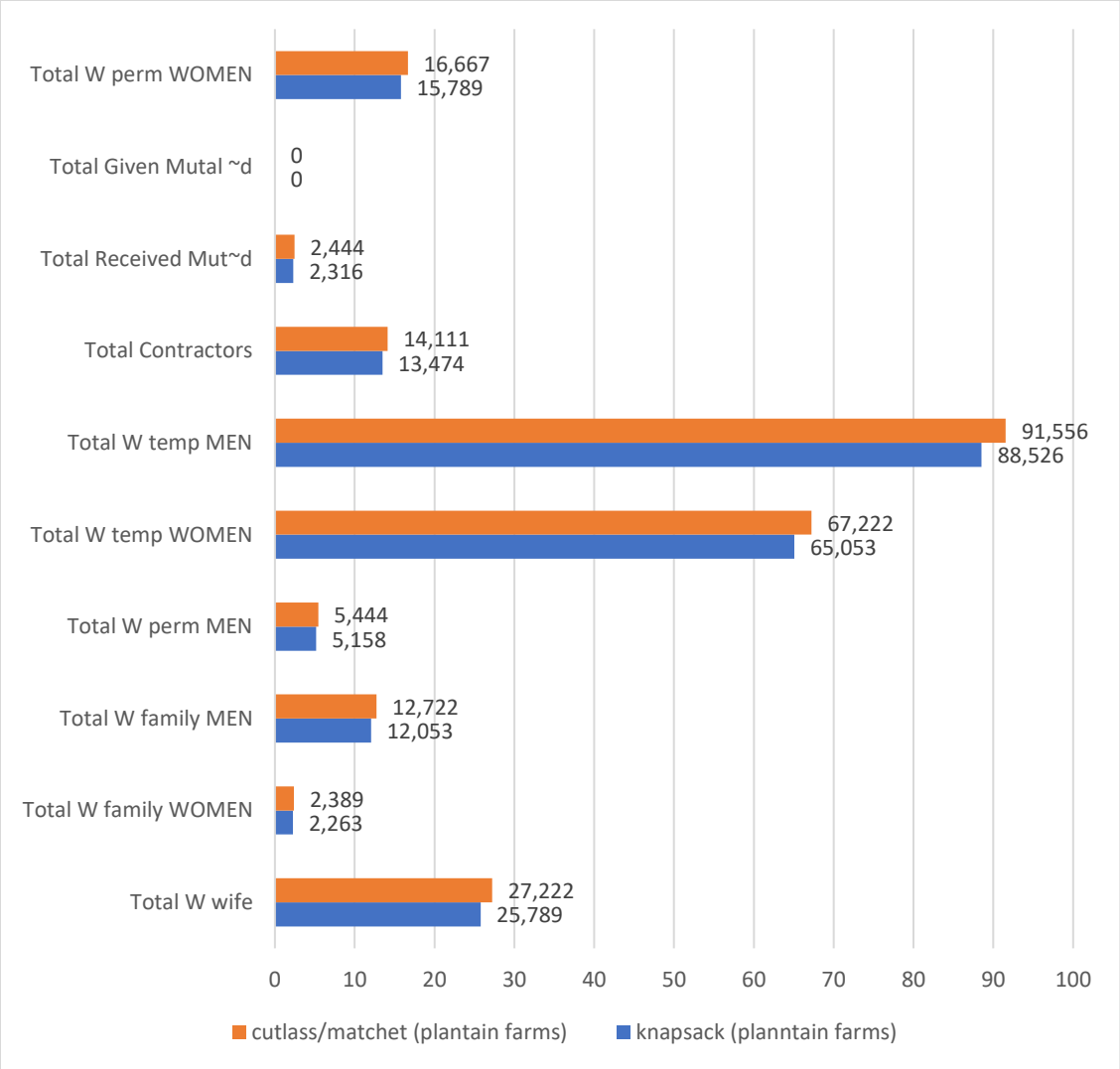

Figure 12 Weeds control using a knapsack sprayer (blue) and manual methods using a cutlass/machete (yellow).

