

# Can Zambia Increase Food Output While Addressing Climate Change?

*An Evaluation of the World Bank's Zambia Climate-Smart Agriculture Investment Plan*  
April 2021



The World Bank (Bank/WB) committed in December 2016<sup>1</sup> to produce 10 “Climate Smart Agriculture Investment Plans” (CSAIPs), of which the Zambia CSAIP was the first to be finalized. Through these CSAIPs the Bank intends to support strategies that incorporate climate mitigation and adaptation. In many WB client countries, agriculture is a major source of greenhouse gas (GHG) emissions, as well as the sector likely to be most impacted by climate change. For many, agriculture is also a focus of Nationally Determined Contributions (NDCs)

submitted to the United Nations Framework Convention on Climate Change (UNFCCC). Recognizing the important role that agriculture plays in Zambia both for their people and the planet, BIC is evaluating the Zambia CSAIP to examine the extent to which it offers a plan that addresses the goals of increased productivity, resilience, and GHG mitigation in an inclusive and sustainable manner.

## Introduction

The [Zambia Climate-Smart Agriculture Investment Plan \(CSAIP\)](#), released in March 2019 and developed collaboratively between the Government of Zambia (GoZ) and the World Bank partnering with Food and Agriculture Organization (FAO) and the International Institute for Applied Systems Analysis (IIASA), aims to achieve the ‘triple win’ of productivity increases, climate resilience, and mitigation of greenhouse gas emissions through agricultural practices such as crop diversification, conservation agriculture, agroforestry, and reducing post-harvest losses. According to the World Bank, the Zambia CSAIP was designed to fill knowledge gaps about climate-smart agriculture’s local- and national-level benefits, inform policy development, and prioritize investment opportunities, thereby setting the stage for successful adoption of CSA practices.

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<sup>1</sup> This commitment was part of the 18<sup>th</sup> replenishment of IDA (IDA18), the [International Development Association](#) the World Bank’s concessional finance arm. IDA18 was finalized in December 2016 and financed projects over the three-year period from July 1, 2017 to June 30, 2020. The Bank’s April 2016 Climate Change Action Plan also stated that “Climate-smart agriculture profiles and investment plans will be developed by 2020 for at least 40 countries;” it has prepared 31 CSA profiles and 10 investment plans.

The agricultural sector in Zambia and other sub-Saharan countries is being called upon to boost food production to meet the demand of growing populations. Yet in the face of this expanding demand, agriculture systems face increasingly variable climate-related threats such as droughts, seasonal and flash flooding, and extreme temperatures which significantly threaten food security.

In more recent years, Zambia has mainstreamed climate change and specifically climate smart agriculture in its seventh [national development plan](#) (2017-21) and its second [national agriculture plan](#) (2016). With agriculture as the backbone of Zambia's economy,<sup>2</sup> enabling investments towards climate-smart practices in agricultural systems is critical to the World Bank's twin goals of ending extreme poverty and promoting shared prosperity in the country. The challenge for climate-smart agriculture is to determine which activities that advance productivity, resilience, and GHG mitigation are also able to attract and provide returns on investment? This assessment concludes that the three CSA pillars are well integrated, and the most effective pathways to CSA are identified. While the investment opportunities are clear, one area that requires further elaboration are sources and means for investment. The result is that the Zambia CSAIP is non-prescriptive and not so much an investment plan as an investment menu, with the dishes (specific investments) to be chosen and the cook(s) (investors) to be identified.

## **CSA Goals: Productivity, Resilience, and Mitigation**

### *Productivity*

According to the Zambia CSAIP, implementing climate-smart techniques can boost crop yields up to 23 percent, but these productivity increases will be insufficient to avoid the need for further conversion of natural forests for agricultural production in order to meet increasing demand.<sup>3</sup> In Zambia's case, irrigation is a major factor in determining the total output of a cultivation cycle. While extensive research has been dedicated towards enhancing irrigation technologies and improving water storage, significant barriers exist to implementing these methods in a manner that sufficiently meets smallholder needs.<sup>4</sup> At present, the country has 523,000 ha of irrigable land, but only 155,890 (29 percent) of that land is technically equipped for irrigation. As a consequence of unsecured land tenure rights, adoption rates of irrigation and water storage technologies remain low.

