Can Côte D'Ivoire Increase Food Security While Addressing Climate Change?

An Evaluation of the World Bank's Cote D'Ivoire Climate-Smart Agriculture Investment Plan
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Introduction

The Côte D'Ivoire Climate-Smart Agriculture Investment Plan (CSAIP), released in January 2019, aims to achieve the CSA three pillars of productivity increases, climate resilience, and mitigation of greenhouse gas emissions through investments in agro-meteorology, financial services access, soil fertility practices, and agricultural extension agencies. The plan was developed collaboratively between the Government of Côte d'Ivoire and the World Bank (WB), with support of the Adaptation of African Agriculture to Climate Change (AAA) Initiative and technical assistance from the Consultative Group for International Agricultural Research (CGIAR) Program on Climate Change Agriculture and Food Security (CCAFS). It is intended to align with Côte d'Ivoire's Nationally Determined Contribution (NDC) submitted to the UNFCCC and National Agricultural Investment Plan II (2017-2025).

BIC is reviewing this CSAIP since the Bank committed in its 2016 Climate Change Action Plan (p. 44) to produce at least 40 plans, and these have potential to significantly impact climate action if followed. As of the end of 2020, the Bank had publicly released eight and reported that five others are in preparation. Côte d'Ivoire's is of particular interest since it is a prominent agricultural exporter of cocoa as well as producer for the domestic market. It is also a participant in other World Bank-led climate initiatives, such as the Forest Investment Program. This CSAIP analysis in Côte d'Ivoire and the other World Bank sponsored CSAIPs base their analysis on national plans and commitments, supplemented by external analysis of climate models, CSA potential, and economic analysis. The preliminary and final investment priorities were developed by Ivorian stakeholders.

The agricultural sector in Côte d'Ivoire is the foundation of much of the country's economy; however, threats of climate change to productivity and increased poverty levels require better interventions. The twelve prioritized World Bank investments to boost crop resilience and improve yields are intended to improve food and financial security for more than 2.2 million smallholders.

The CSAIP identifies Côte d'Ivoire as struggling with ineffective land tenure policy, poor infrastructure development and irrigation systems, low national market accessibility, little to no education on CSA practices, high inequality, and high deforestation. Côte d'Ivoire has worked to address these issues in recent years via numerous new agencies and policies with success in the

transportation and financial assistance sectors. The CSAIP recommendations were developed based on review of many national goals and providing a monitoring and evaluation system to reach them. The M&E indicators include organizational structure of implemented projects, level of human and technical capacity, and the rate of budget execution for all outlined investments. The CSAIP concludes more time is needed to detail the specific M&E approaches with which, how, and when investments are progressing in regard to national plans and CSAIP goals.

CSA Goals: Productivity, Resilience, and Mitigation

Agriculture is the largest economic sector in Côte d'Ivoire and employs over half of the working population; therefore, adapting farming practices to the threat of climate change is key to ensuring economic progress.

Productivity

As stated in the CSAIP (p. 16), agriculture as a share of GDP has declined from 45% in 1960 to 20% today, reflecting declining productivity relative to other sectors. This decline is in part due to climate change, increased conflict, and poverty, which all contribute to rising food insecurity. Without widespread access to fertilizers and banking systems, smallholder producers are limited in knowledge, technology, and services. The CSAIP emphasizes the key actors for each project goal with reasonable timelines and systems of progress monitoring. The CSAIP proposes monitoring productivity by the percentage increase in incomes for producers, a reasonable proxy if adjusted for crop price fluctuations. Climate change has already impacted rice yields with a 27% drop in yield in 2016. Temperature increases and low precipitation place the highest pressure on the southern sector to adapt. Cocoa, one of Côte d'Ivoire's most valuable international exports, is not suited to many of the impacts of climate change. Increasing productivity can have effects well beyond smallholders. Distributors and processors can benefit from increased income with more productive producers.

