

# **(Semi)Subsistence Agricultural Systems in Sierra Leone: Present and Future Challenges**

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*The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission*

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## **Abstract:**

*The Government of Sierra Leone has recently published its National Sustainable Agriculture Development Plan (NSADP) 2010-2030 which contemplates the gradual eradication of shifting cultivation practices and the active promotion of vertically integrated processing and commercialisation chains for selected staple (rice and cassava) and export crops (cocoa and coffee). The aim of this article is to examine the implications of the changing agricultural policy for (semi)subsistence farmers who represent about two-thirds of the Sierra Leonean population. For this purpose farm typologies are introduced according to the diversity of cultivated crops. The analysis focuses on smallholders' food security, employment opportunities and access to inputs and natural resource. For this purpose, socio-economic data from a 2009 survey to 600 farm-households under the two main production systems of Sierra Leone are used. Results illustrate the potential impact on rural livelihoods during the implementation of the NSADP (including land leasing processes) and the challenges related to the transition period required to effectively replace shifting cultivation with permanent agricultural systems.*

## **Introduction**

Agriculture is essential to Sierra Leone's economic and social development. While the agricultural population (circa 5 million) represents roughly two thirds of total population, the agricultural sector in Sierra Leone in recent years has contributed less than 50% of GDP. Several factors hinder agricultural performance. On one hand the farming systems are characterized by highly inefficient input/output mixes which favor risk minimization over cash-income generation strategies (particularly in the production of staple crops under shifting cultivation). Pre and post harvest losses are also substantial, reaching up to 30% of total output in many rural areas. Simultaneously, the country has recently become subject to substantial foreign investment on arable land which poses threats to the communal property right system in place. In the present article, we review in detail not only the agricultural situation in Sierra Leone from the point of view of smallholders who are the majority in the agricultural sector, but also assess the potential impact on rural livelihoods of the implementation of the National Sustainable Agriculture Development Plan (NSADP) 2010-2030. For this purpose, a survey of 600 farmers containing detailed information on production practices is used. The paper is structured as follows: First, we introduce the dominant agricultural production systems in Sierra Leone and using survey data we present a typology of farms based on agro-ecological setting, crop diversification and market integration. Second, we highlight the main components of NSADP strategies which promote the commercial agriculture of specific crops under permanent cultivation. The latter is followed by an

analysis of the practical consequences to (semi)subsistence smallholders and the challenges they are likely face in the changing agricultural policy environment of Sierra Leone today and in the middle and long term.

### **Agriculture in Sierra Leone**

Although permanent (i.e. non shifting) tree cropping under forest (mainly in terms of cash tree crops such as coffee and cocoa) are present in Sierra Leone, the most widespread agrarian system<sup>1</sup> in Sierra Leone is that of *shifting cultivation*. Under this system, also known as the *slash and burn* system, the vegetation is cleared by partial felling of trees, burning, and planting of crops for a specific period of one or two years. The nutrients of the ash provide a rapid, initially lush growth of crop plants. However, much of the ash and the nutrients are lost through runoff or through leaching. After harvesting the planted crops, the land is left uncultivated or *idle* for natural regeneration and quickly forms secondary forest. (Mazoyer and Roudart, 2006) According to Grigg (1974) if regeneration takes place between 20-25 years it is denominated *forest-fallow*, between 6 to 10 years *bush-fallow* and between 1-2 years *short-fallow*. In the case of Sierra Leone the idle intervals have been continuously decreasing since 1960's when a 20 year period was sustained. Nowadays the idle period is closer to the bush-fallow levels between 4 and 7 years (NSADP, 2009). Consequently, the soil fertility is not fully restored, contributing to the decline in yields. Several authors have already pointed out the danger of the expansion of cropping and the reduction in fallowing (idle period) as it raises the risk of environmental degradation (Mazoyer and Roudart, 2006; Sachs and Bloom, 1998). The latter partially explains why agriculture in Sierra Leone despite being the largest single employer, has contributed less than 50% to GDP in 2006 and 2007 (UNDP, 2007). According to the literature review and various data survey, the majority of farm households in Sierra Leone (which amounted to approximately 400.000 farm families) are managing plots which do not exceed 2 cropped hectares (Sesay et al 2004; SLIHS 2007; Jalloh 2006). All the major food crops are cropped by smallholders under the *shifting cultivation* system and up to 15 different crops (sorghum, millet, maize, fundi (*digitaria*), benniseed, groundnuts, cowpeas, root crops and tubers including cassava, sweet potato, and yam together with a host of vegetables) are traditionally grown in mixed stands, with rice being the dominant staple (Jalloh, 2006). The widespread crop diversification strategies appear to follow a food security objective since only a small proportion of output is actually marketed; (in the case of rice, which is the prominent crop in the country, our survey results indicate that less than 20% of produced output is sold). At the same time, smallholders face constraints to invest in agricultural equipment not only due to credit shortage in the sector but also to village-level institutional arrangements which do not support using land as collateral for loans. For instance, the notion that the enlarged farm-household family (including the dead and the unborn) has to agree in land transactions represents a significant bottleneck. Lastly, only the most basic agricultural equipment and tools (i.e. hand-hoe) are available and transport infrastructure is considered largely inadequate.

