Cocoa agroforestry a bridge for sustainable organic cocoa Production

ISAAC NUNOO[1], VICTOR OWUSU[1] AND BEATRICE OBIRI DARKO[2]

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Abstract

Cocoa agroforestry system holds the key to sustainable future for organic cocoa production. But an important question being asked is how much of shade tree on cocoa farms can be altered in attempts to improve yields and still maintain the environmental benefits? Results showing different levels of cocoa agroforestry indicated that medium shade level uses less agrochemicals, supports biodiversity and has sustainable yield of about 500kg/Ha for over 70 years as compared to the full sun, low shade and heavy shade levels. Outreach focusing on medium shade may be the most effective way of optimizing ecological, economic, and social outcomes to build organic bridges in cocoa production.

Introduction

Cocoa naturally requires shade trees but full sun cocoa is replacing shade production in cocoa growing regions of Ghana. The full sun contribute to high rate of deforestation, unsupportive to biodiversity, high input demand, short productive life and low yield over time. Cocoa agroforestry holds the key to sustainable future outputs in organic cocoa production. The study evaluated the impact shade levels have on the yield of cocoa under the different cocoa agroforestry systems (full sun, low shade, medium shade and heavy shade) that exist in Ghana (UNDP, 2011).

Material and methods

Data were collected from 200 cocoa farmers in the Sefwi Wiawso district, Ghana, by means of multistage sampling technique through household structured interviews and focus group discussions. Respondents were stratified into the four cocoa agroforestry systems as found in Ghana. The stratification was based on the number of shade trees per hectare and the degree of canopy cover.

Table 1 Characteristics of cocoa agroforestry systems

Characteristics	Full sun	Low shade	Medium shade	Heavy shade
Number of shade trees/Ha	0	1-9	10-15	> 15
Canopy cover (%)	< 36	36-65	66-85	> 85

Data obtained from the respondents were analysed using the descriptive statistics and inferential analysis. The yield curve model (Ryan et al., 2007) was also adopted to determine the impact shade levels have on yield under the various cocoa agroforestry systems.

Results

Results showed that 85 % of the respondents are males with the remaining 15 % being females. This indicates that cocoa production is a male dominated occupation. The results from the data also shows most of the cocoa famers in the study area are small scale farm holders with an average farm size of 2 hectares. This confirms a study by Obiri et al., (2007) which states that cocoa farming is mostly practice by small holder farmer with farm size ranging from 1-4 hectares.
Respondent indicated that although agricultural activities diminishes biodiversity by displacing or replacing natural environments cocoa agroforestry systems can harbor high levels of biodiversity often comparable to native forest. Shade management on cocoa farm is strongly related to the degree of agrochemical usage.

[1] Kwame Nkrumah University of Science and Technology, Ghana; Nunooisaac85@yahoo.com
[2] Forestry Research Institute of Ghana

Table 2: Levels of Agrochemical usage

Agrochemicals/Ha	Full sun	Low shade	Medium shade	Heavy shade
Weedicide (Litres)	2.28	1.95	1.95	0.72
Fertilizer (Kg)	215.25	160	144	126.5
Fungicide (G)	213	176.75	171.75	90.75
Insectice (Litres)	2.35	2.36	2.22	2.10

Source: Field Survey, 2012

The results from table 2 shows that, quantity of agrochemical use decreases with increasing number of shade trees on the cocoa farm. This indicates that full sun cocoa system requires more agrochemical as compared to the low, medium and heavy shade shade systems. Similar studies by Schroth et al., (2000) indicated that in the case of cocoa agroforestry systems pests and disease incidence could be modified compared with full sun specific plantations. This gradual shift of reducing shade levels and approaching the full sun cocoa farming is becoming very expensive to practice and putting the livelihood of many cocoa depending households in danger since they can't afford the needed agrochemicals to maintain sustainable yield. A study by Leiter and Harding (2004) showed that cocoa grown under agroforestry system uses little to no chemical inputs, while those under full sun requires these inputs but farmers are not always able to afford them. Farmers indicated that competitive weeds have been found to be on the increase in cocoa farms under full sun system with this weeds serving as pool for pests and diseases.
Out of the sample 87.5 % grows the hybrid varieties whiles the reaming 12.5% grows the local varieties. Further results from respondents on shade levels on cocoa farms indicated that 25 % practice full sun, 37.5 % low shade, 22.5 % medium shade and 15 % heavy shade. Respondents acknowledged that shade trees on cocoa farms maintains soil moisture, improving soil fertility, suppresses weed growth and improves biodiversity. It is therefore recommended that 10 to15 trees per hectare be maintained within the cocoa plantation to avoid some of the danger of disease and pest incidence associated with heavy shade system (Padi and Owusu 2003).