Resilience

The CSAIP identifies several risks to projects such as political instability, community conflict, and climate change effects such as severe weather and disease. Certain crops, such as cassava, are less productive with increased climate uncertainty; therefore, resilience-building is especially important for crop producers. Low adoption rates of climate-smart practices pose another barrier for the Ivorian government and its supporters to overcome through specific project investments. As shown in the CSAIP, climate adaptation can increase yields for various staple crops and livestock by 2050 with potential for increased exports. Increasing rates of cash crop farming may discourage certain imports and improve the domestic markets and economy. The ability to predict extreme weather events allows for preparation and improved resilience for farmers. The CSAIP suggested the reduction of vulnerability to hazards through financial service assistance such as insurance can improve long term viability of smallholder operations. It also addresses the

increased vulnerability of major crops, including mango, cocoa, and yam, and the need to increase crop resilience to climate change.

Mitigation

Côte d'Ivoire has relatively low greenhouse gas (GHG) emissions, with the majority related to deforestation and forest degradation, of which agriculture is responsible for two-thirds[1]. The country has committed to a 28% reduction in emissions by 2030 to achieve via improved carbon sequestration practices. The NDC commits to mitigate through better water management, improved agricultural production, and reduced deforestation. The CSAIP finds that at US$40/ton (8 times the current market price, but a fair estimate of the social cost), the value of mitigation from CSA ranged from 7%–13% of total CSA value, thus providing measurable co-benefits.[1]

CSAIP Process and Proposed Interventions (CSAIP Annex F)

The World Bank has committed to providing countries with the technical and financial support to develop the CSAIP plans. This process is intended to be a country-led process, with local experts and Ivoirian stakeholders prioritizing investments that are found in Ivoirian national documents (e.g. policies, strategies and plans). Stakeholders identified a "long list" of 29 potential investments found in Ivorian documents that supported CSA. Stakeholders analyzed these against a set of criteria to identify a final short list of 12 proposed investments, that were then developed into project concepts. Using scenarios of climate and social risks, the WB calculated NPV and ROI for the twelve priority investments. Data on the number of beneficiaries and estimates of incomes and adoption rates resulted in a potential value gain for the four risk scenarios analyzed. The World Bank estimates the four priority investments will cost between US$ 20-40 million each with sufficient adoption rates and low risk. Below we summarize the investments we assessed as most impactful and relevant for achieving the CSAIP goals.

1. Soil Fertility

Ivorian soil is naturally low in fertility and high in aluminum, making it suitable for only certain crops. Fertilizers are necessary to supplement the soil for diversified crop production. The CSAIP outlines the need for Ivorian specific education by extension agents for best management practices in the difficult soil. To develop a national Soil Information Service (SIS) is best achieved through the collaboration of national and international research institutions. The CSAIP outlines an improved communication system for soil quality institutions, extension agents, and producers to better exchange information. However, lack of infrastructure and the remoteness of many rural farms may hinder the success of a national SIS. Accessibility of information in the

[1] See Climate Investment Funds (CIF), Cote d'Ivoire and FAO, "Green Climate Fund approves new projects," 8/21/20, The CSAIP (p. 12) meanwhile states that 26% of Cote d'Ivoire's emissions are from agriculture and land use change; this appears to understate their full impact, if CIF and FAO are accurate, According to Cote d'Ivoire's NDC (2015), in 2012 agriculture accounted for 6,141 KT CO2e of total emissions of 15,964 KT CO2e, or 38.5%.

most rural parts of the country is required to achieve widespread adoption of the implementation plan. Fortunately, this is largely addressed by components 3-5 of annex F-1, the national soil fertility program, especially producer and extension worker technical assistance and linkages.

