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The Influence of Adoption of Improved Oil Palm Production Practices on the Livelihood Assets of Oil Palm Farmers in Kwaebibirem District of Ghana

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Abstract
A number of improved oil palm production practices have been introduced to assist small-scale oil palm farmers increase yield and improve on their livelihoods. This study was conducted to examine the influence of adoption of improved oil palm production practices on the livelihood assets of oil palm farmers in Kwaebibirem District of the Eastern Region of Ghana. In all, 120 oil palm farmers were randomly selected and interviewed using structured questionnaires. Results revealed farmers' characteristics such as level of education and farm size had significant influence ($p<0.05$) on the adoption of improved oil palm production practices whilst farmers' age, gender, farming experience did not exhibit significant influence ($p>0.05$). Significant differences were observed among farmers who fully adopted improved oil palm technology than the non adopters in acquiring the following: more physical assets in the form of houses and household appliances; financial assets such as access to credit, increased income and savings; participation in group activities as a social asset and human capital in the form of ability to pay children's school fees. It is recommended that extension services should cover more farmers who should be encouraged to adopt improved oil palm production farming practices and therefore improve on their livelihood assets.
Keywords: Oil palm, Adoption, Livelihood Assets

1. Introduction

Oil Palm, *Elaeis guineensis (Jacq),* is the most economically important oil crop in the Palmae family in the world. The Oil Palm Industry in Ghana has developed over the last two decades into an important industry which comes next to cocoa in the agricultural sector of Ghana's economy. The importance of oil palm is manifested in oil yield per hectare and is dependent on the type of planting materials used coupled with sound agronomic practices. In Ghana, about 583,313 households are involved in oil palm cultivation nation-wide, and generate about 1.62 million Ghana Cedis annually (Ghana Statistical Service, 2008). The total area under oil palm cultivation has increased from 296,800ha in 2001 to 360,000ha in 2010 (MOFA, 2011). The bulk of the area under oil palm production comes from a large number of private small-scale holdings with estimated total holding of 266,100 ha representing 80% of the total area under cultivation.

Oil palm is one of the driving forces of rural agri-business and agro-industries. Among the vegetable oil crops, oil palm has the highest oil yield per hectare. The oil palm industry has the potential to become one of the leading non-traditional foreign exchange earners for the country. For example, a total of about 2,004,300 Mt of Fresh Fruit Bunches were produced in Ghana in 2010 yielding a crude palm oil of about 397,502 Mt (MOFA, 2011). The export values for palm oil ranged from US$ 7.9m in 2001 to US$ 46m in 2010 (FAOSTAT, 2011).

To boost the yields of small-scale oil palm farmers, a number of technologies such as improved production practices which comprise improved oil palm planting materials, lining & pegging, rodent control measures, use of cover crops, weed management strategies, fertilizer management strategies, pruning and harvesting, have been introduced. These technologies, when adopted could lead to improved livelihood assets such as physical, financial, natural, social and human capital. Farmers can use these acquired livelihood assets to undertake other

livelihood strategies such as on-farm activities like cocoa production, citrus production, livestock rearing and non-farm activities such palm oil processing, soap making and trading etc. Proceeds from these other diversified livelihood strategies can further be used by the farmers to acquire more livelihood assets. However, not all technologies adopted have impacted positively on adopters. Literature indicates that negative influences and environmental impacts are associated with modern technologies such as high yielding varieties and chemical fertilizers use (IFPRI, 2002). There is evidence that adoption of improved production practices can increase yields which in turn can improve upon the acquisition of livelihood assets (IFPRI, 2002; Rahman, 2002). This should have motivated farmers to adopt the improved production practices yet oil palm farmers in the Kwaebibirem district are not adopting the practices as expected. There is the perception that certain constraints faced by the farmers do not allow them to fully adopt such improved technologies. Among the constraints are high cost of inputs and sometimes their unavailability. Also, the low extension coverage of farmers in Ghana has been a main source of worry and might be the main constraint to adoption (Asuming-Brempong, Sarpong and Asante, 2005). This study therefore attempts to assess the influence of the improved oil palm production practices on the livelihoods assets of oil palm farmers in the Kwaebibirem District.