Local expert knowledge (Dr. Alpha Lakoh from Njala University, Freetown Sierra Leone) indicates that the existence of large farms is indeed very limited. In the case of rice producers about 5 farmers are said to own farms which vary in size between 1000 and 2000 ha; while a few more

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<sup>1</sup> In the Guidelines for Agrarian Systems Diagnosis (FAO 1999) the following definition by Mazoyer is given for an Agrarian system: "a mode of exploiting the environment historically created and sustainable; adapted to the bioclimatic conditions of a given space and responsive to the social conditions and needs of that moment" Several production systems together and the interactions between them make up an agrarian system.

farms are said to have 200-5000 ha on rice production. Only 4 farms above 30000 ha were identified in the production of oil palm and/or sugar cane. Concerning medium size farms ranging between 5 and 20 ha Dr. Lakoh pointed out that their number is also reduced and such farmers frequently engage in permanent cultivation of coffee or cocoa. The qualitative evidence introduced suggests that the farming sector in Sierra Leone is highly dominated by smallholders.

Two major agricultural production systems can be identified in Sierra Leone. These are defined in relation to their agro-ecological setting (humid vs sub-humid tropics) and the different mixes of crop cultivation for which each allows. Humid zones of the tropics are defined by higher annual rainfall than sub-humid areas. Annual rainfall in humid areas is of 1200 mm while in the sub-humid it varies between 600 to 1200 mm. Likewise, the growing season is longer than 270 days in the humid parts and of 120 to 270 days in the sub-humid. Rainforest is the natural vegetation in humid tropical areas while the original vegetation in the sub-humid tropic is woodland with medium to tall grass ground cover. Major crops in the humid tropics are staples (largely maize, rice) and a variety of tree crops. Rice and maize are again the major crops with a widespread presence of tubers (Powell and William, 1993; Sachs and Bloom, 1998). In Sierra Leone, the tree crops which may be grown in the sub-humid parts vary from those in the humid parts. For instance, export tree crops such as coffee and cocoa benefit from the moisture of the rainforest and are mainly planted in the humid tropics. Other tree crops such as oil palm, citrus trees or sugar cane are dominant in the sub-humid areas and are mainly used for self-consumption.

In the present paper two main criteria were used to define (semi)subsistence farm typology in Sierra Leone. The first one refers to the agro-ecological conditions described above, i.e. whether farms are mainly located under a humid or sub-humid tropical ecology. The second criterion addresses the degree of crop mix and crop specialization/diversification present within the farm and their involvement in market exchange. The Sierra Leone survey at hand is a useful source of information in order to further specify a complete farm typology for Sierra Leonean smallholders. Although originally aimed at capturing the effect of STABEX-funded<sup>2</sup> aid programs on smallholders in the main agricultural areas of Sierra Leone, the survey provides accurate information on agricultural activity, output and performance of 600 (semi)subsistence farmers. Surveyed farms were classified into 7 different farm types according to crop mix intensities (Table 1). Farm types can be further divided into sub-categories (See Table A1) which is useful when evaluating the returns on farm activity within the same dominant farm type. For this purpose, Farm Net Income<sup>3</sup> per farm-household unit<sup>4</sup> (FNI/HHunit) and acre per farm-household unit (acre/HHunit) are useful indicators which allow for direct comparisons between different farm types. Figure 1 below portrays these indicators for the 7 farm types identified and their respective sub-categories. It can be observed from Figure 1 that on one hand farmers who are involved in the cultivation of cocoa and coffee (i.e. FT5, FT6 and FT7) achieve substantially higher incomes per farm-household unit than all other farms located in sub-humid zones where these trees cannot be grown (on average 8 to 10 times higher at FNI/HHunit levels). In addition, the close up on the segment of farm types achieving lower income levels illustrates that crop diversification is