2. Financial Services

The net present value (NPV) of CSA financial services is estimated at $800 million, the highest ROI among proposed interventions. Income could increase by 50% for one million beneficiaries. Increased access to financial services to improve smallholder resilience in alignment with the Ivorian Five-Year Financial Inclusion Strategy also addresses the issue of poverty. Most rural citizens practice subsistence agriculture; 57% are poor. Continued monitoring of Ivorian financial services will likely encourage mitigation of risks and issues as they arise. The CSAIP describes current loans for women-owned agribusiness that are expected to encourage growth in productivity and income of often neglected women farmers. However, as identified in the CSAIP, the many women lacking land tenure likely will not benefit from these financial services without specific policy changes and implementation follow-up.

3. Agro-meteorology

Since climate change is such a large threat to long term smallholder success in Côte d'Ivoire, timely and accessible weather knowledge helps to reduce vulnerability and increase yields. Improved communication systems such as radios, newsletters, and mobile services for smallholders will supplement increased infrastructure to produce accurate data on agro-climatic maps, crop production forecasts, and early warning systems for extreme weather. The CSAIP identifies training programs for smallholders to learn and interpret agrometeorological data appear well supported by numerous national and international agencies.

4. Agricultural Extension System

The CSAIP seeks to increase the number of extension agents per smallholder and supply continuing education of updated information and CSA practices for agents to improve. Multi-way communication is key to ensure relevant data and education between research institutions, agents, and smallholders. With increased technical capacity in the form of communication systems, improved continuous education for agents and smallholders, and upgraded equipment and infrastructure, the extension agencies can better support CSA implementation.

5. Cassava production

Cassava is an important food crop for developing countries due to its caloric content and climate resiliency. For Ivorians, it makes up about 35% of daily calorie intake. Cassava is produced by 85% of smallholder farmers, often for household consumption only. Its production has remained largely unchanged throughout Ivorian history as a staple crop for nearly all smallholders, yet yields have been falling, likely due to climate change. Women are the main producers of Ivorian cassava. A recent increase in investments in cassava production by a variety of agencies now

including the WB seeks to implement CSA practices for resiliency, educate on best cassava varieties for production, and continuous research for new and improved varieties. The CSAIP focuses on strengthening the commercial sector for cassava via technical assistance for women provided by private industry partners. The ROI for cassava is only 41% compared to 2,071% for financial services; however, the CSAIP concludes that cassava is a vital product to so many households that it is necessary to invest in building resilience for future expansion of the crop. While tenure assistance for women farmers is needed and welcome, it will be a missed opportunity if it does not incorporate training on benefits of diversifying to other staples that are better for both diets and soil, such as sweet potatoes and millet.[2]

6. Abidjan Market and Livestock sector

Abidjan is the fourth largest city in Africa, with 20% of Côte d'Ivoire's population, and continuing to grow. To meet growing demand for food and the need for urban improvement, the CSAIP proposed increased vegetable, poultry and pork production year-round and better market infrastructure. Given that most food demand originates in the city, a climate smart food system, dependent more on national products rather than imported goods, would benefit the domestic economy. Much like previously described investments, the CSAIP proposes continuous research and greater extension agent capacity as a driver of Abidjan market improvement. The livestock sector and its heavy contribution to country-wide GHG emissions is also addressed as a pressing issue. Livestock are vulnerable to climate change impacts and with so much of the country dependent on its outputs and income, the CSAIP suggests technical assistance, research and better infrastructure are necessary.

7. Cocoa Production

As the CSAIP notes (p. 128), Côte d'Ivoire produces about 1.5 million tons of cocoa annually, or 33% of total global supply, making it the world's largest cocoa producer. Cocoa accounts for 44% of the Côte d'Ivoire's exports and 5% of the national GDP. The program (Annex F-7) calls for expansion of CSA practices to cocoa, including (i) integrated systems, such as agroforestry, (ii) grafting techniques to rehabilitate old plantations, (iii) improved varieties, (iv) best practices for pest and disease control, and (iv) production and use of organic fertilizers. These and other program elements, such as increasing the capacity of farm advisors to integrate CSA practices, and developing improved varieties, will help improve productivity and should indirectly address destruction of natural forests to make room for cocoa. Given that cocoa has been a primary driver of such deforestation in Cote d'Ivoire, however, one would hope that this issue would be

