COST-BENEFIT ANALYSIS OF RESILIENCE IN THE SAHEL (RISE) II - YALWA & YIDGIRI ACTIVITIES

COST-BENEFIT ANALYSIS REPORT

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COST-BENEFIT ANALYSIS REPORT

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Photo Credit:	Zachary Robb. "Rural Landscape in Burkina Faso." July 2018.

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ACRONYMS

AE	*Auxiliaires d'élevage* (animal health auxiliaries)
AGRODIA	National Association of Wholesalers and Retailers of Agricultural Inputs
BAP	Best Agricultural Practices
BHA	USAID Bureau for Humanitarian Assistance
CAIMA	*Centrale d'Approvisionnement des Intrants et Materiels Agricoles*
CBA	Cost Benefit Analysis
CFA	*Communauté Financière Africaine* franc
CNFA	Cultivating New Frontiers in Agriculture
CSCF	Commodity-Specific Conversion Factors
DDI	USAID Democracy, Development and Innovation
EMD	USAID Center for Economics and Market Development
ENPV	Economic Net Present Value
ERR	Economic Rate of Return
ES	Ecosystem Services
FEP	Foreign Exchange Premium
FNPV	Financial Net Present Value
GESI	Gender Equity and Social Inclusion
GHG	Greenhouse Gas
GoBF	Government of Burkina Faso
GoN	Government of Niger
IP	Implementing Partner
IRR	Internal Rate of Return
MCC	Millennium Challenge Corporation
MIRR	Modified Internal Rate of Return
MoAH	Ministry of Agriculture and Hydro-Agricultural Facilities
NCBA-CLUSA	National Cooperative Business Association
NPK	Nitrogen, Phosphorus, and Potassium Fertilizer
NPV	Net Present Value
NTP	Non-Tradable Premium
PARSEN	Fertilizer Sector Reform Support Project in Niger
PICS	Purdue Improved Crop Storage
PO	Producer Organization
PPR	*Peste des petits ruminants*
RISE	Resilience in the Sahel Enhanced
REGIS-AG	Resilience and Economic Growth in the Sahel - Accelerated Growth

REGIS-ER	Resilience and Economic Growth in the Sahel - Enhanced Resilience
RQ	Research Question
SIEE	Supplemental Initial Environmental Examination
SME	Small or Medium Enterprise
SRO	Sahel Regional Office
SVPP	*Services Vétérinaires Privés de Proximité* (Private Veterinary Outreach Services)
TAP	Traditional Agricultural Practices
UCBA	Unified Cost Benefit Analysis
USAID	United States Agency for International Development
USD	United States Dollar
USG	United States Government
VC	Value Chain
WCS	Warrantage Credit Scheme
ZOI	Zone of Influence

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EXECUTIVE SUMMARY

ACTIVITY DESCRIPTION

The Resilience in the Sahel Enhanced (RISE) initiative is a multisector program supported by the United States Agency for International Development (USAID) aimed at increasing the resilience of vulnerable households in the Sahel region that face climatic, conflict-induced, environmental, and economic shocks that adversely affect their livelihoods. The RISE initiative has been implemented in two major phases: RISE I and RISE II. This report focuses on selected activities undertaken in RISE II. The overall theory of change for RISE II is that sustained and coordinated efforts can address the underlying causes of chronic vulnerability and build resilience. USAID has funded multiple development and humanitarian assistance activities under RISE. Under RISE II, follow-on activities have built on the achievements and lessons of RISE I. The Yidgiri activity in Burkina Faso and the Yalwa activity in Niger follow earlier RISE I activities and similarly focus on market and nutrition activities, supporting the cowpea, poultry, and small ruminants value chains (VCs). CNFA implements both Yidgiri and Yalwa, each running from 2020-2025. The Sahel region, including the RISE II zones of influence (ZOIs), has been subject to a range of stresses and shocks, historically and during activity implementation, including environmental shocks, animal disease, physical insecurity, food price shocks, and the COVID-19 pandemic.

At the request of USAID, the LEAP III team has conducted a cost-benefit analysis (CBA) of the Yalwa and Yidgiri activities under RISE II. Five research questions (RQs) motivate this CBA activity:

- RQ1: Are the targeted activities (Yidgiri and Yalwa) effective uses of USAID funding?
- RQ2: Are the targeted activities (Yidgiri and Yalwa) generating benefits from a societal (*i.e.*, economic) perspective and from a stakeholder (*i.e.*, financial) perspective?
- RQ3: How are the net impacts of the targeted activities (Yidgiri and Yalwa) affected by net impacts and dependencies on the environment?
- RQ4: To what extent are the targeted activities (Yidgiri and Yalwa) generating benefits for women and youth stakeholders?
- RQ5: From a programmatic perspective, which are the key parameters to target to ensure the delivery of net benefits to stakeholders?

CBA APPROACH

The CBA models estimate the financial and economic impacts of selected activities under the RISE II Initiative in Burkina Faso and Niger. The models provide estimates of household- and country-level impacts of interventions in the cowpea, poultry (chicken and guinea fowl), and small ruminant (goat and sheep) VCs. The models rely most significantly on primary data collected through household surveys of RISE II beneficiaries in both countries, supplemented with secondary data where required. Results are reported in terms of financial and economic net present value (FNPV and ENPV, respectively), internal rate of return (IRR), and economic rate of return (ERR). A stakeholder analysis considers impacts on those stakeholders of specific interest, including the host country government, women beneficiaries, and youth beneficiaries.

The CBA of selected RISE II activities consists of fourteen models, seven for Yalwa and seven for Yidgiri. Ten of the models assess a full range of impacts - financial, economic, stakeholder, and sensitivity - on agricultural producers or farmer beneficiaries. Four models assess only financial impacts on producer organizations (POs) and veterinary service providers benefitting from RISE II.

CBA RESULTS

YALWA

This CBA finds that the Yalwa activity, which supports farmers and other VC actors in three regions of Niger, delivers mixed results (**Table ES-1**). Financial analysis shows that the typical farmer participating in the Yalwa activity will not consistently enjoy a positive impact from that participation: A farmer producing chicken or goats reports a negative return, while a typical cowpea, guinea fowl, or sheep farmer enjoys a positive return. For a cowpea farmer, the financial returns will vary widely depending on his or her former and current cropping pattern and participation in a warrantage credit scheme (WCS). For non-farmer beneficiaries, the results are similarly mixed: The average PO reports a positive financial return, while a veterinary service provider reports a negative financial return that could provide a disincentive to remain in operation in the market.

The economic analysis, which reflects Yalwa's performance across its more than 50,000 beneficiary farmers, incorporates USAID's investment cost and accounts for major economic distortions and selected environmental externalities. This analysis suggests that Yalwa delivers a negative ENPV, driven by the negative performance recorded in the chicken and goat VCs.

TABLE ES-1. HEADLINE CBA RESULTS FOR YALWA ACTIVITY

	Financial	*Economic*	
Value Chain	**FNPV (CFA)**	**Beneficiaries (#)**	**ENPV (USD)**
Cowpea	ranges from 8,397 to 759,553	20,875	($2,641,826)
Poultry - Chicken	(494,058)	10,256	($7,982,260)
Poultry - Guinea Fowl	31,547	3,419	($1,437,237)
Small Ruminants - Goats	(1,512,945)	9,912	($16,278,165)
Small Ruminants - Sheep	1,629,753	6,888	$6,691,255
TOTAL	***N/A***	**51,350**	**($21,378,233)**

Considering women and youth beneficiaries, Yalwa's impact builds on the financial analysis for a typical farmer as presented in **Table ES-1**. Aggregation across all women or youth beneficiaries is useful to account for both the scale of net impact per VC and the differential rates of participation by women and youth across VCs. Women beneficiaries under Yalwa capture a disproportionate share of the total net impacts (losses) to all farmers. However, youth beneficiaries enjoy net benefits - in contrast to the net

impacts (losses) reported for non-youth farmers. Women and youth beneficiaries' relative participation in the high-performing sheep VC drive their resulting net impacts.