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<sup>2</sup> The government of Sierra Leone requested in 2005 the use of European Union STABEX (Stabilization of Export Earnings) funds for the enhancement of national rice production and the rehabilitation of cocoa and coffee plantations. Technical assistance initiatives were aimed at improving smallholder agricultural productivity, farm income and more generally supporting poverty alleviation in vulnerable rural areas. The survey was carried out in 2009 as the cooperation projects were coming to an end. (National Authorising Office, 2007)

<sup>3</sup>  $FNI = GO - (VC + FC)$  where GO: Gross Output = Farm Production \* Market price; VC: Variable Costs = cost of labor and other inputs; FC: Fixed Costs = Cost of tools and land rent payments (Adapted from Segre et al, 1999 and FAO 1999)

an important livelihood strategy. Farms mainly devoted to rice (FT1) report the lowest income levels. While, farmers who are cultivating a wider variety of crops (FT2, FT3 and FT4) are able to secure relatively higher farm net income levels with equivalent land endowment per farm household unit.

**Table 1:** Farm Typology in Sierra Leone (Based on Survey Findings)

<b>Farm Type (FT):</b> Avg FNI/HHunit in Leones – Acre/HHunit	<b>Acronym*</b>	<b>Description</b>	<b>Number (%) of Farms per FT</b>	<b>Total Area per FT</b>
<b>Sub-Humid Areas:</b>				
FT 1: 14700 – 0.44	R	Rice only or rice as the dominant crop (90% of cultivated area)	64 (11%)	2%
FT 2: 66409 – 0.74	R + S	Rice and other staple crops	64 (11%)	4%
FT 3: 71664 – 1.50	R + T - cc	Rice and tree crops (oil palm, and/or citrus trees or other trees)	99 (16%)	9%
FT 4: 83584 – 0.86	R + S + T - cc	Rice, other staple crops and tree crops (oil palm and/or citrus)	165 (27%)	23%
<b>Humid Areas:</b>				
FT 5: 930912 – 1.72	R + cc	Rice and cocoa & coffee trees	36 (6%)	9%
FT 6: 862644 – 2.11	R + S + T + cc	Rice, other staple & tree crops and cocoa & coffee trees	73 (12%)	20%
FT 7: 696674 – 1.40	cc + T <sub>oil palm</sub>	Cocoa & coffee trees and oil palm	94 (16%)	33%

\*Acronym: R: rice; S: other staple crops including different combinations of: *cassava, sweet potato, pepper, beans, other vegetables and tubers*; T: tree crops mainly grown by smallholders in sub-humid areas: oil palm and citrus trees; T<sub>oil palm</sub>: oil palm; cc: cocoa and coffee (only cultivated in the humid agro-ecology of Sierra Leone).

<sup>4</sup> hhunit: farm household unit =  $\sum$  (adult equivalent household members The adult equivalent transformation is based on the following standards: adult male = 1; adult female = 0.75; child 7- 10 years old = 0.69; child 4 – 6 years old = 0.62; child 0 – 3 years old = 0.45 (Fagernäs and Wallace, 2007)