[2] Cassava's limited nutritional value and potential for soil depletion are well-documented; see e.g. Brianna Elliott, RD, "Cassava: Benefits and Dangers," in Healthline, March 24, 2017, and R.H. Howeler, "Long-term effect of cassava cultivation on soil productivity," in Field Crops Research, Volume 26, Issue 1, March 1991, Pages 1-18. Millet compares favorably on both counts. See Ariane Lang, BSc, MBA "What Is Millet? Nutrition, Benefits, and More," March 19, 2020 and Tarun Mittal, "Did you know… millets help restore soil ecosystem?" 29th Apr 2017. Millet's "slow composting nature helps in maintaining soil structure and retaining water, thus preserving soil health for extended durations.

addressed more explicitly, including alignment with the Ivorian REDD+ and Forest Protection, Restoration and Expansion Strategy (SPREF, 2018)[3], and incentives and financing to conserve and restore forests. This could include, e.g., assistance with or provision of formal land titling and crop insurance for smallholders who adopt and maintain more sustainable practices and participate in traceability arrangements that exclude cocoa sourced from deforested land.

Additionally, the CSAIP proposes investments in maize development, mango value chain, livestock sector, yam production and processing, and rainfed rice (see Table below).

Table 5 CSAIP investments by zone

Northern savannah	Central zone	Southern forest zone	Nationally
Maize development	Cassava production	Abidjan market	Agrometeorological system
Mango value chain	Rainfed rice	Cassava production	Agricultural finance services
Livestock sector	Yam prod. & Processing	Cocoa	Soil fertility
Yam prod. & Processing			Agricultural extension

The Role of Donors

Numerous potential funders for the CSAIP are identified with specific national and international investors and stakeholders outlined in Annex F. Under the Country Partnership Framework (CPF), the World Bank and the IFC mobilized $2 billion to private-sector-led agricultural growth for FY2016-FY2019. The project concepts are intended to provide a set of country-identified priorities that could appeal to a range of donors and serve as the basis for further program design and implementation.

Greatest CSAIP Program Risks

Segmentation of producer needs and geography: Given the variety of geographic zones influencing producers' action and needs, the CSAIP is limited in financing economies of scale. The remoteness of certain farmers can hinder adoption rates. Additionally, each agropole region provides varying climates better suited to particular CSA best management practices. While the

[3] The 2020 Cocoa and Forests Initiative's Joint Framework for Action, which came out after the CSAIP, is another program with which any new cocoa project or program should coordinate.

CSAIP offers a variety of such practices, it does not match them with the regions; such matching would be useful in mitigating this risk.[4]

Societal Exclusion of Women: Women producers have largely been left out of previous extension service offerings and financial opportunities. Wide adoption and implementation of CSA practices requires including women in these opportunities. As pointed out in the CSAIP, women account for only 10% of landowners in the country. The CSAIP did analyze which projects could be targeted to women most easily given cultural, financial, etc. constraints: those were cassava; cocoa; Abidjan market; and mango.

Tenure Security and Low Adoption Rates: Land tenure security has been a consistent issue for Ivorians with few new laws to better manage rural land distribution. The 2018 Land Policy Improvement and Implementation Project (LPIIP) initiated a $50 million WB (IDA) loan for rural land tenure security in Côte d'Ivoire.[5] The CSAIP recognizes that security of land tenure is a key driver of on-farm investment. The CSAIP suggests public sector support for improving land tenure security and access to land, and notes that improving tenure rights, transparency, and security would also substantially improve women's economic prospects. As the CSAIP points out, adoption rates of CSA practices often remain low when land is not directly owned by the smallholders.