2. Objectives

The specific research objectives were:

i. To examine socio-economic factors relating to the adoption of improved oil palm production practices.
ii. To assess the levels of adoption of oil palm technologies.
iii. To determine the contributions of adoption of improved oil palm production practices to the livelihood assets of oil palm farmers.

3. Methodology

A survey research design using quantitative measurements for collecting and analyzing data was employed. The Kwaebibirem District was selected for the study due to the fact that it is the major oil palm producing area in the country. Also the Oil Palm Research Institute (OPRI) and the Ghana Oil Palm Development Corporation (GOPDC) as well as the University of Ghana's Forest and Horticultural Crops Research Centre (FOHCREC) are all located in the district.

The target farmers were individual farmers who established oil palm farms earlier than the year 2000. The reason for choosing farmers in this category was that the oil palm takes about four years for harvesting to commence and for any influence to be observed in farmers' livelihood outcomes, the farmers should have harvested their crops for at least five years.

The District has been grouped into eight Agricultural Communities with eight Agricultural Extension Agents (AEAs) manning each. Since the whole district could not be covered due to financial and time constraints, four of the communities were selected, using simple random sampling techniques. The communities were Akim-Wenchi, Damang, Abaam and Pramkese. A sample size of thirty farmers was selected from each of the four communities giving a total sample size of one hundred and twenty (120). Data was then collected using structured questionnaire. The data was analysed using the Statistical Package for the Social Sciences (SPSS).

The improved oil palm production practices considered in this study are; the use of certified oil palm planting materials, lining and pegging, cover cropping, rodent control measures, weed management strategies, fertilizer application, pruning and harvesting techniques. The respondents were put into three adopter categories as full, partial and non adopters based on the number of practices they adopted. The classifications were as follows:

Non-adopters	0-3 of the recommended practices
Partial adopters	4-5 of the recommended practices
Full adopters	6-8 of the recommended practices

4. Results and discussions

4.1 Sex and level of adoption of improved oil palm production practices

Table 1 revealed that men were not significantly different from women with regard to adoption of improved oil palm production practices ($p>0.05$). This occurrence contradicts other findings. For example Oduruke (2003) observed that females recorded higher adoption of cassava production technologies while Ragasa, Berhan, Tadese & Taffasse (2012) indicated that females are less likely to adopt improved technologies. However, Kassie, Zikhali, Manjur & Edwards (2009) posited that impact of gender on technology adoption is technology-specific. The implication of this is that extension agents should focus on both men and women when promoting the adoption of improved production practices.

Table 1: Sex and level of adoption of improved oil palm production practices

Level of Adoption of improved oil palm production practices	Sex of respondents		Total	Fisher's Exact Value (2-tailed)
	Male	Female		
	n %	n %	n %	
Fully Adopted	49 (48.5)	10 (9.6)	59 (49.2)	P=0.9366
Partially Adopted	41(40.6)	7 (36.8)	4 (40.0)	NS
Not Adopted	11 (10.9)	2 (10.5)	13 (10.8)	
Total	101 (100.0)	19 (100.0)	120 (100.0)	

Source: Field Survey, 2009

4.2 Age and level of adoption of improved oil palm production practices

It has been observed that there is no significant difference ($p>0.05$) between the age of the respondents and the level of adoption of improved oil palm production practices (Table 2). This means that age as a personal characteristic of oil palm farmers does not influence the rejection or adoption of improved oil palm production practices. It is likely that both the young and old farmers might have been exposed to the same information on oil palm production. Thus, young farmers as well as old farmers are equally likely to adopt fully, partially or not adopt the improved oil palm technology. This finding is in line with that of Million & Belay (2004) that age had a weak and negative association with adoption. On the contrary, Diederen, Meijl, Wolters and Bijak (2003) observed that younger farmers are more likely to adopt innovations than older farmers. The implication of this finding is that when change agents are organizing training programs to promote the adoption of improved production practices, they should not use age as the criterion for selection of farmers.