Finally, according to the stakeholder analysis conducted as part of this CBA, the Government of Niger (GoN) is expected to experience a net positive impact on its fiscal position as a result of the Yalwa activity, driven by the collection of higher incremental revenues associated with import taxes on agricultural inputs.

YIDGIRI

This CBA finds that the Yidgiri activity, which supports farmers and other VC actors in three regions of Burkina Faso, also delivers mixed results (**Table ES-2**). Financial analysis shows that, under Yidgiri, the typical farmer beneficiary will not consistently enjoy a positive impact from that participation: A farmer producing cowpea or chicken enjoys a positive financial return while small ruminant producers incur losses. Note that the financial analysis excludes the typical farmer beneficiary producing guinea fowl, due to the very low number of survey respondents on which to build the financial analysis. For non-farmer beneficiaries, however, the results are consistently positive: A typical PO and veterinary service provider both report a positive financial return, suggesting an incentive to remain in operation within the sector.

The economic analysis reflects Yidgiri's performance across approximately 68,000 beneficiary farmers while accounting for USAID's investment cost (excepting for the guinea fowl VC), major economic distortions, and selected environmental externalities. This analysis suggests that Yidgiri delivers a positive NPV, driven by the strongly positive performance recorded in the cowpea and chicken VCs.

TABLE ES-2. HEADLINE CBA RESULTS FOR YIDGIRI ACTIVITY

	Financial	*Economic*	
Value Chain	**FNPV (CFA)**	**Beneficiaries (#)**	**ENPV (USD)**
Cowpea	ranges from 20,816 to 1,673,259	36,581	$30,084,434
Poultry - Chicken	2,361,526	12,162	$30,683,303
Poultry - Guinea Fowl	*N/A*	776	*N/A*
Small Ruminants - Goats	(566,285)	2,805	($2,203,964)
Small Ruminants - Sheep	(470,772)	15,894	($4,919,415)
TOTAL	***N/A***	**68,218**	**$53,644,357**

Considering women and youth beneficiaries, Yidgiri's impact builds on the financial analysis for a typical farmer as presented in **Table ES-2**. Aggregation across all women or youth beneficiaries accounts for the scale of net impact per VC and the differential rates of participation by women and youth across VCs. Results again exclude the guinea fowl VC due to the lack of robust data to inform the analysis. Women beneficiaries under Yidgiri capture 54 percent of the total net impacts (benefits) to farmers, falling slightly short of the activity's target for women's participation. When aggregated across VCs, youth beneficiaries under Yidgiri capture 5 percent of the total net impacts (benefits) to farmers. The results

for women and youth beneficiaries are driven by under-representation in the better-performing chicken VC.

Finally, the stakeholder analysis conducted as part of this CBA suggests the Government of Burkina Faso (GoBF) should experience a net negative impact on its fiscal position due to the Yidgiri activity. Notably, the incremental cost of fertilizer subsidies available to cowpea producers is estimated to outweigh the collection of higher incremental revenues associated with import taxes on agricultural inputs.

LIMITATIONS

These CBA models are based on a rigorous methodology but remain subject to several limitations that may tend to exaggerate costs while understating benefits. While the USAID investment cost has been carefully considered in light of expenditure data (see **Annex 3**), it has not been possible to exclude activity costs that are not directly associated with increases in farmer incomes resulting from the Yidgiri or Yalwa activities. Separately, the calculation of benefits may be understated due to the exclusion of selected non-income benefits (*e.g.*, improvements in literacy or nutrition) from the CBA models. Additionally, the benefits may be subject to downward bias as a result of the reliance on primary data that is subject to recall error (including seasonality considerations); that lacks a true counterfactual (the data represents a "before and after" intervention comparison); and that is indicative of mid-term rather than full-term performance. As additional data on activity performance becomes available, the CBA models could be updated to more accurately reflect the tally of costs and benefits generated by the Yalwa and Yidgiri activities.

Two major knowledge gaps are present in these findings. First, Yidgiri and Yalwa seek to generate additional benefits (including literacy and nutrition) that are not quantified in this analysis.[1] Second, the value of household labor is both unknown and highly influential over the results of the analysis. The following figures demonstrate the influence of these knowledge gaps on the CBA findings. **Figure ES-1** shows that, even if there is no opportunity cost of household labor, stakeholders would still have experienced an economic decline since the start of Yalwa. However, if the economic value of the unquantified benefits (nutrition and literacy) of Yalwa exceeds $21 million, then Yalwa would be on track to generate net economic benefits through improvements in the financial performance of farmer beneficiaries. **Figure ES-2** shows that the positive findings observed for Yidgiri are robust even if the true opportunity cost of beneficiaries' time is much higher than assumed in this analysis.

[1] The LEAP III team had proposed to quantify additional environmental and nutritional impacts in the original RISE II CBA methodology, but excluded those from the final CBA methodology at the request of USAID.

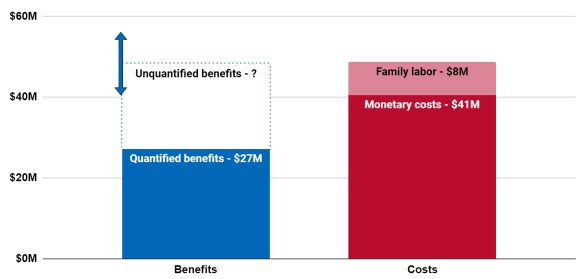

FIGURE ES-1. INFLUENCE OF KNOWLEDGE GAPS ON YALWA FINDINGS

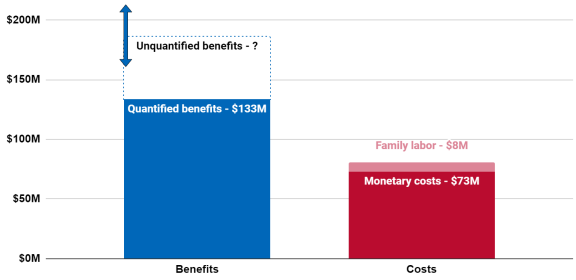

FIGURE ES-2. INFLUENCE OF KNOWLEDGE GAPS ON YIDGIRI FINDINGS

CONCLUSIONS AND RECOMMENDATIONS

The CBA assesses the economic and financial performance of the Yalwa and Yidgiri activities. These analyses provide evidence to conclude that the Yidgiri activity is on track to deliver the intended benefits at the activity level or for most beneficiaries; and that the Yalwa activity is not yet delivering the intended net benefits at the activity level, despite generating net benefits for some beneficiaries. This analysis highlights the difficult and complex challenges of assisting these beneficiaries - particularly farmers - as they face low crop yields, high animal mortality rates, and high costs of inputs such as fertilizers and feed relative to their earnings. In this way, the results are perhaps unsurprising: The conclusions drawn confirm the general observation that the Sahel is an exceptionally challenging environment for agricultural producers and related VC actors.

RQ1: Are the targeted activities (Yidgiri and Yalwa) effective uses of USAID funding?

Economic analysis suggests that the Yidgiri activity is on track to deliver net economic benefits at the activity level. The Yidgiri activity reports a positive ENPV (see **Table ES-2**) and an economic rate of return that exceeds the economic discount rate (12 percent), suggesting that it represents an effective use of USAID funding. Under Yidgiri, many farmers reported increased levels of yields or livestock production, and the economic model suggests that these exceed the increased cost of inputs associated with improved practices adopted by farmers. The data collected suggests that most farmers are significantly better off compared to prior to the implementation of the Yidgiri activity.

Conversely, the Yalwa activity reports a negative ENPV (see **Table ES-1**) and an economic rate of return below the economic discount rate (12 percent), indicating that it is not yet delivering net economic benefits. Under Yalwa, USAID funding could be used more effectively if farmer-level performance could be improved through reductions in costs, increases in benefits, or both.