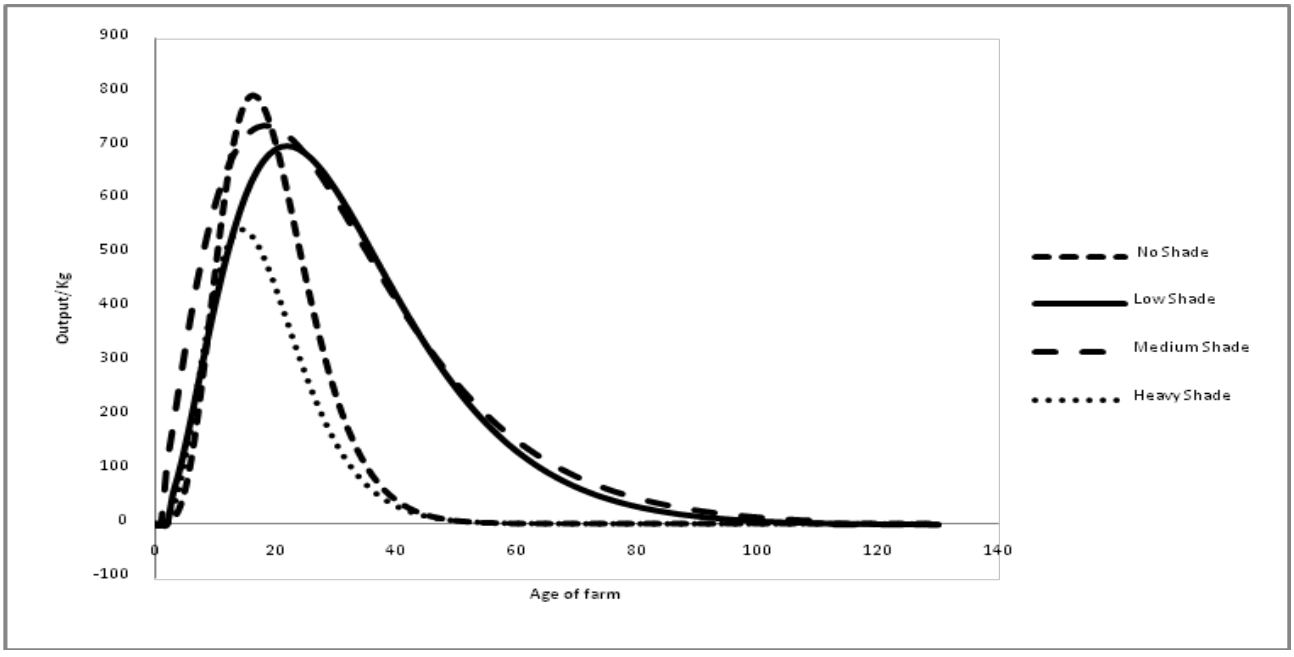

Figure 1: Cocoa yield under different cocoa agroforestry systems

The average yield per hectare of the full sun, low shade, medium shade and heavy shade were 794kg/Ha, 696kg/Ha, 735kg/Ha and 546kg/Ha respectively. The yield curve under the full sun system shows a sharp rise in the yield and followed by a very sharp fall in the yield after age 16. The medium shade has a gradual

yield till it peaks at age 19 followed by a gradual fall in yield till age 80. The results confirms a study by Ruf and Zadi (1998) who noted that cocoa with less than optimum shade has a shorter life cycle. It may last for only 20 years without shade whiles shaded cocoa may yield for 60-100 years. Shade cocoa may provide fewer economic benefits in the short term but it will continue producing into the future without the need for chemical inputs. Medium shade cocoa agroforestry system maintains an average number of shade trees (10-15trees/Ha) which ensures biodiversity coupled with low agrochemical input demands making it organically and environmentally friendly and sustainable.

Discussion

Despite their higher yield potential in early years, full sun cocoa grown without fertilizer and more agrochemical application experiences rapid yield declines with time. Cocoa agroforestry system provides cool and thriving environment for biodiversity and less agrochemical use making the system supportive in organic cocoa production. Fair-trade practices, access to pre-harvest credit, carbon sequestration credits, avitourism, and environmental funds based on taxing agrochemical inputs are some incentive to promote organic cocoa production. More so outreach focusing on medium shade cocoa agroforestry system may be the most effective way of optimizing ecological, economic, and social outcomes to build organic bridges in cocoa production.

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