From the figure above, the general farmwide trend remains consistent on plantain farms. The figure illustrates the distribution of seasonal weeding tasks across different categories of workers, comparing mechanized methods using a knapsack sprayer (blue) to manual methods using a cutlass/machete (yellow). The results indicate that while most weeding tasks are performed manually, a significant portion is also mechanized using the knapsack sprayer. This suggests that farmers often combine both methods for weed control, highlighting a gap in fully mechanizing weeding on these farms.

A2- TRICYCLE FOR SEASONAL WORK

Tricycle usage for seasonal work (days/year) **on all farms**

For all farms using the tricycle, which is 15 out of 38 farms (39.5%), the average seasonal working times are: Wives contribute 56.8 days per year. Family labor from women averages 9.667 days, while family labor from men averages 19.4 days. Permanent male workers average 147.933 days. Temporary female workers contribute 102.533 days, and temporary male workers average 173 days. Contractors contribute 65 days annually. Mutual aid received averages 3.6 days, with no mutual aid given. Temporary male workers and permanent male workers are the most frequent users, with averages of 173 and 147.933 days, respectively.

Table 42 ***Tricycle usage for seasonal work*** *(days/year)* ***on all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	15	56.80	57.86	0.00	189.00
Total Work, Family Women	15	9.67	22.53	0.00	78.00
Total Work, Family Men	15	19.40	37.42	0.00	126.00
Total Work, Permanent Men	15	147.93	379.26	0.00	1435.00
Total Work, Temporary Women	15	102.53	349.14	0.00	1414.00
Total Work, Temporary Men	**15**	**173.00**	179.04	3.00	708.00
Total Contractors	15	65.00	81.54	7.00	323.00
Total Received Mutual Aid	15	3.60	7.69	0.00	24.00
Total Give Mutual Aid	15	0.00	0.00	0.00	0.00
Total Work, Permanent Women	15	46.73	124.80	0.00	401.00

Tricycle usage for seasonal work (days/year) **on plantain farms**

On plantain farms using the tricycle, which represents 21% of all farms (8 out of 38), the average seasonal working times are: Wives contribute 45.75 days per year. Family labor from women averages 5.375 days, while family labor from men averages 28.5 days. Permanent male workers do not contribute. Temporary female workers average 64.625 days, and temporary male workers contribute 94.875 days. Contractors average 24.5 days annually. Mutual aid received averages 5.5 days, with no mutual aid given. On these plantain farms, temporary male workers and temporary female workers are the most frequent users, with averages of 94.875 and 64.625 days, respectively.

Table 43 ***tricycle usage for seasonal work*** *(days/year)* ***on plantain farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	8	45.75	47.04	0.00	117.00
Total Work, Family Women	8	5.38	15.20	0.00	43.00
Total Work, Family Men	8	28.50	45.95	0.00	126.00
Total Work, Permanent Men	8	0.00	0.00	0.00	0.00
Total Work, Temporary Women	8	64.63	43.60	0.00	110.00
Total Work, Temporary Men	**8**	**94.88**	87.08	3.00	248.00
Total Contractors	8	24.50	15.06	7.00	45.00
Total Received Mutual Aid	8	5.50	10.24	0.00	24.00
Total Give Mutual Aid	8	0.00	0.00	0.00	0.00
Total Work, Permanent Women	8	37.50	106.07	0.00	300.00