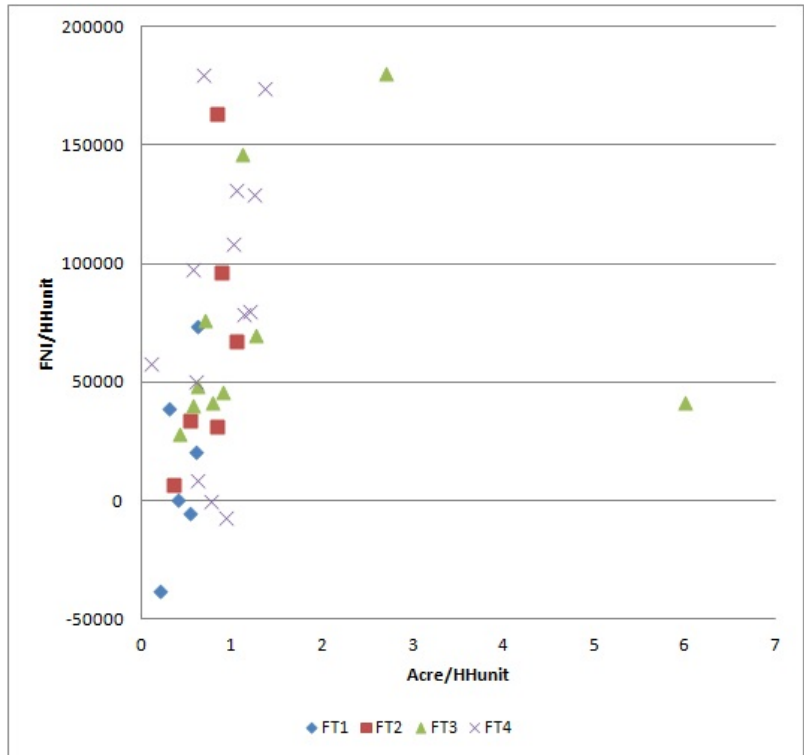
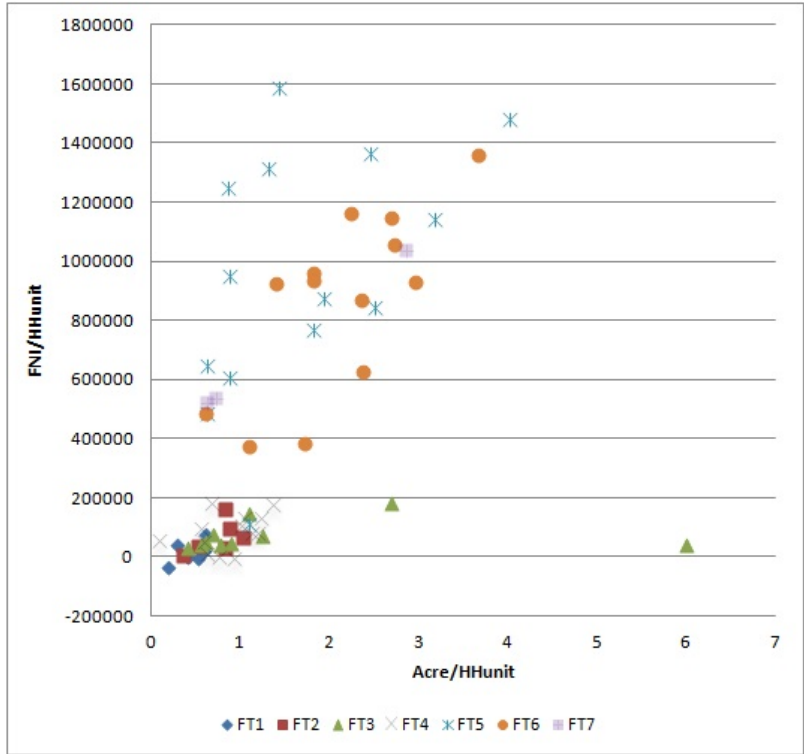


Figure 1: FNI/HHunit (in Leones) & Acre/HHunit by Farm Type (Overall and Close up)

## Main Components of NSADP and Analysis of Potential Effects on Smallholders

In this section, we discuss the objectives and strategies of the NSADP and evaluate the potential policy impact and challenges for the livelihood of identified farm types. The cornerstone of the government plan involves a replacement of the shifting cultivation system which implies a change in smallholders' crop diversification strategies. The NSADP (2009) focuses on a move towards permanent cultivation of food crops (mainly rice and cassava), promotion of export tree crops (i.e. cocoa and coffee), introduction of inorganic fertilization and land leasing to secure economies of scales in the production of exportable mono-crops for bio-fuels (such as sugar cane and oil palm). The government pursues this 20 year objective through the improvement of rural infrastructure, agricultural extension services, farmer capacity building and support to productivity enhancing activities (i.e. mechanization, credit access, etc.) (NSADP, 2009). There are therefore four main aspects to analyze: 1) Practical aspects around the replacement of shifting cultivation and the introduction of permanent agriculture (consequences in terms of input access, market integration and dependence and biodiversity conservation) 2) Socio-economic implications of said change in agrarian systems or the move from crop diversification in agricultural smallholdings to rice or cassava mono-cultivation on one side and export tree crops on the other 3) Challenges to set up vertically integrated processing facilities and commercialization chains which are inclusive of small-scale farmers and 4) Analysis of land leasing or acquisition processes; with a particular focus on the recent case of oil palm and sugar cane production for bio-fuels in Sierra Leone.