Based on these conclusions, it is recommended that USAID and IPs continue to assess the performance of the Yalwa and Yidgiri activities by applying updated data to the CBA models, whether data generated from ongoing or planned data collection efforts or by collecting additional data to address perceived data gaps or weaknesses. By updating the models into the future, including to reflect activity performance beyond mid-2022, the CBA models can help USAID and IPs to assess the economic performance of the Yalwa and Yidgiri and make a clearer and more robust assessment of the effectiveness of USAID development funding.

RQ2: Are the targeted activities (Yidgiri and Yalwa) generating benefits, from a societal (*i.e.*, economic) perspective and from a stakeholder (*i.e.*, financial) perspective?

The Yidgiri activity appears to generate net benefits from a societal (economic) perspective when aggregated across all VCs. The net benefits generated within the cowpea and chicken VCs exceed the costs generated within the small ruminant VCs (Figure ES-3). From a stakeholder (financial) perspective, the Yidgiri activity similarly generates net benefits for a typical farmer in the cowpea and chicken VCs but not for a farmer producing small ruminants. Moreover, the Yidgiri activity appears to generate net benefits for other actors in the sector, specifically POs and veterinary service providers.

The Yalwa activity does not yet generate net benefits from a societal (economic) perspective, though performance varies across the VCs targeted. The net benefits generated within the small ruminants-sheep VC fall short of the net costs generated within the cowpea, poultry, and small ruminants-goats VCs (Figure ES-3). From a stakeholder (financial) perspective, the Yalwa activity generates net benefits for farmer stakeholders in the cowpea, guinea fowl, and sheep VCs as well as for POs. However, the Yalwa activity does not generate net benefits for the farmer stakeholders producing chicken or goats, or for veterinary service providers.

The CBA of the Yalwa and Yidgiri activities suggests some strong areas of activity performance in generating benefits from both a societal and stakeholder perspective while identifying other areas where performance appears to be lagging. Given that headline performance is inhibited by very difficult operational circumstances and that benefits may be understated within this analysis, the fact that the Yidgiri activity is on track to generate net benefits from a societal perspective is even more remarkable. That said, both activities have areas for improvement. To that end, it is recommended that USAID and IPs continue to monitor performance with a particular focus on those VCs that are not yet generating benefits from either an economic or financial perspective. To improve performance at the stakeholder level, IP activity managers could focus on those VCs and their corresponding critical parameters that may be under their control or influence (see RQ5); improvements at the farmer level should help boost economic benefits at an activity level.

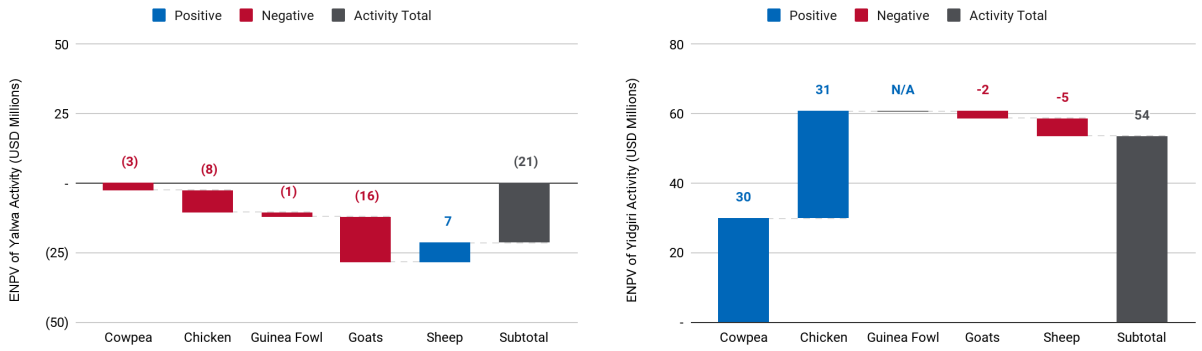

FIGURE ES-3. ENPV OF YALWA (LEFT) AND YIDGIRI (RIGHT) ACTIVITIES (USD MILLIONS)

RQ3: How are the net impacts of the targeted activities (Yidgiri and Yalwa) affected by net impacts and dependencies on the environment?

The net impacts of the Yidgiri and Yalwa activities are not significantly affected by the subset of net impacts on the environment that were included in the scope of this CBA. This conclusion holds at both the activity level and at the level of the small ruminant VCs, the only VCs for which environmental impacts (costs associated with incremental GHG emissions) were estimated.

The dependencies on the environment have not been explicitly modeled within the CBA, and it is not therefore possible to determine their influence on the net impacts of the Yidgiri or Yalwa activities. Nevertheless, the desk review has confirmed that dependencies on the environment underpin nearly all agricultural activities, most notably for the small ruminant VCs. Small ruminant production depends heavily on the ecosystem services provided by communal pasturelands for small ruminant grazing. Therefore, a key concern for both Yidgiri and Yalwa is the extent to which farmers may continue to rely on pasturelands for small ruminant grazing in the face of increased competition for land access and use; any decline in access to pastureland would require farmers to feed their ruminants from other sources, which could undermine the feasibility of small ruminant production.

Because the environmental impacts that have been modeled within this CBA - the costs associated with incremental GHG emissions - do not significantly affect the overall performance of the Yidgiri and Yalwa activities, there is no basis to recommend any significant change to the current implementation of either activity. However, if the (modeled) environmental impacts are modest, environmental dependencies are critical to activity performance. Accordingly, it is recommended that any plan to expand the Yidgiri or Yalwa activities should revisit the environmental impacts and dependencies and explore cooperation with other activities under the RISE II Initiative focused on the management of applicable natural resources such as pastureland.

RQ4: To what extent are the targeted activities (Yidgiri and Yalwa) generating benefits for women and youth stakeholders?

This analysis finds that the targeted activities generate net benefits for youth stakeholders, though only Yidgiri also generates net benefits for women stakeholders.

At the activity level, Yidgiri generates net benefits for both women and youth stakeholders, specifically women and youth farmers. This conclusion is supported by the finding that Yidgiri generates a positive FNPV when aggregated across all women beneficiaries and across all youth beneficiaries. This result is driven by strongly positive returns enjoyed by women and youth farmers producing cowpea and chicken, outweighing negative returns calculated for women and youth farmers producing small ruminants.

Similarly, the Yalwa activity generates net benefits for youth stakeholders at the activity level as reflected in a positive FNPV when aggregated across all youth farmers. This result is driven by positive returns enjoyed by youth farmers producing cowpea, guinea fowl, and sheep, exceeding the negative returns calculated for youth farmers producing chicken and goats. However, the Yalwa activity does not generate net benefits for women beneficiaries at the activity level: Women beneficiaries' participation is concentrated in the chicken and goat VCs, where the typical farmer experiences negative returns, outweighing the positive benefits reported for women farmers producing cowpea, guinea fowl, or sheep.

The targeted activities could generate increased benefits for women and youth stakeholders, specifically agricultural producers, by increasing the rates of women and youth participation in those VCs for which farmer beneficiaries experience positive financial impacts. Yidgiri and Yalwa activity managers could

redouble efforts to reach activity targets for women to comprise 60-75 percent of beneficiaries and youth to comprise 25-30 percent of beneficiaries over the remaining life of the activities. For those VCs in which farmer beneficiaries experience negative financial impacts, Yidgiri and Yalwa activity managers could work to deliver positive financial impacts for farmers by identifying and working to address weak areas of performance (see RQ5 below).

RQ5: From a programmatic perspective, which are the key parameters to target to ensure the delivery of net benefits to stakeholders?

From a programmatic perspective, Yidgiri and Yalwa activity managers should continue to monitor those parameters that have a significant effect on CBA results.