Table 2: Age and level of adoption of improved oil palm production practices

Level of Adoption	Age of respondents		Total	Fisher's Exact Value (2-tailed)
	18-49 years	50-70		
	n %	n %	n %	
Fully Adopted	29 (50.9)	30 (47.6)	59 (49.2)	P= 0.4567
Partially Adopted	24 (42.1)	24 (18.1)	48 (40.0)	NS
Not Adopted	4 (7.0)	9 (14.3)	13 (10.8)	
Total	57 (100.0)	63 (100.0)	120 (100.0)	

Source: Field Survey, 2009

4.3 Level of education and level of adoption of improved oil palm production practices

The educational level of farmers was found to have significant influence on the level of adoption of improved oil palm production practices ($p<.05$) (Table 3). This implies that farmers with higher level of education are likely to fully adopt the oil palm improved technology than those with low educational status. Even though Llewelyn and Williams (1996) did not find any significant impact of farmers' education on farming efficiency in Indonesia, Mahmudul, Tanigichi & Ishida (2004) demonstrated the significant role of farmers' education in raising farming efficiency in Ethiopia and Bangladesh. However, there is some agreement in literature that education significantly influences adoption of technological innovations in agriculture (Asadullah, 2005; Langyintuo & Mekaria, 2005). Thus level of education is important if farmers are to adopt technologies.

Table 3: Level of education and level of adoption of improved oil palm production practices

Level of Adoption of improved oil palm production practices	Educational Level of Respondents			Total	Fisher's Exact Value (2-tailed)
	No Formal Education	Basic/ Middle	Secondary/ Tertiary		
	n %	n %	n %	n %	
Fully Adopted	7 (31.8)	40 (51.9)	12 (57.7)	59 (49.2)	P= 0.0474 S
Partially Adopted	10 (45.5)	32 (41.6)	6 (28.6)	48 (40.0)	
Not Adopted	5 (22.7)	5 (6.5)	3 (14.3)	13 (10.8)	
Total	22 (100.0)	77 (100.0)	21(100.0)	120 (100.0)	

Source: Field Survey, 2009

4.4 Farming experience and level of adoption of improved oil palm production practices

The Fisher's Exact Test indicates no significant difference ($p>0.05$) between full adopters, partial adopters and non-adopters in terms of the influence of their experience on the adoption of the improved production practices (Table 4). The above implies that farmers with less than 10 years and those with more than 10 years of farming experience are equally likely to fully, partially or not adopt the technology. Similarly, Workneh (2006) observed that farming experience does not significantly influence farmers in the adoption of improved beekeeping practices.

Table 4: Farming experience and level of adoption of improved production practices

Level of Adoption of improved oil palm production practices	Farming Experience of respondents		Total	Fisher's Exact Value (2-tailed)
	<10 yrs n %	> 10 yrs n %	n %	
Fully Adopted	22 (45.8)	37 (51.4)	59 (49.2)	P=0.553 NS
Partially Adopted	19 (39.6)	29 (40.3)	48 (40.0)	
Not Adopted	7 (14.6)	6 (8.3)	13 (10.8)	
Total	48 (100.0)	72 (100.0)	120 (100.0)	

Source: Field survey, 2009

4.5 Relationship between farm size and level of adoption

Respondents who cultivated oil palm between 1 to 10 hectares were classified as small scale farmers and those with a farm size of 11 to 50 hectares as medium scale farmers. Results from Table 5 showed that medium scale farmers were more likely to adopt the improved oil palm production practices than small scale farmers ($p<0.05$) . This means that the larger the farm size of farmers the higher the rate of their adoption of improved production practices. This finding however contradicts the observation of Nzomoi, Byaruhanga, Martim & Omboto, (2007) and Sserunkuma (2005) who indicated that farm size negatively influence technology adoption in the production of horticultural export produce even though Akudugu, Guo and Dadzie (2012) observed significant differences.