The Zambia CSAIP also touches upon the importance of irrigation as a method for enhancing crop diversification. According to the CSAIP, crop diversification offers significant benefits for both resilience and productivity. However, diversification faces notable barriers, including: (1) small farm sizes disincentivize diversification; (2) access to advisory services is limited; (3) access to finance to provide new inputs for operation is limited; and (4) access to markets and irrigation to support diversification is limited especially for rural, smallholder communities.

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<sup>2</sup> Agriculture accounts for 60% of the population's livelihoods, of which, 80% are classified as poor.

<sup>3</sup> See Zambia CSAIP, p. 1

<sup>4</sup> See Zambia CSAIP, p. 10 - Table ES.3 Barriers to adoption of CSA practices in Zambia

The CSAIP's discussion on productivity solutions, while robust, misses some opportunities to include explicit synergies between smallholder farming and forest management. Forest restoration, for instance, has been positively linked to higher productivity levels.<sup>5</sup> Yet the discussion of these benefits in the CSAIP is relatively limited, especially as they relate to enhancing ecosystem services. Further investment in forest restoration would enable the agricultural sector to maintain or increase productivity while increasing forest cover.<sup>6</sup>

### *Adaptation and Resilience Building*

Adaptation needs are thoroughly considered in the CSAIP, as they should be given the overall outlook for Zambian farmers. Practices such as drought-tolerant seeds, agroforestry, and crop diversification are repeatedly discussed in the CSAIP as showing good results under both extreme dry and wet conditions. As such, they are highly suitable for climate adaptation and household resilience building. This is especially important under dry conditions, where the adoption of nearly all CSA practices has a significant positive impact on food security and crop production. To test and develop these strategies, the CSAIP recommends considering a pluralistic participatory extension approach which would involve enrolling farmers in participatory trials of specific practices. Other proposed strategies include timely agro-weather advisory services (emergency response coordination) and customized capacity-building support to assist farmers with optimizing planting times and minimizing risks associated with adopting CSA.

### *Mitigation*

Zambia's Nationally Determined Contribution (NDC) sets ambitious goals for climate mitigation and adaptation largely centered around the agricultural sector and aiming to reduce GHG emissions between 25 percent and 47 percent by 2030, depending on the level of international financing. The CSAIP offers a great deal of overlap among the three pillars of climate-smart agriculture: mitigation, resilience, and productivity. That is, productivity is also "climate-smart" because it reduces the need to expand agricultural territory (which reduces emissions from forest loss and soil disturbance) and increases food security (and thus resilience).

Expanding and maintaining forests is an essential solution to climate change globally. Specifically, halting deforestation and forest-land conversions and increasing forest cover create climate co-benefits and enhance mitigation. The inclusion of forests as a component of the Zambia CSA investment plan contributes to these goals. While the [Zambia Country Forest Note](#) (CFN; Dec. 2019<sup>7</sup>) was published after the CSAIP, the CSAIP aligns with it in promoting agroforestry (along with reduced biomass burning and charcoal use). One of the strengths of

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<sup>5</sup> See e.g. De Pinto A, Cenacchi N, Robertson R, Kwon H-Y, Thomas T, Koo J, Begeladze S and Kumar C (2020): [The Role of Crop Production in the Forest Landscape Restoration Approach—Assessing the Potential Benefits of Meeting the Bonn Challenge](#), *Frontiers in Sustainable Food Systems*.

<sup>6</sup> For more on how forests benefit other sectors like agriculture, read BIC's [report](#) and corresponding [update](#) evaluating the World Bank's Forest Action Plan (2016)

<sup>7</sup> See BIC's review, June 2020: [Zambia Country Forest Note: Is it a sustainable roadmap for managing forests?](#)

agroforestry is that it can provide integrated, synergistic climate adaptation and mitigation. In the Zambian context, it is a key tool for sequestering carbon and reducing GHG emissions. Additional efforts and complementary policies aimed at reducing biomass burning and charcoal use will be needed since they represent a larger share of total carbon emissions.<sup>8</sup> Despite the clear effort at integrating forests into the CSAIP, it omits discussion of reforestation as a tool to offset the loss of natural forests, restore healthy ecosystems, and improve productivity of agricultural lands, which can be found in the Zambia Country Forest Note.