- Cowpea VC: Farmers' crop yields, crop prices, input costs, and participation and price premiums associated with participation in a WCS
- Poultry-Chicken and Poultry-Guinea Fowl VCs: Animal production parameters including animal mortality, costs of feed and veterinary services, and market prices
- Small Ruminant-Goat and Small Ruminant-Sheep VCs: Animal production parameters such as animal productivity and mortality, costs of feed and veterinary services, and market prices and sales volumes for animals, milk, and manure

Finally, the economic analysis of Yidgiri and Yalwa performance hinges on the aggregation of benefits across the target number of beneficiaries. Yidgiri and Yalwa activity managers should continue to recruit farmer participation within their respective activities in line with established beneficiary targets, even prioritizing the recruitment of farmers to those VCs that offer the greatest potential to deliver net financial benefits as well as to achieve stakeholder participation targets among women and youth.

1. INTRODUCTION

1.1 RISE INITIATIVE - BACKGROUND AND THEORY OF CHANGE

The Resilience in the Sahel Enhanced (RISE) initiative is a multisector program aimed at increasing the resilience of vulnerable households in the Sahel region facing climatic, conflict-induced, environmental, and economic shocks that adversely affect their livelihoods. Operationally, the RISE initiative[2] is a set of USAID development and humanitarian assistance projects and activities that are managed collectively by the Sahel Regional Office (SRO), USAID Bureau for Humanitarian Assistance (BHA), USAID/West Africa Regional, USAID/Washington and the field offices in Burkina Faso and Niger. To date, the RISE initiative has been implemented in two major phases: RISE I and RISE II. This report focuses on the activities undertaken in RISE II.

The overall theory of change for RISE II is that sustained and coordinated efforts can address the underlying causes of chronic vulnerability and build resilience. The stated goal of RISE II is to ensure that, "Chronically vulnerable populations in Burkina Faso and Niger, supported by resilient systems, effectively manage shocks and stresses and pursue sustainable pathways out of poverty." This goal is further elaborated into five objectives: 1) enhance social and ecological risk management systems; 2) increase and sustain economic well-being; 3) improve health, family planning, and nutrition outcomes; 4) enhance governance of institutions and organizations; and 5) enhance the social, economic, and political agency of women and youth.

USAID has funded multiple development and humanitarian assistance activities under RISE. RISE I included two concurrent five-year activities: Resilience and Economic Growth in the Sahel - Enhanced Resilience (REGIS-ER) implemented by the National Cooperative Business Association (NCBA-CLUSA), and Resilience and Economic Growth in the Sahel - Accelerated Growth (REGIS-AG), implemented by Cultivating New Frontiers in Agriculture (CNFA). Both activities spanned six zones of influence (ZOIs) across Burkina Faso and Niger.

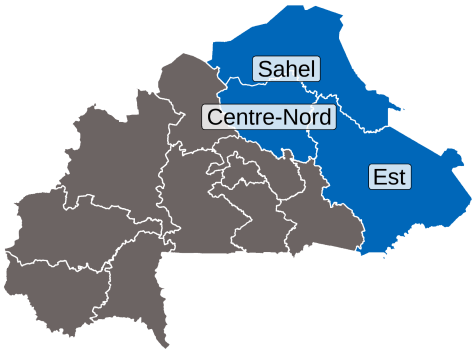

FIGURE 1-1a. RISE ZONES OF INFLUENCE - BURKINA FASO

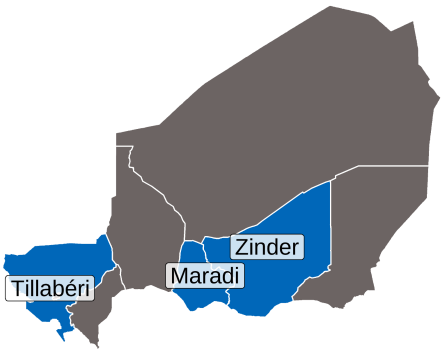

FIGURE 1-1b. RISE ZONES OF INFLUENCE - NIGER

[2] https://www.usaid.gov/sahel-regional/our-work

Under RISE II, follow-on activities have built on the achievements and lessons of RISE I. Two new activities, the Yidgiri activity in Burkina Faso and the Yalwa activity in Niger, follow on from the REGIS-ER and REGIS-AG activities. These activities similarly focus on market and nutrition activities, supporting many of the same value chains as under REGIS-ER and REGIS-AG: cowpea, poultry, and small ruminants. CNFA implements both Yidgiri and Yalwa, each running from 2020-2025.

Under RISE II, the Yidgiri activity in Burkina Faso and the Yalwa activity in Niger are designed to enhance individual, household, community, and institutional capacities to sustain and improve well-being, with a particular focus on strengthening market systems. In Burkina Faso, market systems interventions seek to enhance the capacity of 650 farmer unions, producer organizations, agribusinesses and 42,500 smallholders and entrepreneurs and help producers reach $75 million in sales of cowpea, small ruminants and other crops. In Niger, market systems-related interventions are expected to reach 105,000 smallholders and entrepreneurs, 30 unions, 650 market organizations, 160 small- and medium-sized enterprises (SMEs), and 500 innovators, generating sales of cowpea and small ruminants estimated at $90 million.

1.2 DEVELOPMENT CONTEXT

The RISE II ZOIs have been subject to a range of stresses and shocks, both historically and in the period of activity implementation. For example, Burkina Faso has experienced environmental shocks (lack of rainfall, floods), animal disease (including a significant outbreak of avian influenza in 2022), physical insecurity, and food price shocks driven by international market dynamics (including those linked to the conflict in Ukraine); all of these have had impacts on agricultural activities, food production, and food security in the country.[3] The COVID-19 pandemic has had direct impacts on human health; public measures designed to reduce the transmission of diseases also disrupted economic activity (including food production and related livelihoods), which reportedly had a more significant impact than the virus itself in countries including Burkina Faso and Niger (Dejene *et al.*, 2021).[4]

1.3 COST-BENEFIT ANALYSIS OF RISE II

The USAID Center for Economics and Market Development (EMD) has requested that the LEAP III team complete a cost-benefit analysis (CBA) of the Yalwa and Yidgiri activities under RISE II. The CBA models build on a set of CBA models previously developed to evaluate select activities under RISE I. The intended primary users of the CBA models are staff members with USAID's implementing partner (IP) for the Yidgiri and Yalwa activities.

The research questions (RQs) motivating this CBA activity are as follows:

- RQ1: Are the targeted activities (Yidgiri and Yalwa) effective uses of USAID funding?
- RQ2: Are the targeted activities (Yidgiri and Yalwa) generating benefits, from a societal (*i.e.*, economic) perspective and from a stakeholder (*i.e.*, financial) perspective?

[3] See AFP (2022, March 30).

[4] In Burkina Faso, agricultural activities and food distribution were excluded from government-mandated closures, but affected closures in other sectors. The most restrictive period coincided with the planting period for rainfed crops (including maize, sorghum, millet, and cotton) in 2020 (Dejene *et al.*, 2021). The impacts of COVID-19 were understood to be less severe on staple crops (such as cowpea) than on high-value, more perishable commodities (Dejene *et al.*, 2021).

- RQ3: How are the net impacts of the targeted activities (Yidgiri and Yalwa) affected by net impacts and dependencies on the environment?
- RQ4: To what extent are the targeted activities (Yidgiri and Yalwa) generating benefits for women and youth stakeholders?
- RQ5: From a programmatic perspective, which are the key parameters to target to ensure the delivery of net benefits to stakeholders?

1.4 STRUCTURE OF THIS DOCUMENT

As part of the CBA for RISE II, the LEAP III team has reviewed and revised a set of CBA models and collected primary and secondary data to populate those models, including "with project" and "without project" (*i.e.*, counterfactual) evaluation scenarios, such that the CBA results are representative of the period of performance for RISE II. The LEAP III has prepared and submitted to USAID a set of documents detailing the process for CBA model preparation and data collection and analysis (CBA Methodology, Data Collection Plan, and Data Collection Report).

The current document briefly reviews the methodology underpinning the RISE II CBA and presents the results of the RISE II CBA as well as brief conclusions and recommendations drawn from these results.