Table 5: Relationship between farm size and level of adoption

Level of Adoption	Size of oil palm farm in hectares		Total	Fisher's Exact Value (2-tailed)
	1-10 ha n %	11-50 ha n %	n %	
Fully Adopted	43 (42.2)	16 (88.9)	59 (49.2)	P=0.0006 S
Partially Adopted	47 (46.1)	1 (5.6)	48 (40.0)	
Not Adopted	12 (11.8)	1 (5.6)	13 (10.8)	
Total	102 (100.0)	18 (100.0)	120 (100.0)	

Source: Field Survey, 2009

4.6 Extent of adoption of oil palm production practices on the acquisition of physical assets

Fisher exact test showed that there was no significant differences ($P>0.05$) among the adopter categories with regards to the extent of influence of oil palm production on the acquisition of means of transport and palm oil storage facility (Table 6). This means that oil palm production has not contributed significantly to the acquisition of means of transport and palm oil storage facility to the full adopters than the partial and non adopters. Since most of the farmers sell their fresh fruit bunches to palm oil processers located in the communities, they might not view acquisition of palm oil storage facility as important. However, a significant difference ($p<0.05$) was observed among the adopters in terms of acquisition of a house and household appliances.

Thus, oil palm production highly influenced the acquisition of these physical assets by the full adopters than the other two adopter categories. For instance, about 81.2% of full adopters said oil palm production has highly influenced their ability to acquire household appliances as compared to only 12.5% of partial adopters and 6.2 % of non adopters.

Table 6: Extent of adoption of oil palm production practices on physical assets

Nature of influence on acquisition of physical assets	Level of adoption of improved oil palm production practices			Total	Fisher's Exact Value (2-tailed)
Means of transport	Full Adopter	Partial Adopter	Non Adopter		P=0.385
Somehow influenced	0 (0)	0 (0)	0 (0)	0 (0)	
Moderately Influenced	4 (80)	1 (20)	0 (0)	5 (100)	
Highly influenced	8 (100)	0 (0)	0 (0)	8 (100)	
Total	12 (92.3)	1 (7.0)	0 (0)	13 (100)	
Household appliances					P=0.000
Somehow influenced	2 (8.3)	14 (58.3)	8 (33.3)	24 (100)	
Moderately Influenced	29 (51.8)	26 (46.4)	1 (1.8)	56 (100)	
Highly influenced	26 (78.8)	5 (15.2)	2 (6.1)	33 (100)	
Total	57 (50.4)	45 (39.8)	11 (9.7)	113 (100)	
Palm oil storage facility					P=0.351
Somehow influenced	0 (0)	0 (0)	0 (0)	0 (0)	
Moderately Influenced	10 (66.7)	5 (33.33)	0 (0)	15 (100)	
Highly influenced	8 (88.9)	1 (11.1)	0 (0)	9 (100)	
Total	18 (75)	6 (25)	0 (0)	24 (100)	
Building a house					P=0.000
Somehow influenced	0 (0)	3 (75)	1 (25)	4 (100)	
Moderately Influenced	17 (51.5)	16 (48.5)	0 (0)	33 (100)	
Highly influenced	29 (87.9)	3 (9.1)	1 (3)	33 (100)	
Total	46 (65.7)	22 (31.4)	2 (2.9)	70 (100)	

Source: Field Survey, 2009

4.7 Extent of adoption of improved oil palm production practices on acquisition of financial assets

On the extent of influence of oil palm production on the acquisition of financial assets, the Fisher exact test revealed a significant difference ($p<0.05$) between the full adopters, partial adopters and non adopters with regards to household income, savings and access to credits (Table 7). Thus full adopters obtained more income, saved more and had more access to credit as a result of oil palm production than the partial and non adopters. Similarly, Akudugu et al. (2012) observed increased incomes as a result of adoption of modern agricultural production technologies by farm households in Ghana. The implication is that oil palm production can improve considerably the financial asset base of farmers if they apply the best production practices. There is the need therefore to develop appropriate techniques to enhance adoption by farmers.

Table 7: Extent of influence of adoption of improved oil palm production practices on acquisition of financial assets