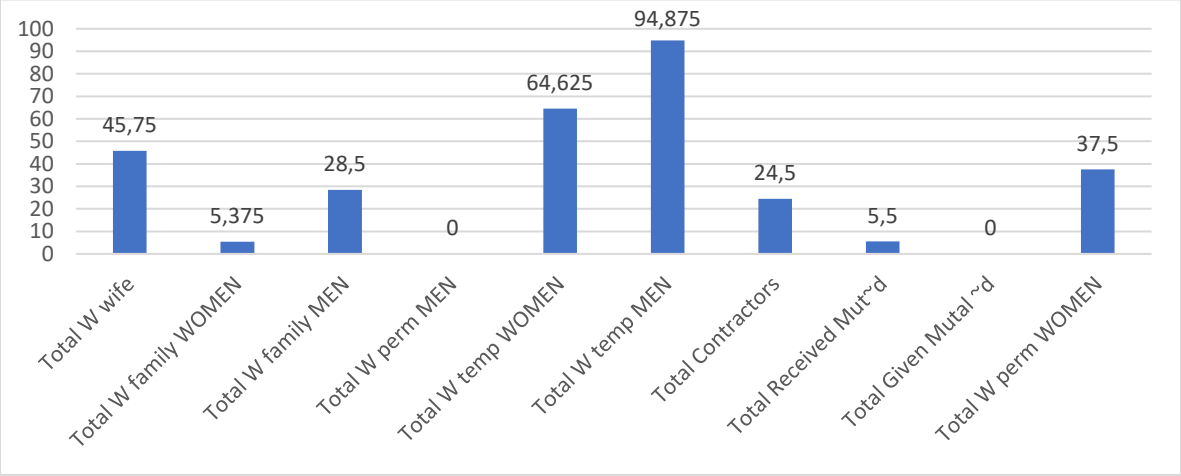

Figure 13 *Tricycle usage, plantain farms*

3- KIA TRUCK FOR SEASONAL WORK

Table 44 ***Kia truck usage, all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	10	33.00	51.61	0.00	126.00
Total Work, Family Women	10	0.00	0.00	0.00	0.00
Total Work, Family Men	10	123.50	333.92	0.00	1067.00
Total Work, Permanent Men	10	200.80	458.87	0.00	1435.00
Total Work, Temporary Women	**10**	**314.90**	424.96	84.00	1414.00
Total Work, Temporary Men	10	223.80	184.29	84.00	708.00
Total Contractors	10	55.60	58.08	5.00	166.00
Total Received Mutual Aid	10	2.00	6.33	0.00	20.00
Total Give Mutual Aid	10	0.00	0.00	0.00	0.00
Total Work, Permanent Women	10	40.10	126.81	0.00	401.00

Table 45 ***Kia truck usage, only plantain farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	6	11.83	28.99	0.00	71.00
Total Work, Family Women	6	0.00	0.00	0.00	0.00
Total Work, Family Men	6	184.83	432.48	0.00	1067.00
Total Work, Permanent Men	6	15.50	37.97	0.00	93.00
Total Work, Temporary Women	**6**	**203.50**	225.09	84.00	660.00
Total Work, Temporary Men	6	194.00	79.78	84.00	281.00
Total Contractors	6	50.67	57.28	16.00	166.00
Total Received Mutual Aid	6	3.33	8.17	0.00	20.00
Total Give Mutual Aid	6	0.00	0.00	0.00	0.00
Total Work, Permanent Women	6	0.00	0.00	0.00	0.00

A4- TRACTOR FOR SEASONAL WORK

Tractor usage for seasonal work (days/year) **on all farms**

For all farms using the tractor, which accounts for 19 out of 38 farms (50%), the average seasonal working times are: Wives contribute 22 days per year. Family labor from women is absent, while family labor from men averages 66.895 days. Permanent male workers contribute 120.474 days, and temporary female workers average 149.789 days. Temporary male workers contribute 155.158 days. Contractors average 29.474 days annually. There is no mutual aid received or given. On these farms, temporary male and female workers are the most frequent users of the tractor, with averages of 155.158 and 149.789 days, respectively.

Table 46 ***tractor usage for seasonal work*** *(days/year)* ***on all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	19	22.00	42.14	0.00	126.00
Total Work, Family Women	19	0.00	0.00	0.00	0.00
Total Work, Family Men	19	66.90	244.19	0.00	1067.0
Total Work, Permanent Men	19	120.47	337.38	0.00	1435.0
Total Work, Temporary Women	19	149.79	330.82	0.00	1414.0
Total Work, Temporary Men	**19**	**155.16**	161.66	19.00	708.00
Total Contractors	19	29.47	49.34	1.00	166.00
Total Received Mutual Aid	19	0.00	0.00	0.00	0.00
Total Give Mutual Aid	19	0.00	0.00	0.00	0.00
Total Work, Permanent Women	19	21.37	91.94	0.00	401.00

Tractor usage for seasonal work (days/year) on plantain farms

For plantain farms using tractors, which account for 11 out of 38 farms (28.9%), the average seasonal working times are as follows: Wives contribute an average of 25.909 days per year. There is no family labor from women, and family labor from men averages 17.091 days. Permanent male workers contribute an average of 8.909 days, while temporary female workers average 79 days. Temporary male workers contribute 99.182 days. Contractors contribute 12.818 days annually. No mutual aid was received or given. Temporary male and female workers are the primary users of the tractor, with averages of 99.182 and 79 days, respectively.