2. METHODOLOGY

2.1 METHODOLOGY - GENERAL APPROACH

The CBA models aim to estimate the financial and economic impacts of selected activities under the RISE II Initiative - namely, the Yidgiri activity in Burkina Faso and the Yalwa activity in Niger. The intended primary users of the CBA models are the staff of USAID and implementing partners (IPs) for RISE II. The models were developed to provide estimates of household- and country-level impacts of interventions in the cowpea, poultry, and small ruminant value chains (VCs).

The models rely most significantly on the primary data collected through household surveys in both countries from April to June 2022.[5] Secondary data was used where required and is cited as needed in the methodology and the models.

The models were specified using the Unified Cost Benefit Analysis (UCBA) framework which acts as a blueprint for the CBA models (Annex 1). The methodology was developed prior to the construction of the new CBA models and was updated throughout the construction of the models so that the UCBA reflects the inputs and calculations in the models.

2.2 MODEL DESCRIPTION

Google Sheets and Microsoft Excel software programs were used to construct models that compare the annual cash or resource flows[6] in the "without project" and the "with project" scenarios. These cash/resource flows are used to calculate the annual incremental cash/resource flows. The financial, economic, stakeholder, sensitivity, and risk analyses have been completed using the annual incremental cash/resource flows. The analysis covers a ten-year period from 2020 (the period in which the Yalwa and Yidgiri activities commenced) until 2029.The year 2030 is treated as a liquidation period.

The models reflect real cash/resource flows. Nominal data have been converted to real data through the use of price indices calculated from secondary inflation and exchange rate data, when necessary.[7] Models are constructed such that real price changes may be introduced into the models when appropriate.[8] The resulting real cash/resource flows were then used to compute results including financial and economic net present value (FNPV and ENPV, respectively), internal rate of return (IRR), and economic rate of return (ERR); of these, the farmer net annual income, NPV, and ERR are featured within the model dashboards. These calculations required the discounting of the incremental cash/resource flows. The financial discount rate applied is based on the opportunity cost of capital for beneficiaries, derived from primary data. For each activity, a common discount rate is applied across all VCs, to facilitate

[5] Details regarding the primary data collection are available in the Data Collection Plan and Data Collection Report previously submitted to USAID by the LEAP III team.

[6] Cash flows pertain to the financial benefits and costs of an investment; resource flows pertain to the economic benefits and costs of an investment.

[7] Examples include historical price data and USAID investment cost data.

[8] Examples include historical records of real changes in the price of fuel and agricultural commodities over the period 2020-2022. Estimates are produced at the global level, and may not accurately reflect changes in every country. For example, in Burkina Faso, changes in commodity prices might be less volatile over the short term following the government's imposition of export control measures on selected crop products (millet flour, corn flour, and sorghum flour; not including cowpea or cowpea flour) as of February 23, 2022 through December 2022 (Bankova *et al.*, 2022 May 30; Laborde & Mamun, 2022). USAID has confirmed that the export ban has been expanded to include cowpea and may extend into 2023. No such export control measures have been reported for Niger (Bankova *et al.*, 2022 May 30; Laborde & Mamun, 2022).

comparability across the financial analysis of different VCs within a single activity (3 percent in Burkina Faso, 2 percent in Niger). The economic discount rate applied is 12 percent in line with USAID CBA guidelines, for both activities across all economic analyses.

The incremental cash/resource flows were used to assess the direct income impacts accruing to Yalwa and Yidgiri beneficiaries across the cowpea, poultry-chicken, poultry-guinea fowl, small ruminant-goat, and small ruminant-sheep VCs. The direct income impacts accuring to Yidgiri beneficiaries within the poultry-guinea fowl VC were calculated but are not reported within this report due to the very low number of survey respondents on which to build the financial analysis, limiting their robustness. The incremental cash/resource flows were further used to determine the fiscal externalities accruing to the Government of Burkina Faso (GoBF) and the Government of Niger (GoN). Finally, the incremental resource flows formed the basis to calculate environmental externalities accruing to the economies of Burkina Faso and Niger.

The CBA of RISE II activities consists of fourteen models: seven for Yalwa and seven for Yidgiri. Ten of the models assess a full range of impacts on agricultural producers or farmer beneficiaries, while four models assess financial impacts only on producer organizations and veterinary service providers.

- Agricultural Producers (Farmers)
    - Cowpea
    - Poultry - Chicken
    - Poultry - Guinea Fowl
    - Small Ruminants - Goats
    - Small Ruminants - Sheep
- Producer Organization
- Veterinary Service Providers

The CBA models consist of up to four types of analysis: financial, economic, stakeholder, and sensitivity analysis. This analysis is conducted at the household level (financial and sensitivity analyses) or the country level (economic, stakeholder, and sensitivity analyses). The full complement of financial, economic, stakeholder, and sensitivity/risk analysis has been conducted for each model that focuses on farmer beneficiaries, while only financial analysis has been conducted for those models that focus on producer organizations and veterinary service providers.

Financial Analysis: For agricultural producers (farmers), financial analysis has been conducted based on the comparison of traditional agricultural practices[9] (TAP) versus the improved practices adopted by the typical beneficiary of Yalwa and Yidgiri activities, specific to each value chain. The comparison of production with and without the project has been used to identify and quantify the financial benefits and costs associated with each of these. Farm budgets were constructed through the collection of primary data, secondary data, and a review of the applied and academic literature. The farm budgets were used to estimate the net annual income and corresponding financial returns that farmers could attain from each of these farming practices as well as the incremental financial impacts of improved farming practices supported by the Yalwa and Yidgiri activities.

The extent to which farmers have adopted agricultural practices recommended by the Yalwa and Yidgiri activities is embedded in the primary data that have been used to populate the CBA models: The

[9] 'Traditional agricultural practices' are assumed to be sub-optimal in various ways, but may reflect some of the benefits of support received from under RISE I and/or from other donor projects in the RISE ZOIs.

primary data reflect actual farmer performance and production practices as opposed to best agricultural practices (BAP). The implicit adoption rate, therefore, varies per production technology and output (*e.g.*, the number of farmers vaccinating livestock is reflected in the median number of veterinarian visits per year for the typical beneficiary farmer). Users may adjust the CBA model parameters to reflect complete adherence to BAP, if desired.

For POs, financial cash flows were estimated using primary data collection to assess their financial sustainability. The financial analysis compares the performance of a PO without the intervention and with the intervention, to assess whether the financial performance has improved and thus whether the PO has an incentive to continue its participation in RISE II and even to remain in operation into the future.[10]

For veterinary service providers, the financial analysis uses data collected from veterinary service providers, triangulated with data collected from farmers in livestock value chains, to estimate the profitability of providing veterinary services with Yalwa and Yidgiri. [11]

Economic Analysis: Economic analysis has been used to evaluate the broader benefits and costs accruing to society as a whole. The economic analysis differs from financial analysis in the valuation of resources: The financial analysis builds on market prices to value inputs and outputs, while the economic analysis adjusts these market prices to account for known market distortions (*e.g.*, trade tariffs, taxes, and subsidies). The economic analysis also differs from financial analysis insofar as some impacts defined as costs and benefits for farmers do not have an impact at the country level when they function as a transfer between stakeholders with no implication on country resources. For this analysis, the financial cash flows have been adjusted to determine economic resource flows, accounting for tariffs, taxes, and subsidies specific to major inputs and outputs relevant to the Yalwa and Yidgiri activities.[12] The inclusion of market distortions was informed by secondary data collection and focused on the main inputs and outputs of the production.

Economic analysis also requires that the economic resource flows be scaled in line with the total number of beneficiaries engaged in the Yalwa and Yidgiri activities. The total number of beneficiaries reached and targeted per activity has been provided directly by the IPs and incorporated into the CBA models. The RISE II CBA models have aggregated net benefits across beneficiaries following the same methodology as the RISE I CBA models. This simplified approach multiplies the flows pertaining to a representative farmer by the present value of beneficiaries discounted at the economic discount rate in order to account for the cohort-based entry of beneficiaries into the activity (stretching over the life of the

[10] The purpose of this financial analysis is to assess the sustainability of the Yalwa and Yidgiri activities, which assume the participation of producer organizations even beyond the investment period. Producer organizations are assumed to generate a positive financial return from their participation, incentivizing long-term participation.