Nature of influence on acquisition of Financial assets	Level of adoption of improved oil palm production practices			Total	Fisher's Exact Value (2-tailed)
Household Income	Full Adopter	Partial Adopter	Non Adopter		p=0.000
Somehow influenced	2 (10.5)	12 (63.2)	5 (26.3)	19 (100)	
Moderately Influenced	22 (43.1)	24 (47.1)	5 (9.8)	51 (100)	
Highly influenced	35 (79.5)	8 (18.2)	1 (2.3)	44 (100)	
Total	59 (51.8)	44 (38.6)	11 (9.6)	114 (100)	
Household Savings					p=0.000
Somehow influenced	2 (15.4)	6 (46.2)	5 (38.5)	13 (100)	
Moderately Influenced	24 (53.3)	21 (46.7)	0 (0)	45 (100)	
Highly influenced	24 (77.4)	6 (19.4)	1 (3.2)	31 (100)	
Total	50 (56.2)	33 (37.1)	6 (6.7)	89 (100)	
Access to credit					p=0.003
Somehow influenced	2 (25)	4 (50)	2 (25)	8 (100)	
Moderately Influenced	25 (64.1)	14 (35.9)	0 (0)	39 (100)	
Highly influenced	23 (82.1)	4 (14.3)	1 (3.6)	28 (100)	
Total	50 (66.7)	22 (29.3)	3 (40)	75 (100)	

Source: Field Survey, 2009

4.8 Extent of influence of adoption of oil palm production practices on social capital

There was a significant difference ($p<0.05$) among the adopter categories in terms of extent of influence of oil palm production on group activities (Table 8). Thus oil palm production has contributed significantly to participation in group activities such as group meetings and other social activities organized by the farmers groups. As long as farmers are willing to work together in groups, they may be able to overcome problems of institutional access to information, inputs and credit (Liverpool-Tasie, 2012) and may have a lot of influence on marketing and technological change in agriculture (Shiferaw, Obare & Muricho, 2008).

Table 8: Extent of influence of adoption of oil palm production practices on social capital

	Level of adoption of improved oil palm production practices			**Total**	**Fisher's Exact Value**
Participation in group activities	Full Adopter Freq %	Partial Adopter Freq %	Non Adopter Freq %	Freq %	
Somehow influenced	3 (15.8)	10 (52.6)	6 (31.6)	19 (100)	p=0.0001
Moderately Influenced	29 (10.9)	26 (45.6)	2 (3.5)	57 (100)	
Highly influenced	27 (71.1)	10 (26.3)	1 (2.6)	38 (100)	
Total	59 (51.8)	46 (40.4)	9 (7.9)	114 (100)	

Source: Field Survey, 2009

4.9 Extent of adoption of oil palm production practices on acquisition of human capital

The main aspect of human capital studied was ability to pay for children's education. It was observed that there was a significant difference between ability to pay for children's education ($p<0.05$) (Table 9). That means the ability to pay for children's education is influenced by the level of adoption of farm production practices. Education provides knowledge and skills and changes attitudes which help to improve the quality of life at all levels. Ntsiful (2010) made similar observations on expenditure on children's education as a result of adoption of oil palm technologies while studying oil palm plantations in Ghana.

Table 9: The extent of adoption of oil palm production practices on human capital

Influence on human capital	**Level of adoption**			**Total**	**Fisher's Exact Value**
Ability to pay school fees	Full Adopter Freq %	Partial Adopter Freq %	Non Adopter Freq %	Freq %	
Somehow influenced	3 (27.3)	4 (36.1)	4 (36.4)	11 (100)	P = 0.0048
Moderately Influenced	23 (53.5)	19 (44.2)	1 (23.3)	43 (100)	
Highly influenced	24 (68.6)	10 (28.6)	1 (2.8)	35 (100)	
Total	50 (56.2)	33 (37.1)	6 (6.74)	89 (100)	

Source: Field Survey, 2009

5. Conclusions

It was observed that among the farmers characteristics studied, level of education and farm size have significant influence on adoption of improved farming practices, unlike the other farmer characteristics. It was also observed that adoption of improved farm practices had influenced access to physical assets in the form of houses and household appliances; financial assets such as access to credit, increased income and savings; and social assets such as effective participation in group activities. Finally, adoption influenced human capital in the form of ability to pay for children's education. This implies that adopting improved oil palm production practices can improve the livelihood asset base of farmers. Thus, the well-resourced farmers can diversify into other livelihood activities and adopt other innovations to enable them acquire more livelihood assets.

6. Recommendation

It is recommended that more efforts be made to improve extension services so that more farmers who will have access to extension can also be encouraged to adopt improved farming practices and thereby improve on their livelihood assets.