Table 47 Tractor usage for seasonal work (days/year) on plantain farms

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	11	25.91	42.25	0.00	117.00
Total Work, Family Women	11	0.00	0.00	0.00	0.00
Total Work, Family Men	11	17.09	40.48	0.00	126.00
Total Work, Permanent Men	11	8.91	29.55	0.00	98.00
Total Work, Temporary Women	11	79.00	46.69	0.00	157.00
Total Work, Temporary Men	**11**	**99.18**	67.82	30.00	260.00
Total Contractors	11	12.82	13.09	1.00	32.00
Total Received Mutual Aid	11	0.00	0.00	0.00	0.00
Total Give Mutual Aid	11	0.00	0.00	0.00	0.00
Total Work, Permanent Women	11	0.00	0.00	0.00	0.00

A5- AUGER FOR SEASONAL WORK

Auger usage for seasonal work (days/year) on all farms

On farms utilizing an auger, which include 18 out of 38 farms (47.4%), the following seasonal work patterns are observed: Wives contribute an average of 51.778 days per year. Family labor from women averages 8.056 days, while family labor from men averages 75.444 days. Permanent male workers average 123.278 days, and temporary female workers contribute 199.778 days. Temporary male workers work an average of 173.667 days. Contractors contribute an average of 65.111 days annually. Mutual aid received averages 3 days, with no aid given. Notably, temporary female workers are the primary users of the auger, with the highest average usage at 199.778 days.

Table 48 ***Auger usage for seasonal work*** *(days/year)* ***on all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	18	51.78	55.37	0.00	189.00
Total Work, Family Women	18	8.06	20.78	0.00	78.00
Total Work, Family Men	18	75.44	249.86	0.00	1067.00
Total Work, Permanent Men	18	123.28	348.81	0.00	1435.00
Total Work, Temporary Women	**18**	**199.78**	338.67	0.00	1414.00
Total Work, Temporary Men	18	173.67	164.48	3.00	708.00
Total Contractors	18	65.11	79.95	0.00	323.00
Total Received Mutual Aid	18	3.00	7.11	0.00	24.00
Total Give Mutual Aid	18	0.00	0.00	0.00	0.00
Total Work, Permanent Women	18	38.94	114.66	0.00	401.00

Auger usage for seasonal work (days/year) **on plantain farms**

On plantain farms, where 10 out of 38 farms (26.3%) use an auger for seasonal work, the average usage is as follows: Wives contribute 44.6 days per year. Family labor from women averages 4.3 days, while family labor from men averages 22.8 days. Permanent male workers are not used on these farms. Temporary female workers average 71.5 days, and temporary male workers average 113.5 days. Contractors contribute an average of 22.7 days annually. Mutual aid received averages 4.4 days, with no aid given. Temporary male workers are the primary users of the auger, with the highest average usage at 113.5 days.

Table 49 ***Auger usage for seasonal work*** *(days/year)* ***on plantain farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	10	44.60	44.05	0.00	117.00
Total Work, Family Women	10	4.30	13.60	0.00	43.00
Total Work, Family Men	10	22.80	42.27	0.00	126.00
Total Work, Permanent Men	10	0.00	0.00	0.00	0.00
Total Work, Temporary Women	10	71.50	49.36	0.00	157.00
Total Work, Temporary Men	**10**	**113.50**	92.69	3.00	260.00
Total Contractors	10	22.70	15.63	0.00	45.00
Total Received Mutual Aid	10	4.40	9.32	0.00	24.00
Total Give Mutual Aid	10	0.00	0.00	0.00	0.00
Total Work, Permanent Women	10	30.00	94.87	0.00	300.00