[11] The purpose of this financial analysis is to assess the sustainability of the Yalwa and Yidgiri activities, which assume the continued operation of veterinary service providers even beyond the investment period. Veterinary service providers are assumed to generate a positive financial return from their operation, incentivizing long-term participation.

[12] The CBA of RISE I further incorporated the use of commodity-specific conversion factors (CSCFs) into the economic analysis to account for market distortions to the prices of inputs and outputs. For the CBA of RISE II, the application of CSCFs has deliberately been omitted: An up-to-date database of CSCFs is not available for either Burkina Faso or Niger. Recent, reliable data that would be necessary to calculate those CSCFs directly is similarly unavailable for either Burkina Faso or Niger; for example, the calculation of foreign exchange premiums (FEP) and non-tradeable premiums (NTP) produced by Kuo *et al.* (2015) does not include either Burkina Faso or Niger. A review of the CSCFs applied in the RISE I models suggests that the introduction of CSCFs should not introduce material differences to the economic analysis from the more streamlined approach noted in the text above. Finally, the loss of precision in the economic analysis is justified by delivering CBA models that omit "black box" calculations in favor of transparency for end-users, which is understood to be a major objective of the CBA of RISE II. Refer to Annex 2 for additional discussion of these issues.

activity). This approach delivers accurate estimates of the economic impact of the Yalwa and Yidgiri activities, provided that income flows do not differ by beneficiary cohort.[13]

This economic analysis accounts for costs lacking market prices, specifically environmental externalities. This economic analysis estimates the incremental greenhouse gas (GHG) emissions associated with the production of small ruminants, which impose a cost on society though they are not (currently) imposed as a financial cost to small ruminant producers.

The economic analysis has been used to measure economic returns accruing both to Burkina Faso and Niger attributable to the Yidgiri and Yalwa activities, respectively.

Stakeholder Analysis: Stakeholder analysis has been used to identify those actors who stand to gain or lose as a result of the impacts generated by Yalwa and Yidgiri. The actors principally considered within this analysis include selected beneficiaries of the Yalwa and Yidgiri activities: agricultural producers of cowpea, poultry, and small ruminants; producer organizations; and veterinary service producers. Additional stakeholders include the governments of Burkina Faso and Niger and USAID. Further analysis has been undertaken to assess the impacts on stakeholders with respect to gender and age, in line with the research questions underpinning the CBA of selected RISE II activities.

Sensitivity Analysis: Sensitivity analysis has been used to vary selected data parameters and assumptions underpinning the financial and economic analyses, in order to assess how the impacts of Yalwa and Yidgiri respond to these changes. The sensitivity analysis allowed for the identification of critical variables that most strongly determine (positively or negatively) the activities' impacts.

2.2 MODEL SPECIFICATION

Table 2-1 summarizes the benefits, costs, and stakeholders considered in each of the RISE II CBA models. A detailed description of each model's methodology is specified in Annex 1.

TABLE 2-1. BENEFITS, COSTS, AND STAKEHOLDERS IN RISE II CBA MODELS

Value Chain	Impacts	Stakeholders		
		Beneficiaries	Government	Country
Cowpea	B1: Increased Revenue from Sales	✓	✓	✓
	B2: Improved Resilience in the Face of Shocks	✓	✓	✓
	B3: Warrantage Disbursement	✓		
	C1: Increased Input Costs	✓	✓	✓
	C2: Increased Labor Costs	✓		✓
	C3: Increase in Agricultural Working Capital	✓		✓

[13] The primary data collection did not solicit information on when the survey respondents began to participate in the Yalwa or Yidgiri activity, such that it is not possible to assign survey respondents to a beneficiary cohort in order to determine whether different beneficiary cohorts have experienced distinct net income flows. The primary survey data accordingly provides no basis to reject the discount-based approach to aggregation across beneficiaries.

TABLE 2-1. BENEFITS, COSTS, AND STAKEHOLDERS IN RISE II CBA MODELS				
Value Chain	**Impacts**	**Stakeholders**		
		Beneficiaries	**Government**	**Country**
	C4: Investment Costs	✓		✓
	C5: Repayment of Warrantage Credit	✓		
	C6: Direct Cost of Intervention			✓
Poultry (Chicken & Guinea Fowl)	B1: Increased Revenue from Sales	✓	✓	✓
	B2: Improved Resilience in the Face of Shocks	✓	✓	✓
	C1: Increased Cost of Feeding	✓	✓	✓
	C2: Increased Veterinary Costs	✓	✓	✓
	C3: Increased Labor Costs	✓		✓
	C4: Investment Costs	✓		✓
	C5: Increase in Agricultural Working Capital	✓		✓
	C6: Direct Cost of Intervention			✓
Small Ruminant (Goat & Sheep)	B1: Increased Revenue from Animal Productivity	✓	✓	✓
	B2: Improved Resilience in the Face of Shocks	✓	✓	✓
	B3: Increased Revenue from Culled Animals	✓	✓	✓
	C1: Increased Input Costs	✓	✓	✓
	C2: Increased Veterinary Costs	✓	✓	✓
	C3: Increased Labor Costs	✓		✓
	C4: Investment Costs	✓		✓
	C5: Increase in Agricultural Working Capital	✓		✓
	C6: Direct Cost of Intervention			✓
	C7: Increase in GHG Emissions			✓

Table 2-1 does not include the models for either POs or veterinary service providers. These two models are narrower in scope, consisting of a single benefit (increase in revenues) and a single cost (increase in costs of production) to assess the net financial impact of Yalwa or Yidgiri participation on POs and veterinary service providers, respectively.

REVENUE

RISE II aims to make agricultural inputs and markets accessible to farmers and encourage them to transition to BAP across the target VCs.[14] The increases in revenue are assumed to come from increased production, and it is assumed that market prices will not change as a result of the intervention.[15] Estimating the change in revenue across VCs is done by looking at sales (or the equivalent value of on-farm consumption) in the "with project" and "without project" (counterfactual) scenarios at the household level and calculating the incremental change.

For cowpea, the estimation is made across multiple scenarios as different agricultural practices have been observed, including monocropping of cowpea and intercropping of cowpea with millet and sorghum.[16] Incremental revenue for cowpea farmers has also been calculated for farmers using the warrantage credit scheme (WCS) who delay sales and thereby earn a higher market price for a proportion of their cowpea sales by selling in the lean or hungry season.[17]

To estimate the financial impacts of the livestock interventions, the livestock models first calculate the productivity of the flock or herd; the production function for each type of livestock is estimated given the prevailing mortality rate, reproductive rate, and the percentage of animals being sold or used for other purposes in a given period. This production function estimates how production contexts and decisions impact flock/herd size and subsequent sales volumes.

Of note, the modeling of benefits of increased sales within the small ruminants models requires care in interpretation: *B1: Increased Revenue from Animal Productivity* only captures the increased productivity (milk and manure production) of the farmer's original herd or flock size. *B2: Increased Resilience due to Reduced Mortality* captures the additional productivity (milk and manure production) of the animals that are added to the herd or flock as a result of reduced animal mortality and the increased animal sales associated with improved mortality rates.

COSTS

RISE II encourages beneficiaries to adopt BAP, which increases their production costs, including agricultural inputs, labor costs, investment costs, and working capital.

The adoption of improved farming practices requires a shift in the agricultural inputs used. In the cowpea VC, this includes improved seeds, fertilizers, and Purdue Improved Crop Storage (PICS) bags. For the

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[14] The term 'best agricultural practices' refers to a range of agricultural practices including the use of improved inputs and production techniques. The primary survey data does not provide a binary indicator to distinguish between participants who have adopted BAP and those who have not. Instead, summary statistics calculated for the "with project" scenario are considered to implicitly reflect the average adoption rate of BAP amongst RISE II beneficiaries.