Conclusion and Recommendations

The Côte d'Ivoire CSAIP offers a comprehensive analysis of the climate change risks and financial inhibitors to the agriculture sector's success. The "long list" of potential investments is drawn from national documents, such as the NDC or national agricultural plans. This is intentional to ensure that CSA actions build on national priorities and are already government supported, even if not financed or implemented. A challenge is that by building on national priorities, other potential CSA actions are not included. We offer the following recommendations to guide donors as they build out the project concepts into a full project design and implement the CSAIP in Côte d'Ivoire and other countries for which the Bank is preparing such plans :

1. **Integrate forest-smart policies more robustly into CSAIP investment plans**.[6] The

[4] A World Bank consultant who worked on the CSAIP and commented on a final draft of this review noted that "the CSAIP only presents 'project concepts.' The assumption is that the design and implementation would link project concepts to different geographies."

[5] https://www.worldbank.org/en/news/press-release/2018/03/28/world-bank-supports-rural-land-tenure-security-in-cote-divoire. IDA refers to International Development Association, the WB arm for lower income countries

[6] WB consultant comment: Forest-smart practices were included at # 16 and #18 on the long list of potential CSAIP priorities, but national stakeholders did not put them on the final list.

CSAIP acknowledges the high rates of deforestation and recent decrease in cocoa yields, and agroforestry is suggested for producers, extension agents, and elsewhere for cocoa. While agroforestry isn't a national priority, the CSAIP acknowledges that it can still be a vital element of many CSA actions, to be supported within individual components such as the national soil fertility program (p.104) and in financial services (p. 105). We suggest the CSAIP could benefit from prioritizing inclusion of investments for shade-grown cocoa and coffee in tandem with afforestation and reforestation. Agroforestry and other forest-smart practices have many potential benefits for other recommended investment strategies as well. WB clients, Cote d'Ivoire included, would benefit from further integrating these practices in their CSAIPs since significant synergies can exist between the forest and agricultural sectors when consistent policies and programs to mainstream forest considerations across landscapes are implemented.

2. Clarify the integration of WB efforts with other donors. The project concepts are offered as part of a priority investment plan that could appeal to a wide range of donors, from public/private ventures to donors. The design of the CSAIPs is to provide a country-vetted list of priorities for action. The WB, in coordination with Côte d'Ivoire should do a better job in "advertising" these investment opportunities to donors**.** The CSAIP's Appendix F offers a detailed list of key actors for each investment project which is helpful as a start.

3. Provide a separate section on financing for programs supporting gender-sensitive supply chains. While analysis of women's role in the agricultural sector is robust, little to no information is included that explicitly defines the flow of finance which will support programmatic solutions for women-led coalitions, cooperatives, and smallholder operations. This and future CSAIPs should offer specifics on WB/donor coordination of financial support to women and other marginalized populations. The CSAIP could include a table which expressly outlines financial and programmatic support aimed at supporting women smallholders and women farmers who may not own the land they work.[7]

4. Outline more specific guidelines on GHG emissions reduction. The CSAIP delves into carbon mitigation and Côte d'Ivoire's goal of 28% reduction of emissions by 2030. However, specific GHG emissions reduction plans are not explicitly proposed. Much of the carbon mitigation is assumed to be achieved via co-benefits from adoption of CSA practices. Therefore, we encourage the WB to outline carbon reduction components within the agriculture sector plans with corresponding GHG reduction targets. Within the soil fertility and specific crop investments, the CSAIP would benefit from quantification of total estimated carbon sequestration. More specific carbon sequestration elements could be initiated in the livestock

[7] WB consultant comment: we neither have the commitments nor the data since these are general concepts. This could only be done in a [project] design phase, and if [projects] are financed, it is likely that they would be designed, appraised, and implemented at different times by different donors. So great idea, but hard to put in a CSAIP.

sector. Incorporating regenerative livestock practices such as rotational grazing, rotation of crop land and livestock land, and silvo-pastoralism could simultaneously sequester carbon and improve farmer resilience.[8]