Additionally, the CSAIP suggests introducing a carbon tax on GHG emissions which could be applied to land use change. The CSAIP modeling indicates that existing land use change trends put the country at risk of failure to meet its NDC GHG emissions reduction goal. The CSAIP recommends a carbon tax of \$10/tCO<sub>2</sub>e which could reduce emissions from deforestation and other land use change by 99 percent by 2050, compared to a scenario without policy intervention.<sup>9</sup> Such a tax would make deforestation for agricultural production unprofitable. While food production and availability would slightly decrease, crop yields would increase, along with some food imports. While the CSAIP finds these policies offer net benefits, enactment is unlikely for now.

## **The Role of Donors**

The Zambia CSAIP offers an overview of all projects that promoted climate-smart agriculture (CSAIP Appendix F). As of 2017, some 15 donors in Zambia disbursed a total of US \$173 million through 80 agriculture and natural resource related projects. A lion's share of this was spent in 2017 with US \$118 million supporting 38 different CSA-related projects which claimed to reach over 1.6 million beneficiaries.<sup>10</sup> According to the CSAIP, the largest share of donor allocations targeted improvements in crop productivity (28 percent) followed by market access and service delivery (17 percent).<sup>11</sup> The CSAIP also highlights the fact that donors are most likely to fund initiatives related to conservation agriculture and agroforestry practices which directly support forest-smart interventions.

While information outlining the flow of finance from donor sources is useful to raise awareness of the many players, better integration of other donor spending with World Bank activities is needed for these resources to be allocated efficiently. The CSAIP addresses investment requirements to scale up CSA (see below) and specifically promotes business partnerships with communities, farmer field schools, and the participatory, integrated landscape management approach, but lacks a section outlining how these activities and donors supporting them will be coordinated.

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<sup>8</sup> See Zambia CSAIP, p. 2

<sup>9</sup> Under business as usual, deforestation of natural forested lands is estimated to reach seven percent (900,000 ha) in the southern and western provinces by 2030. See Zambia's Long-Term Vision for 2030: [http://zambiaembassy.org/sites/default/files/documents/Vision\\_2030.pdf](http://zambiaembassy.org/sites/default/files/documents/Vision_2030.pdf).

<sup>10</sup> See Zambia CSAIP, p. 127-128 - Table APP 17: Summary of CSA donor projects, beneficiary numbers, and 2017 expenditures

<sup>11</sup> See Zambia CSAIP, p. 85

## Investment Requirements to Scale up CSA

The Zambia CSAIP covers three main elements to address Zambia's agricultural investment needs: 1) delivery mechanisms, 2) a financing plan, and 3) guidelines for improving the institutional framework. These provide an outline for addressing CSA investment needs.

### *Delivery Mechanisms for Scaling up CSA*

The Zambia CSAIP proposes a series of mechanisms through which the investments exceed the opportunity cost of capital, even without factoring in environmental benefits.<sup>12</sup> Business partnerships with rural communities, farmer field schools, and integrated landscape management are identified as the most promising mechanisms since they have the highest internal rate of return on investment. Other mechanisms offering favorable returns include out-grower schemes, weather index insurance (with and without subsidy), and a pluralistic participatory extension approach.<sup>13</sup> While out-grower schemes have a lower internal rate of return, implementing such an approach sets the stage for better private sector engagement, a crucial component for enhancing community welfare and creating market access opportunities.

### *Financing Need*

Taking into account the proposed mechanisms, the CSAIP concludes that \$196 million will be needed over six years to achieve a CSA adoption rate of more than 50 percent among smallholder farmers.<sup>14</sup> The CSAIP also estimates a net present value (NPV) —the value of benefits from such investment over costs, in current dollars — of \$63.6 million, and an average economic rate of return of 20 percent.<sup>15</sup> Even better, the investment required to roll out CSA is less than recent funding allocations by the GoZ and donors for the agricultural sector.

The investment recommendations are, however, indicative and intended as a non-prescriptive menu of opportunities, which the government can draw on when preparing future projects. At the same time, the CSAIP highlights which CSA practices are specifically suitable for specific regions and agro-ecological conditions. These recommendations for geographic targeting of CSA strategies can be paired with delivery mechanisms, which according to the Bank, have been costed and an indicative budget made available.<sup>16</sup>

### *Public and Private Sector Mobilization*

<sup>12</sup> See Zambia CSAIP, p. 84 - Figure 7.1: Economic internal rate of return and net present value of 7 delivery mechanisms, individual and aggregated

<sup>13</sup> For more substantive review of the delivery mechanisms to support CSA adoption, see Zambia CSAIP, pp. 79-83

<sup>14</sup> Average investment cost \$32.6 million/yr.