[15] While the CBA models allow users to vary prices under "with" and "without" project scenarios in line with the intervention logic of Yalwa and Yidgiri, no price differentials are assumed in the results presented within this report with the exception of cowpea under a WCS. This is reflective of the primary survey data and a lack of data from the IPs to populate the differential market price parameters.

[16] Traditional farming practices in the Sahel often include farmers growing multiple crops on the same plot of land. RISE I has encouraged farmers to move towards monocropping to promote higher yields and more intensive farming practices.

[17] Primary survey data of cowpea farmers under the Yidgiri activity unexpectedly reported a lower price paid for cowpea under the WCS, contrary to the objectives of the intervention. The LEAP team speculates that this might have been the result of reliance on recall data, if prices paid under warrantage were for the previous production year and compared to current market prices. In order to avoid this issue, warrantage prices have been introduced as a premium paid relative to market prices without warrantage, allowing for consideration of the warrantage price premium within the sensitivity analysis. While RISE I documentation suggests that the price of cowpea may even double during the off-season (CNFA, 2016a), the models assume more conservative warrantage price premiums of 18 percent for Yalwa and 27 percent for Yidgiri.

poultry and small ruminant VCs, the RISE II intervention encourages improved feeding inputs and increased use of veterinary services. Beneficiaries are also assumed to maintain larger herds or flocks of animals which requires an increased provision of feed and veterinary services.

Adopting improved practices also affects the labor required for agricultural production, whether from farmers, their household members, or hired labor. The change in labor has been calculated using primary data and disaggregated by gender and age (youth or adult). Hired labor is valued at the prevailing market wage based on an assumption of efficient labor markets. Household labor is valued at the opportunity cost of labor, equated to a percentage of the national minimum wage. *This treatment of the cost of household labor is a strong and significant assumption because the rates assumed for household labor - which forms the bulk of labor used by RISE II beneficiaries across all VCs for nearly every task except the delivery of veterinary services - are a major cost of production within the CBA models.* We might expect that farmers undervalue this opportunity cost for two reasons: 1) it is not paid in cash and 2) various contextual factors can limit the ability of household members to participate in the labor market, decreasing their opportunity cost.[18]

Improving farming practices may require farmers to invest in the first year of the intervention. For example, farmers in the cowpea VC may need to invest in improved storage facilities and/or new machinery to accommodate more intensive farming practices and increased yields. Farmers raising livestock may invest in improved or larger shelters for their animals.

An increase in operating costs for farmers could lead to increases in their levels of agricultural working capital. Farmers were asked about how they covered their expenses and what level of cash balance they maintained; this cash balance was then calculated as a percentage of operating costs to generate a proxy for working capital. The cost of agricultural working capital is the change in working capital, which is calculated on an annual basis accounting for inflation.[19]

The cost of the interventions to USAID was brought into the country-level analysis using data provided directly from the IPs. The total cost of the Yalwa and Yidgiri activities was apportioned across the five VCs; for the livestock VCs, costs were further apportioned based on the proportion of beneficiaries producing specific types of animals. For more detail on the handling of the USAID investment costs, see **Annex 3**. The country-level evaluation also accounted for the increased greenhouse gas emissions associated with farmers increasing the production of small ruminants.

RESILIENCE

RISE II interventions seek to support vulnerable households by increasing household income and by increasing their capacity to deal with community- or household-level shocks. In line with the guidance of Schubert (2020), a practical mechanism to model resilience within a CBA is to include avoided 'shock impact' costs as a benefit of an intervention.

[18] The opportunity cost of time for farming households may be significantly lower than market rates, based on academic research. Whittington and Cook (2019) report mean estimates of the opportunity cost of time falling in the range of 25-75 percent of some measure of household income or wage rate. Gardes and Thiombiano (2017) estimate the opportunity cost of time in rural Burkina Faso using two methods and find that it is between 9.6 percent and 18.1 percent of the minimum wage rate. In consultation with USAID, a conservative estimate of 50 percent of the minimum wage has been used in the CBA models.

[19] While this cost has been retained in line with the RISE I models and the UCBA underpinning the RISE II models, primary data collection suggests that farmers participating in Yalwa or Yidgiri generally do not maintain agricultural working capital; by extension, this suggests that the interventions did not lead to significant increases in working capital required by farmers.

Within the CBA models, the LEAP III team considered the benefit (avoided costs) for Yidgiri and Yalwa activity beneficiaries, focusing on a single shock per VC. To analyze the impact of improved resilience, the CBA models quantified the frequency and impact of shocks with and without the intervention, relying on secondary data. The team has been mindful of potential double-counting where the resilience benefits and increase in income might overlap. Within the small ruminant VCs, the dramatic reductions in animal mortality during an outbreak of specific animal disease - in this case, *Peste des petits ruminants* - attributable to vaccination were impossible to disentangle from generalized improvements in animal mortality. As a result, all changes in mortality within the small ruminants VC have been considered as the resilience benefit.

The RISE II CBA includes scenario-based modeling of selected shocks affecting beneficiary households and their communities. The selection of the shocks and stresses modeled within the RISE II CBA was based on historical evidence, including the multi-round impact evaluation of RISE I (Smith *et al.*, 2021).[20] The shocks modeled - drought for the cowpea models and animal disease outbreaks for the livestock models - are all types of covariate shocks.[21] The impact of shocks was assessed primarily through the production and sale of the agricultural product of focus within the corresponding VC. The adoption of (or ability to avoid) coping strategies in the face of shocks is not incorporated in the CBA models. A summary of the shock impacts and activity impacts on the RISE II beneficiaries is shown in **Table 2-2**.

TABLE 2-2. SHOCK IMPACTS AND ACTIVITY IMPACTS ON RISE II BENEFICIARIES

VC	Shock	Impact on Farming Household	Activity Impact - Offsetting	CBA Model Implications
Cowpea	Extreme weather event	Reduced crop yield	Improved household use of agro-climatic information and improved inputs to maintain or improve yields despite erratic weather.	B2 - Improved Resilience in the Face of Shocks Incorporates the avoided losses of farmers using improved technologies compared to farmers using TAP
Poultry - Chicken & Guinea Fowl	Animal disease	Reduced flock size	Increased access to veterinary services reduces the incidence of disease (mortality) in the flock.	B2 - Improved Resilience in the Face of Shocks Incorporates the avoided losses of farmers using improved technologies (veterinary practices).
Small Ruminants - Goats & Sheep	Animal disease	Reduced herd or flock size	Increased access to veterinary services reduces the incidence of disease (mortality) in the herd or flock.	B2 - Improved Resilience due to Reduce Mortality Incorporates the avoided losses of farmers using improved technologies (veterinary practices).

[20] The LEAP III team issued multiple requests to the parties implementing the impact evaluation of RISE II to obtain more up-to-date information on the types and severity of shocks affecting beneficiary households, but these requests were unanswered.

[21] Covariate shocks are those that affect a large number of people in a given geographic area, as opposed to idiosyncratic shocks that affect specific households or individuals within a community (Sagara, 2018).

COWPEA

The shock modeled within the cowpea VC is agricultural drought, which was previously noted to affect crop farmers within the RISE I impact evaluation documentation.[22] Under RISE II, efforts to increase the use of BAP would not reduce the risk that extreme weather events occur. However, these interventions could lessen the impact of extreme weather on beneficiary households producing cowpea. The use of improved inputs can help to ensure a harvest, even in the event of (some types of) extreme weather. In this case, the 'avoided cost' associated with this shock would be the reduced yield losses of cowpea attributable to extreme weather events.

Sanou *et al.* (2016) analyzed farmers' yields of cowpea and millet across northern Burkina Faso using various farming practices, including nitrogen, phosphorus, and potassium fertilizer (NPK) and manure (fertilizing with one or both), and a control group. The study considered farmers' output over two years (2013 and 2014), one in which rainfall was irregular, leading to a significantly lower yield across all groups, and one in which rain remained more consistent. This study provides a secondary estimate of how improved practices impact farmers under ideal weather conditions and in years when rainfall is not sufficiently consistent to support typical yields.