5. Implement a social marketing campaign[9] to more climate conscious and nutritious staple crops. As shown in the CSAIP**,** cassava is an important crop for subsistence; however, other comparable starchy root vegetables such as yams or sweet potatoes and grains such as millet could be better suited to the climate and Ivorian soil. Increasing education on other varieties of staple crops to complement cassava could increase resiliency and improve nutrition. In promoting a greater variety of staple crops, climate goals and food security can be simultaneously achieved.[10]

6. Expand the soil fertility investment to recommend better-suited crops and regenerative agriculture practices.[11] The Ivorian soil quality is most suitable for products including cashew, rubber, oil trees, and pineapple. The WB recommends many CSA practices to build soil health; however, these aluminum tolerant crops are not offered as an opportunity for income. Expanding research and education on these crops could reduce fertilizer need and costs for smallholders. Additionally, the CSAIP recommends a public awareness campaign for best management practices such as crop rotation and intercropping. To achieve carbon sequestration and improved soil fertility, regenerative agriculture practices such as no-till and animal integration could be recommended as well.[12]

7. **Include a separate section on water irrigation infrastructure.[13]** The lack of water irrigation infrastructure is mentioned as a hindrance to crop performance. Nearly all of

[8] WB consultant comment: best practices such as these for livestock are included in the concepts, and in the economic analysis. For more recent CSAIPs, the FAO ExACT tool was used and there are more details. [This is] very hard to do though without clear spatial definition of the area.
[9] WB consultant comment: We can't do this as [it is] not a nationally-defined priority.
[10] WB consultant comment: Agreed and we were very aware of food security- see concept on yams [and] see table [on CSAIP investments by zone] that shows the balance of which were suggested and why (columns 2 and 3): so for food security: cassava, livestock, mango, maize, rice, yams -- all included.
[11] WB consultant comment: The entire investment is around capacity building in one area of the country, and to do really solid mapping and analysis, and then outreach based on the findings. [T]he findings would include soil mapping and crop-based climate resilience at that place. So I don't think it is appropriate to make recommendations in a technical/capacity building component about what crops to promote. This undermines the whole point of developing national capacity.

[12] WB consultant comment: note that these are examples and would be defined as appropriate- but would be based on analysis of what practices are best for those soils and context. Most of the regenerative [agriculture] is included in the database of CSA interventions that are used—[a] whole huge evidenced-based dataset.
[13] WB consultant comment: Is this appropriate to do if not prioritized by stakeholders in country? I don't think this is appropriate for CSAIPs to do, but clearly should be part of ag sector reviews and strategies.

agriculture (98%) is rain-fed, with irrigation systems only in use for some cash crops. Just 73,000 ha, or 15% of irrigable land, have irrigation systems installed, and of that less than half is regularly irrigated.[14] As mentioned, smallholders have expressed interest in expanded use of irrigation systems. Irrigation is expressed numerous times as a helpful component for the investment projects such as rice and cassava production. The CSAIP recommends improved irrigation for crops for the Abidjan market and for climate-smart cocoa investment projects; however, there is opportunity for a more extensive irrigation plan. The World Bank could detail irrigation plans for improved crop performance and water access in a separate section. With only 2% of agricultural land irrigated, providing more means and aligning incentives for development and use of irrigation could improve both productivity and resilience through increased yields and reduced losses.

[14] See Côte d'Ivoire CSAIP, pg. 16. Per CSAIP, 475,000 ha. (4,750 km.^{2}) of agricultural land has irrigation potential; 32,850 ha. or 6.9% of that is regularly irrigated. The CSAIP notes (p. 6) that irrigation is constrained by technical and financial capacity of enterprises in the infrastructure sector and that it faces risks of tenure and rent issues (as sources of community conflict) within irrigated perimeters. Such issues need to be addressed if irrigation is to be successfully expanded to approach its potential. A climate smart irrigation plan also needs to address ecosystem impacts of expanded irrigation and to minimize GHG emissions, both in construction and use.