Table 50 ***Farms not using auger (but earth chisel) for planting work on all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	14	8.50	12.97	0.00	34.00
Total Work, Family Women	14	0.00	0.00	0.00	0.00
Total Work, Family Men	14	1.14	4.28	0.00	16.00
Total Work, Permanent Men	14	13.07	33.23	0.00	93.00
Total Work, Temporary Women	14	56.43	35.59	1.00	111.00
Total Work, Temporary Men	**14**	**87.14**	89.23	9.00	359.00
Total Contractors	14	1.50	1.91	0.00	6.00
Total Received Mutual Aid	14	0.00	0.00	0.00	0.00
Total Give Mutual Aid	14	0.00	0.00	0.00	0.00
Total Work, Permanent Women	14	0.36	1.34	0.00	5.00

Table 51 ***Farms not using auger (but earth chisel) for planting on plantain farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	7	6.29	10.48	0.00	26.00
Total Work, Family Women	7	0.00	0.00	0.00	0.00
Total Work, Family Men	7	0.00	0.00	0.00	0.00
Total Work, Permanent Men	7	0.00	0.00	0.00	0.00
Total Work, Temporary Women	**7**	**57.00**	29.59	26.00	97.00
Total Work, Temporary Men	7	52.00	27.43	30.00	106.00
Total Contractors	7	1.71	1.70	0.00	5.00
Total Received Mutual Aid	7	0.00	0.00	0.00	0.00
Total Give Mutual Aid	7	0.00	0.00	0.00	0.00
Total Work, Permanent Women	7	0.00	0.00	0.00	0.00

Table 52 ***Hoe usage for seasonal work*** *(days/year)****, all farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	18	32.056	51.676	0	189
Total Work, Family Women	18	5.667	18.915	0	78
Total Work, Family Men	18	74.056	250.129	0	1067
Total Work, Permanent Men	18	53.722	120.668	0	480
Total Work, Temporary Women	18	124.833	150.968	6	660
Total Work, Temporary Men	**18**	**141.889**	92.19	19	359
Total Contractors	18	46.056	81.946	0	323
Total Received Mutual Aid	18	.556	1.542	0	6
Total Give Mutual Aid	18	0	0	0	0
Total Work, Permanent Women	18	.278	1.179	0	5

Table 53 ***Hoe usage for seasonal work*** *(days/year)*, ***plantain only farms***

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	4	55.50	52.55	0.00	117.00
Total Work, Family Women	4	0.00	0.00	0.00	0.00
Total Work, Family Men	4	46.75	60.15	0.00	126.00
Total Work, Permanent Men	4	0.00	0.00	0.00	0.00
Total Work, Temporary Women	4	80.75	32.33	35.00	110.00
Total Work, Temporary Men	**4**	**98.75**	61.79	40.00	166.00
Total Contractors	4	20.25	14.43	0.00	32.00
Total Received Mutual Aid	4	0.00	0.00	0.00	0.00
Total Give Mutual Aid	4	0.00	0.00	0.00	0.00
Total Work, Permanent Women	4	0.00	0.00	0.00	0.00

Below is a graphical representation of the distribution of planting/transplanting and digging tasks mechanized using the auger (blue) and manually (earth chisel/hoe/cutlass) on plantain farms. The total amount of manual work was obtained by summing the amount of planting work done using the earth chisel, hoe, and cutlass, as seen in the previous tables (Tables 8, 9, and 10). It turns out that planting tasks are mostly done by the temporary male workforce and temporary female workforce. In terms of mechanization, the temporary male workforce does more of the planting work when it is mechanized (113 days/year) than the temporary female workforce (71.5 days/year). Generally, planting and related tasks are mainly manual across all types of labor forces. However, the planting work done by the permanent female workforce is mainly mechanized (30 days/year).