<sup>15</sup> This NPV does not assume a carbon price; if one were included, the NPV would increase substantially. With a carbon market price of US\$5/tCO<sub>2</sub>e, for example, the net present value of the investment is estimated to rise by 37 percent. This considerable value justifies exploring carbon finance to support CSA uptake and to compensate farmers for initial expenses of CSA adoption. See CSAIP, p. 72, Figures 5.20, 5.21.

<sup>16</sup> Email from World Bank Coordinator, Climate Smart Agriculture, Africa Region to BIC, April 7, 2021.

The Zambia CSAIP offers guidelines for improving the public sector institutional framework, including suggested steps for the public sector to facilitate the crowding-in of the private sector. To enable enhanced private sector activities, the Plan proposes removing restrictions; reducing transaction costs and risks; and using public or quasi-public goods and services.<sup>17</sup> These actions can collectively contribute to effective implementation of the CSA delivery mechanisms.

## **Smallholder Farmers and Local Communities in the CSAIP**

### *Capacity and Coordination*

The Zambia CSAIP acknowledges that major constraints and performance issues exist among smallholders that inhibit higher rates of adoption of CSA practices. To clear a path for higher adoption, the Zambia CSAIP proposes implementing out-grower schemes, also known as contract farming. Out-grower schemes are binding arrangements through which a firm ensures its supply of agricultural products from individuals or groups of farmers. While this model is largely driven by the private sector, there is a role for the public sector in supporting this system and the needs of smallholders. The CSAIP identifies support for smallholder capacity and coordination as a key tool for enabling farmers to engage gainfully in such commercial value chains.

### *Tenure Security*

The CSAIP recognizes (p. 75) that security of land tenure is a key driver of on-farm investment. In rural Zambia, customary tenure is most common-- only six percent of smallholders in Zambia have some form of land documentation-- and this likely impedes productive 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.

### *Water Infrastructure*

The CSAIP also emphasizes the role for the public sector in providing irrigation infrastructure and accompanying water governance structures. To support continued horticultural development, construction of off-farm water infrastructure is imperative. In Zambia, small scale irrigation often requires development and rehabilitation of small water infrastructure, permanent weirs and small-scale earth dams, and development of boreholes or solar pumps.<sup>18</sup> In rural communities, these resources are often managed by water user associations (WUAs). Strengthening WUAs can create strong local entry points for efficient management of scarce water resources among smallholders and rural communities. Combined, these actions can boost productivity and support stronger financial outcomes.

## **Inclusive Practices for Women Smallholders**

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<sup>17</sup> See CSAIP, p. 81

<sup>18</sup> See CSAIP, p. 132

To enhance CSA adoption, the Zambia CSAIP aims to develop gender-sensitive supply chains that will facilitate women's access to assets and services. Existing conditions include socioeconomic barriers which prevent women from enjoying equal ownership of and access to land, markets, educational resources (valuable trade knowledge), and networks. As a direct result, they are inhibited from maximizing agricultural productivity. Implementing gender-sensitive supply chains will therefore help grow farming operations once women farmers are offered improved access to land and capital. But while the CSAIP substantively analyzes women's needs and potential impacts on agriculture, it does not discuss financing support.

## **Conclusion and Recommendations**

The Zambia CSAIP offers a comprehensive analysis of the constraints inhibiting adoption of CSA and best opportunities to overcome them. A key to the CSAIP's success will be for the World Bank to consider needs both inside and outside the agricultural sector in implementation.

The three pillars of climate smart agriculture (productivity increases, climate resilience, and mitigation of greenhouse gas emissions) are clearly integrated in the Zambia CSAIP. Zambia must implement all three pillars if it is to meet its NDC commitments and provide a framework for CSA adoption through public and private sector mechanisms.

Yet the plan for coordination between the WBG and other donors remains unclear. The WBG must address this issue along with financing for increasing women's access to assets and services and integrating forests more in landscape management. If not, the CSAIP will fail to fully achieve its potential to contribute to the WB's twin goals of ending extreme poverty and promoting shared prosperity in Zambia.