With increasing population pressure and falling soil fertility, it is clear that the sustainability of the *shifting cultivation* system is compromised. According to the NSADP (2009), the government would like to discourage this system and is in favor of a higher value *permanent cropping system* with more sustainable tree and food cropping. However, the introduction of such system in Sierra Leone is not straightforward. For instance, if permanent cultivation is promoted, not only a timely supply of (mainly imported) inputs (fertilizers, machinery, fuel) must be ensured to a large number of smallholders dispersed in remote areas but also adequate training must be provided. This translates into higher dependence on international markets and agricultural research which is at present not sufficiently focused on the needs of tropical agricultural systems (Pingali, 2007). Regarding the use of chemical fertilizers and improved seeds effective schooling is essential in order to reduce land pollution/degradation in the case of the former and achieve higher yields for the latter. The impact of introducing new equipment or machinery is also not entirely unambiguous as it could either release labor to the off-farm sector or/and increase the rate of deforestation. However, machinery could be a solution to harvest losses due to labor shortages in peak periods. It is essential to review how the labor requirements of a permanent cultivation system will be fulfilled. Currently, it is rather the number of family members that determine the size of the cultivated area in Sierra Leone and not the actual total land area available to the family.

The results of the survey (discussed in the previous section) illustrate that smallholders in Sierra Leone are engaged to a great extent in crop diversification strategies in order to secure a minimum consumption level and minimize external risk related to accessing markets; particularly in the sub-humid agro-ecologies. Consequently, the government objective to increase mono-cultivation and vertically integrated production chains in these areas must be based on a well-specified transition program which allows smallholders to fulfill basic food security levels as they find new market and/or job opportunities in mono-cultivation and commercialization programs. If not, the partial food security currently achieved through crop diversification and off-farm labor engagement will be left uncovered and smallholder vulnerability may be expected to sharply increase. Similarly, in the humid parts where the cultivation of export tree crops is already

widespread, the focus should be placed in the improvement of output quality and if possible in designing and promoting a Sierra Leone agro-export brand. Lastly, given the importance of off-farm activities to complement farm-household incomes, the government should accompany NSADP with an overall strategy to activate the rural economy. Not only regarding other agro-sectors such as fishery or forestry (included in NSADP) but inter-related sectors such as trading, manufacturing, construction which provide further opportunities in non-agricultural contexts. Another component of the NSADP is related to land leasing/acquisition. Early in 2011, close to 500 000 ha of farmland (10% of arable land in the country) had been leased or were under negotiation for lease in Sierra Leone (Oakland Institute, 2011)<sup>5</sup>. Land regulation in Sierra Leone contemplates that any payment for land leasing are shared between various national, regional, district and local authorities (German et al, 2010). These land leases (mostly fallow lands) are usually tied to compensation in terms of fixed rent, and employment in the newly formed large farms. A review of the literature on land acquisition processes in Sierra Leone reveals three main issues: 1) compensatory agreements may not be high enough to compensate the change in rural livelihoods main issues. According to Andrew and Van Vlaenderen (2011) in the land leasing agreement of Addax Bioenergy in Sierra Leone (currently leasing 10500ha destined to sugar cane plantations for ethanol production for export to Europe) the rental payment is very low – "less than half the estimated average annual incomes derived from rice and vegetable crops in the wet lowlands and similar to the estimated annual value of crops produced on dry rain fed lands cultivated by local households<sup>6</sup>". 2) Individuals not belonging to landowning families who rent land on annual basis will be left out from any land leasing/acquisition compensation or payment. This particular segment of the rural population is therefore subject to a higher degree of vulnerability. Salazar (2004) indicates that these non-clan members constitute 20 to 40 percent of chiefdom populations. Although some companies appear to be aware of the situation (such as Addax Bioenergy that has proposed to lease an extra 1947 ha to produce food as part of its Social and Environmental Management Program), compensatory actions for landless farmers are not explicitly contemplated in official land regulations. 3) Not enough transparency in land negotiation and agreements. According to the Oakland Institute (2011), the regulatory framework for the negotiation of land investments is extremely weak and the impact assessments developed by the Sierra Leone Environmental Protection Agency (SLEPA) are non-binding and investors have not been held accountable to them. One extreme situation takes place in the Malem Chiefdom where landowning families protest since 2011 against SocFin (leasing 6,475 ha for oil palm and rubber). Locals claim not to have been informed nor participated in any of the negotiations for the 50 year lease which has been agreed.