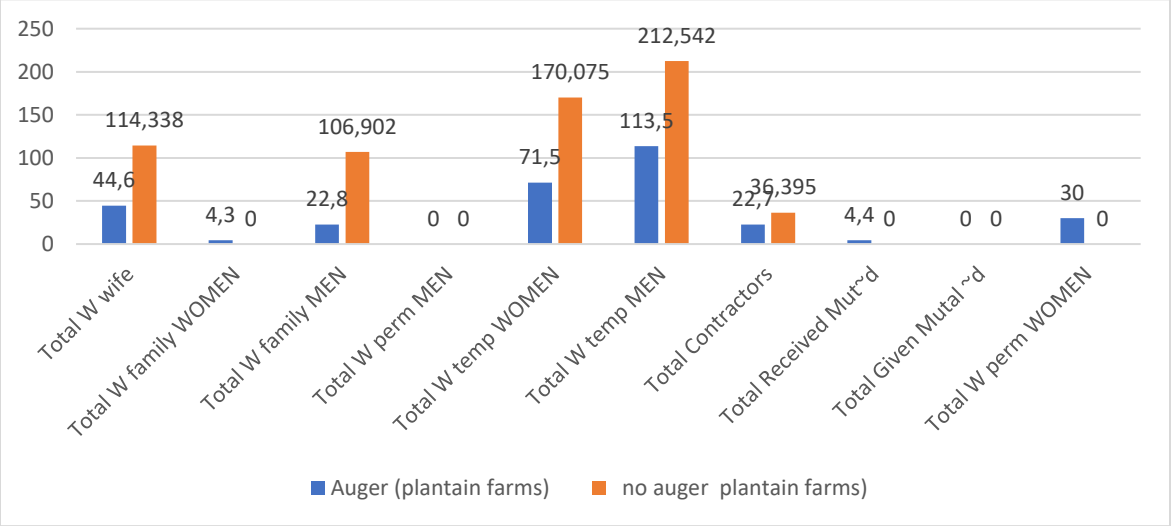

Figure 14 Distribution of work on farms not using the auger (yellow) and on farms using the auger (blue)s

B- LEVEL OF MECHANIZATION IN ROUTINE WORK (Not mechanized)

- ✓ Tractor: None is used for routine tasks
- ✓ Auger: Not used for routine tasks
- ✓ Tricycle: Not used for routine tasks

C- LEVEL OF MECHANIZATION IN NON-DAILY ROUTINE WORK

C1-Knapsack sprayer usage for non-daily routine work (hours/day) on all farms

For non-daily routine work using a knapsack sprayer on all farms, where 10 out of 38 farms (26.3%) use the equipment, the average usage is as follows: Wives spend an average of 4.2 hours per day. Family labor from women and men each averages 0.9 hours per day. Permanent male workers contribute an average of 1.9 hours per day. Temporary female workers average 2.8 hours per day, while temporary male workers average 4.8 hours per day. Temporary male workers are the most involved in using the knapsack sprayer for non-daily tasks.

Table 54 Knapsack Sprayer Usage For Non-Daily Routine Work (Hours/Day) Plantain Farms

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	10	4.2	4.962	0	12
Total Work, Family Women	10	0.9	2.846	0	9
Total Work, Family Men	10	0.9	2.846	0	9
Total Work Permanent Men	10	1.9	3.604	0	11
Total Work, Temporary Women	10	2.8	3.259	0	9
Total Work Temporary Men	**10**	**4.8**	4.185	0	14

Table 55 Knapsack Sprayer Usage For Non-Daily Routine Work (Hours/Day) Plantain Farms

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	**3**	**3.67**	**6.35**	0.00	11.00
Total Work, Family Women	3	3.00	5.20	0.00	9.00
Total Work, Family Men	3	0.00	0.00	0.00	0.00
Total Work Permanent Men	3	0.00	0.00	0.00	0.00
Total Work, Temporary Women	**3**	**3.33**	3.06	0.00	6.00
Total Work Temporary Men	3	2.67	2.31	0.00	4.00

C2- Auger usage for non-daily routine work (hours/day) on all farms

For non-daily routine work using a knapsack sprayer on plantain farms, where 3 out of 38 farms (7.9%) use the equipment, the average usage is as follows: Wives spend an average of 3.7 hours per day. Family labor from women averages 3.0 hours per day. No hours are recorded for family men or permanent male workers. Temporary female workers average 3.3 hours per day, while temporary male workers average 2.7 hours per day.