We offer the following recommendations to guide CSAIP implementation in Zambia and other countries for which the Bank is preparing such plans:

- 1. Integrate forest-smart policies more robustly into CSAIP investment plans.** While the CSAIP promotes agroforestry, other forest-smart practices, such as silvo-pastoralism, living fences, and shade grown crops, among others, are omitted. We encourage the WB to make greater efforts toward integrating these practices in CSA investment plans since significant synergies can exist between the forest and agricultural sectors when consistent policies and programs are implemented. The Bank should also be sure to accompany yield-increasing innovations with careful monitoring and regulation so as not to inadvertently incentivize land conversion, a risk which is duly acknowledged in the Zambia CSAIP<sup>19</sup>

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<sup>19</sup> This is needed given that "during the transition to more productive practices, some early adopters might gain a competitive advantage and have an incentive to expand their cultivation area—potentially at the expense of environmentally sensitive land." See DePinto et al, op. cit.

2. **Clarify the integration of World Bank efforts with other donors.** While the flow of donor contributions is substantial for the agriculture sector in Zambia, coordination with the WB is not explicitly addressed in the report. The CSAIP's Appendix F offers a detailed list of donors (and finance) invested in CSA projects in Zambia. While this is helpful, these resources will be better deployed under continuous coordination among donors to realize the full benefits and limit duplication of efforts.<sup>20</sup>
  
3. **Develop forest and community-based monitoring technologies.** While the CSAIP recognizes that there are knowledge gaps surrounding a sector-wide monitoring and evaluation framework, it does not explicitly mention how these technologies will be deployed in smallholder communities. We strongly recommend the Bank prioritize adapting and applying community-based monitoring tools<sup>21</sup> to maximize transparency and enhance adoption rates of CSA practices.
  
4. **Identify linkages between community-level capacity building and the implementing agency/ministry.** While capacity building is identified as a central need for the private sector to drive higher CSA adoption rates, it is unclear whether the Bank and GoZ efforts to connect communities with implementing agencies are planned to contribute to the CSAIP's overall success. Will enhancing research and public extension services be the vehicle for improving CSA adoption? The CSAIP acknowledges the GoZ's significant gaps in this area, and proposes Farmer Field Schools as a community centered approach for learning. In addition the CSAIP could clarify further remedies to improve communication and resource sharing, especially at community level..
  
5. **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. A possible solution to this would be to incorporate information on this in Table APP 17 (p. 127) which

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<sup>20</sup> In review of a draft of this analysis, Bank staff advised that, even though not mentioned explicitly in the report, donor coordination is taking place:

- Zambia has a roundtable of development partners working in the agriculture sector, who meet regularly to discuss ongoing projects and issues in the agriculture sector. The CSAIP was presented during such a meeting.
- It is a common practice to meet with development partners to ensure synergies among ongoing projects during project missions, as evidenced in recent Bank mission Aide Memoires, e.g. of the Zambia Integrated Forest landscape project.
- Donors were also invited and attended the consultation meetings held for the Zambia CSAIP.
- Development of the CSAIP took place in close collaboration with FAO and the International Institute for Applied Systems Analysis (IIASA).

<sup>21</sup> See [Applications Of Forest Monitoring Tools For Development Projects](#), Bank Information Center, March 2019.

summarizes CSA donor projects. Alternatively, the CSAIP could include a follow-on table which expressly outlines financial and programmatic support aimed at supporting women smallholders.

- 6. Expand the scope of community buy-in to include marginalized rural and forest populations.** While stakeholder engagement is emphasized as critical to the success of CSA adoption, the CSAIP fails to address how the livelihoods and cultural practices of marginalized rural and forest populations will be protected and supported, other than providing suggestions of suitable CSA practices and delivery mechanisms in rural areas. It is vital that the Bank explicitly integrate such protection to facilitate the plan's sustainability and limit harmful outcomes that disempower local communities or engender potential conflict with and among these groups.
- 7. Define and implement programs addressing smallholder farmers' and local communities' needs.** While the CSAIP presents a robust analysis of the CSA needs of smallholders, it does not provide sufficient information on planned programmatic actions that the Bank and GoZ are prepared to implement to address the constraints of CSA adoption for smallholders and their communities. The GoZ and WB have, according to Bank staff, discussed two future operations which will address constraints for smallholders to adopt CSA, both in production and along the value chain, and such efforts should be seen through to implementation.<sup>22</sup>

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<sup>22</sup> The proposed projects targeting smallholders are the Zambia Integrated Forest Landscape project and the Livestock Sector Development Support project. [Email from World Bank to BIC, op. cit.]