References

Akudugu, M. A., Guo, E. & Dadzie, K. (2012). Adoption of modern agricultural production technologies by farm households in Ghana: What factors influence their decisions? *Journal of Biology, Agriculture and Healthcare.* Vol. 2 (3).

Asadullah, M. N. (2005). *Farm productivity and efficiency in rural Bangladesh: The role of education revisited.*

CSAE WPS/2005-10.
Asuming-Brempong, S., Sarpong, D. B. & Asante, F. (2005). *Institutional Bottlenecks of Agricultural Sector Development: The Case of Research and Extension Provision in Ghana*. Final Report. OECD.
Diederen, P., Meijl, H. V., Wolters, A. & Bijak, K. (2003). Innovation adoption in agriculture: Innovators, early adopters and laggards. *Cahiers d'economie et Sociologie,* No. 67.
FAOSTAT (2011). Food and Agriculture Production. http://www.faostat.fao.org
Accessed on 12th August 2013.
Ghana Statistical Service (2008). *Ghana Living Standards Survey*, Report of the Fifth Round (GLSS 5).
IFPRI (2002). Green Revolution: Curse or Blessing? *Policy Brief.*
Kassie, M., Zikhali, P., Manjur, K. & Edwards, S. (2009). Adoption of Organic farming Techniques: Evidence from s Semi-Arid Region of Ethiopia. *Environment of Development.* Discussion Paper Series.
Langyintuo, A. S. & Mekuria, M., (2005). "*Modelling agricultural technology adoption using the software STATA",* Presented at a Training Course, Econometric Application to Modelling the Adoption of Agricultural Technologies, 21-25, Harare, International Maize and Wheat Improvement Centre (CYMMT), Harare, Zimbabwe.
Liverpool-Tasie, L. S. (2012). *Farmer groups, input access and intragroup dynamics: A case study of targeted subsidies in Nigeria*. IFPRI Discussion Paper 01197.
Llewelyn, R. & Williams, J. R. (1996). Nonparametric analysis of technical, pure technical, and scale efficiencies for food crop production in East Java, Indonesia. *Agricultural Economics.*15: 113-126.
Mahmudul, H. A. Z., Tanigichi, K. & Ishida, A. (2004).The impact of farmers' education on income in Bangladesh. *Journal of Japanese Society of Agricultural Technology Management 11*(1): 13-21.
Million, T. and Belay, K. (2004). Factors influencing adoption of soil conservation measures in south Ethiopia: The case of Gununo area. *J. Agric. and Rur. Development in the Tropics and Sub tropics. 105(1):49-62.*
MOFA (2011). *Agriculture in Ghana: facts and figures*, SRID. MoFA, Accra.
Ntsiful, K. A. (2010). *Outgrower oil palm plantations scheme by private companies and poverty reduction in Ghana.* Unpublished PhD Thesis. St. Clements University in Turks and Caicos Islands.
Nzomoi, J. N., Byaruhanga, J.K., Maritim, H. K. & Omboto, P. I. (2007). Determinants of technology adoption in the production of horticultural export produce in Kenya. *African Journal of Business Management. Vol. (5):129-135.*
Oduruke, S. N. (2003). Gender differences in adoption of recommended improved cassava production technologies in Imo State, Nigeria. *Journal of Agriculture and Social Research.* 3(2): 126-134.
Ragasa, C., Berhane, G., Tadasse, F. & Taffesse, A. S. (2012). *Gender differences in access to extension services and agricultural productivity.* Ethiopia Strategy Support Program II. ESSP Working Paper 49.
Rahman, S. (2002). Technological change and food production sustainability in Bangladesh agriculture: farmers' perceptions and empirical evidence, *Outlook on Agriculture* 28, 233-238
Shiferaw, B., Obare, G. & Muricho, G. (2008). Rural market imperfections and the role of institutions for collective action to improve markets for the poor. *Natural Resources Forum:* 32: 25-38.
Sserunkuma, D. (2005). The adoption and impact of improved maize and land management technologies in Uganda. *Journal of Agricultural and Development Economics, Vol. 2, No. 1, 2005, pp. 67-84.*
Workneh, A, (2006). *Identification and documentation of indigenous knowledge of beekeeping practice.* Proceedings of the 14th Ethiopian Society of Animal Production, ESAP. Addis Ababa.