Table 56 ***Auger*** *usage for non-daily routine work (hours/day) on all farms*

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Work, Wife	**2**	**8.00**	**4.24**	5.00	11.00
Total Work, Family Women	2	4.50	6.36	0.00	9.00
Total Work, Family Men	2	0.00	0.00	0.00	0.00
Total Work Permanent Men	2	0.00	0.00	0.00	0.00
Total Work, Temporary Women	2	2.50	3.54	0.00	5.00
Total Work Temporary Men	2	1.50	2.12	0.00	3.00

Auger usage for non-daily routine tasks on plantain farms

For non-daily routine tasks with an auger on plantain farms, 1 out of 38 farms (2.6%) uses the equipment. The average daily usage is 11 hours for wives and 9 hours for family women.

Variable	Obs	Mean	Std. Dev.	Min	Max
Total work, wife	**1**	**11**	.	11	11
Total Work, Family Women	1	9	.	9	9

DIFICULT TASKS WHICH FARMERS WISH COULD BE MECHANISED

Presented in the figure below are distribution of the difficult tasks that farms wish could be mechanized. We delve into areas where farmers wish technological innovation could enhance operational efficiency and alleviate labor-intensive processes. Firstly, digging holes for sucker planting emerges as the most challenging task, with 53% of farms expressing a desire for mechanization in this area. Mechanizing hole digging can significantly reduce labor requirements and time spent on manual labor, facilitating the efficient planting of suckers. Weeding is identified as another challenging task, with 17% of farms expressing a need for mechanization in this area. Mechanized weeding solutions can help farms address labor shortages, reduce reliance on manual labor, and enhance weed control efficacy, ultimately improving crop yields and profitability. The

actual yield of plantain in Ghana is still below the potential yield and mechanization could potentially help bridge that yield gap (Olumba & Onunka, 2020).