### **Concluding Remarks**

The NSADP illustrates that the Government of Sierra Leone aims at increasing production and commercialization through intensification of selected food crops (rice and cassava), and traditional tree crops (coffee, cocoa) while simultaneously promoting foreign farmland investment (particularly in sugar cane and oil palm for biofuels). The survey data provides evidence of the importance of crop diversification strategies at smallholder level which allow fulfilling food security goals while also allowing household labor to engage in off-farm part-time activities. In the case of farm-households which due to agro-environmental conditions cannot grow traditional export trees such as cocoa and coffee, the diversification of staple crops is a preferred and widespread

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<sup>5</sup> The Land Portal Website facilitated by the International Land Coalition reports 588 950 ha (consulted on May 15, 2012)

<sup>6</sup> The authors have calculated that average annual income per household is 76.98 GB pounds for rice and 88.25 GB pounds for vegetable.

practice in comparison to mono-cultivation. Therefore, the government will have to create substantial transaction benefits in order to promote commercialization in the rural areas. To summarize, if the government discards improvements of shifting cultivation, the main challenges for the implementation of the NSADP are on one hand the transition period between shifting cultivation and permanent agriculture and on the other the sustainability of the permanent agriculture system. In the first issue short-term food security and employment opportunities must be considered. In the second, market organization is crucial (particularly for the supply of key inputs such as fertilizers or pesticides). Similarly, the two land leasing case studies referred here suggest that national land regulation and impact assessment frameworks require further tuning in order to attend to the most vulnerable of the rural society in Sierra Leone and fully exploit all potential benefits.

**Appendix: Table A1: Farm Typology Sub-Categories,**

Farm Type	Farm Type Sub-category
FT1: Rice	FT1.1 Upland Rice
	FT1.2 Lowland Rice
	FT1.3 Upland & Lowland Rice
FT 2: Rice & Other Staple Crops	FT2.1 Upland Rice & Other Staple Crops
	FT2.2 Lowland Rice & Other Staple Crops
	FT2.3 Upland & Lowland Rice & Other Staple Crops
FT 3: Rice and tree crops (oil palm, and/or citrus trees)	FT3.1 Upland Rice & Oil Palm
	FT3.2 Lowland Rice & Oil Palm
	FT3.3 Upland & Lowland Rice & Oil Palm
	FT3.4 Lowland Rice & Oil Palm & Citrus & Other Tree
	FT3.5 Upland & Lowland Rice & Oil Palm & Other Tree
	FT3.6 Lowland Rice & Citrus & Other trees
	FT3.7 Upland & Lowland Rice & Citrus & Other trees
FT 4: Rice, other staple crops and tree crops (oil palm and/or citrus & other trees)	FT4.1 Upland Rice & Other Staple Crop & Oil Palm
	FT4.2 Lowland Rice & Other Staple Crops & Oil Palm
	FT4.3 Upland & Lowland Rice & Other Staple Crop & Oil Palm
	FT 4.4 Upland Rice & Other Staple Crop & Oil Palm & Other Trees
	FT 4.5 Lowland Rice & Other Staple Crop & Oil Palm & Other Tree
	FT 4.6 Upland & Lowland Rice & Other Staple Crop & Oil Palm & Other Tree
	FT 4.7 Oil Palm
	FT 4.8 Other Staple Crops
	FT 4.9 Other Staple Crops & Oil Palm
FT 5: Rice and cocoa & coffee trees	FT 5.1 Upland Rice & Cocoa
	FT 5.2 Lowland Rice & Cocoa
	FT 5.3 Upland & Lowland Rice & Cocoa
	FT 5.4 Upland Rice & Cocoa & Coffee
	FT 5.5 Upland & Lowland Rice & Cocoa & Coffee
	FT 5.6 Lowland Rice & Cocoa & Coffee
FT 6: Rice, other staple & tree crops and cocoa & coffee trees	FT 6.1 Upland & Lowland Rice & Other Staple Crops & Cocoa
	FT 6.2 Upland Rice & Other Staple Crops & Cocoa & Coffee
	FT 6.3 Lowland Rice & Other Staple Crops & Cocoa & Coffee
	FT 6.4 Upland & Lowland Rice & Other Staple Crops & Cocoa & Coffee
	FT 6.5 Upland & Lowland Rice & Other Staple Crops & Cocoa & Oil Palm
	FT 6.6 Upland Rice & Cocoa & Other Trees
	FT 6.7 Lowland Rice & Cocoa & Oil Palm



	FT 6.8 Upland & Lowland Rice & Cocoa & Oil Palm
	FT 6.9 Upland & Lowland Rice & Cocoa & Other tree
	FT 6.10 Upland Rice & Other Staple Crops & Cocoa
FT 7: Cocoa & coffee & oil palm	FT7.1 Cocoa & Coffee
	FT 7.2 Coffee & Oil Palm
	FT 7.2 Cocoa & Oil Palm

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