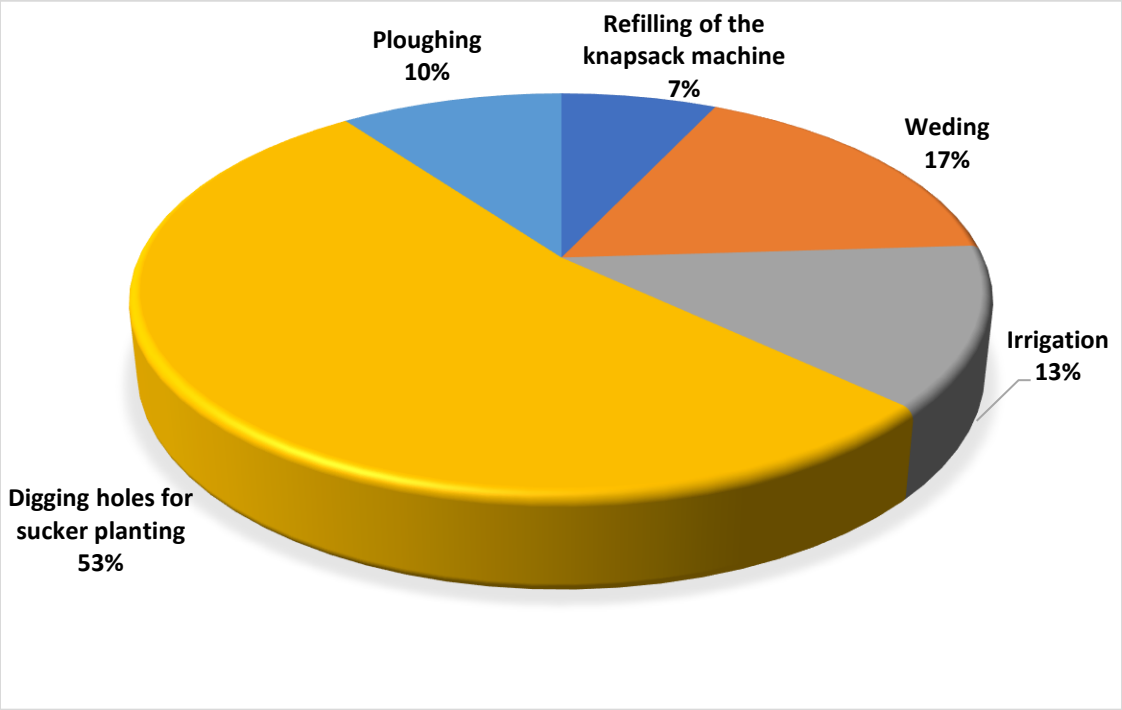

Figure 15 Types of difficult tasks (farm wide)
Source: field survey, 2023

Irrigation, plowing, and refilling of knapsack machines are also identified as challenging tasks, with 13%, 10%, and 7% of farms respectively expressing a desire for mechanization in these areas. Mechanized irrigation systems, plowing equipment, and automated knapsack machine refilling mechanisms can streamline operations, reduce labor fatigue, and enhance efficiency in farm management. Addressing the mechanization needs identified in these difficult tasks can contribute to enhanced productivity, profitability, and sustainability in farm operations. By investing in appropriate mechanization technologies and innovation, farms can optimize resource utilization, mitigate labor constraints.

SUMMARY AND CONCLUSIONS

There is a slightly higher proportion of females (51.05%) compared to males (48.95%) and a dependency ratio of 42% was recorded. The majority of farm managers (97.3%) fall within the working-age range of 15 to 64 years. Among the farm managers who engage in off-farm activities, 56.5% are involved in trading. The data shows that 9 out of 38 farms (23.68%) utilize a permanent workforce and 37 out of 38 (97%) farms employ temporary workforce. The analysis uncovers that, 14 out of 38 (36.8%) farms have livestock and an average of approximately 43 animals per farm. Poultry is the most common type, present on 11 farms (28.95%). The data on field characteristics shows that, on average, farms manage 3 fields, with the number ranging from 1 to 9 fields. The most common crops in the surveyed farms are plantain, maize, and tomatoes. On plantain farms/plots, weedicide/herbicide application (30.54%), planting (11.07%), and harvesting (10.40%) are the most frequent seasonal tasks. On plantain plots, de-trashing is the dominant non-daily routine task and it accounts for about 25% of all these categories of tasks. Knapsack sprayer is the most widely used motorized equipment (36 farms) and followed by tractor (19 farms) and Auger (18 farms). Different categories of workforce are engaged in different tasks and equipment usage on plantain farms. The results give evidence that mechanized tools are present on plantain farms, but they are not extensively utilized across all farms. Mechanization levels vary depending on the kind of equipment, but it is generally low. Farmers express a desire for further mechanization, especially in labor-intensive activities like weeding and irrigation, which could alleviate workload burdens.

RECOMMENDATIONS

Based on the results, we offer the following recommendations:

There should be a focus on mechanizing labor-intensive tasks such as weeding and irrigation, as farmers express a desire for further mechanization in these areas. This could involve introducing more efficient mechanized tools or improving access to existing equipment. Given that mechanized tools are present but not extensively utilized across all farms, the project should work on increasing accessibility. This could be achieved by providing subsidies, setting up equipment rental services, or facilitating cooperative ownership models. We further recommend training programs to farm managers and workers on the effective use and maintenance of mechanized tools like knapsack sprayers, tractors, and augers. This will help in increasing the utilization rate of these tools. With a slightly higher proportion of female farm managers, it's crucial to develop mechanization programs that are inclusive of women. Since 36.8% of the farms have livestock, it is recommended to consider integrating mechanization in livestock-related tasks, which could improve overall farm management and productivity. Given the variation in the number of fields managed per farm, tailor mechanization strategies to the size and structure of the farms. Larger farms with multiple fields may benefit from more advanced and larger-scale equipment, while smaller farms may need simpler, more versatile tools. These recommendations could help to address the key areas where mechanization can be improved, ensuring that the benefits are widely distributed and tailored to the specific needs of the farms in the project.

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