POULTRY - CHICKEN & GUINEA FOWL

The animal disease outbreak modeled within the poultry VCs (both for chicken and guinea fowl) is Newcastle disease, which was previously noted as particularly problematic for poultry producers within the RISE I impact evaluation documentation. For beneficiaries of RISE II, a critical assumption is that beneficiary households would have access to veterinary services, reducing the incidence of animal disease and mortality in the event of an animal disease outbreak. Using Schubert's (2020) terminology, the 'avoided cost' associated with this shock would be the value of dead or diseased animals as a result of the disease outbreak.

The primary data collection asked poultry farmers whether or not they vaccinated their animals before and after their participation in the RISE II interventions. RISE II aimed to make veterinary services more widely available to farmers by making the provision of veterinary services more profitable, and primary data reflected an increase in the proportion of farmers reporting the use of vaccines from the beginning of RISE II and the data collection in 2022. This suggests that these farmers would be better off not only in an average year but would also experience significantly reduced losses in a year where there is an outbreak of Newcastle disease.

Data on the incidence and impacts of Newcastle disease were retrieved from secondary data sources including academic research (Sedeik *et al.*, 2019; Dinev, 2012; Saif *et al.*, 2008) and consultation with a veterinary expert (Shaib, H., personal communication, 2022, August 2).

SMALL RUMINANTS - GOATS & SHEEP

The animal disease outbreak modeled within the small ruminants VCs (both for goats and sheep) is *peste des petits ruminants* (PPR), which the RISE I impact evaluation documentation noted was historically problematic for producers. For beneficiaries of RISE II, a critical assumption is that beneficiary

[22] This was corroborated with the primary survey data for Burkina Faso, where 83.0% of cowpea farmers reportedly experienced a major environmental shock (such as drought) in the previous 12 months. Conversely, only 7.6% of cowpea farmers in Niger reported that they experienced a major environmental shock in the previous 12 months.

households would have access to veterinary services, reducing the incidence of animal disease and mortality in the event of an animal disease outbreak. Using Schubert's (2020) terminology, the 'avoided cost' associated with this shock would be the value of dead or diseased animals as a result of the disease outbreak.

Data on the incidence and impacts of PPR was retrieved from secondary data sources, including academic research (Stem, 1993; Mantip *et al.*, 2019) and consultation with a veterinary expert (Shaib, H., personal communication, 2022, August 2). The high probability of an outbreak in a given year (ranging from 40 percent to 60 percent probability across sources) meant that the incremental mortality due to an outbreak of PPR could not be differentiated from the mortality rates reported in the farmer survey. For this reason, the improved resilience of farmers included all reduced mortality of small ruminants. It must be noted that this includes the impact of not only reduced incidence of PPR but also the reduction in deaths from other diseases and malnutrition.

2.3 GENDER EQUITY AND SOCIAL INCLUSION

The RISE II CBA activity has addressed gender equity and social inclusion (GESI) considerations with respect to both gender and age, specifically a focus on youth participation, in several respects.

The interventions under RISE II focus on improving income for women in vulnerable households. Interventions in poultry and small ruminant VCs were chosen because women were already engaged in the poultry, small ruminant, and rural foods market systems. The goal of these interventions is to increase women's participation in agricultural food chains and reduce barriers such as limited access to vaccination for small ruminants.

Under RISE II, gendered impacts may plausibly extend beyond first-order changes in income. Increasing women's participation may lead to larger gains for the household overall compared to supporting only men. Evidence suggests that if women had the same access to resources for agricultural production as men, they could increase yields on their farms by 20-30%, resulting in cascading additional benefits to families, communities, and national economies. However, in line with USAID guidance on the conduct of CBA, such multiplier effects are not to be counted as impacts (Schubert, 2020).

Other possible gendered impacts of RISE II may include time savings (if applicable), improved nutritional health for mothers and children, improved educational outcomes for girls and women, and changes in the incidence of gender-based violence. The value of beneficiaries' time has been incorporated into the income models with sex disaggregation. However, after consultation with USAID, it was decided not to incorporate the value of improved nutritional health for women and young children (including girls) into the CBAs. Meanwhile, although changes in educational outcomes and gender-based violence can theoretically be incorporated into CBA (Watt *et al.*, 2017), information and data on activity-level impacts are not available to support the calculation of such gendered impacts.[23]

While gender and youth empowerment are major areas of emphasis within the Yidgiri and Yalwa activities, the review of activity documents revealed no reliable indicator suitable to track, quantify, and monetize these impacts and therefore excluded such potential benefits in line with the guidance of Watt *et al.* (2017). Instead, this study has considered the impact of the interventions on women's labor hours,

[23] The RISE I impact evaluation provided anecdotal evidence (but not quantified measures) of increases in gender-based violence, as women's shifting time demands contributed to intra-household tensions that were marked by incidents of domestic violence (Smith & Frankenberger, 2020).

decision-making, and income as compared to men, all of which align with USAID's policy and guidelines on conducting gender analysis.[24] A similar analysis has been undertaken with respect to age to identify impacts on youth or children.

2.4 LIMITATIONS

There are several limitations relevant to this analysis.

Primary Survey Data: The CBA models build on primary data collected specifically to inform the RISE II models. Primary data are based on a stratified random sample of RISE II beneficiaries.[25] The random selection was intended to remove any bias in answers, though bias may have been introduced if certain assumptions did not hold. For example, the presence of insecurity within the RISE II ZOIs (in particular Burkina Faso) could have skewed data collection, if insecurity meant that certain types of beneficiaries (such as large holders of livestock who might have been targets for theft[26]) were more likely to be displaced and therefore unavailable for participation in the survey.[27]

The primary data are based on a survey of RISE II beneficiaries, including farmers, veterinary service providers, and PO leaders. Respondents presumably represent those who have remained in agriculture and continue to participate in RISE II, while those actors that may have been unsuccessful have exited the agricultural sector; which would likely skew the estimated CBA results to show a relatively greater impact of RISE II interventions. However, recent evidence suggests that many rural farming households in the Sahel have limited alternative employment opportunities or resources to support a move to urban areas to pursue non-farm employment, even in the face of persistent hardships (Dejene *et al.*, 2021), suggesting there is realistically little risk of sampling and thus response bias within the primary data. Dejene *et al.* (2021) also report no widespread, permanent closures of agricultural input dealers in 2020, suggesting that there is similarly limited risk of sampling bias among the veterinary service providers surveyed.

A small number of survey responses for several types of beneficiaries is a further limitation to this CBA activity: Of note, very few survey responses were received from guinea fowl producers (13 in Burkina Faso, 66 in Niger), and the data underpinning the CBA models for the guinea fowl VC are accordingly of limited robustness. In several instances, the limited number of respondents failed to report substantive or reasonable answers; to address such gaps, responses relevant to the chicken VC in the same country have been applied as the closest available proxy.[28] Ultimately, the limited number of survey responses from guinea fowl farmers in Burkina Faso has led to a determination that the results of the financial and economic analysis from this VC are not robust and therefore a decision to omit the reporting of financial and economic analysis results within this report.

"With" and "Without" Intervention versus "Before" and "After" Intervention: The primary data underpinning this analysis rely on a "before and after intervention" comparison, which is an

[24] ADS 205 Integrating Gender Equality and Female Empowerment in USAID's Program Cycle, updated 1/22/2021. https://www.usaid.gov/sites/default/files/documents/205.pdf

[25] Details of the data collection methodology are included in the Data Collection Plan and Data Collection Report.

[26] See Wilkins (2022, February 17).

[27] A limited number of comments in the survey of veterinarians suggests that insecurity and violence in Burkina Faso had caused livestock farmers to relocate, potentially outside the RISE II ZOIs.

[28] For example, in Burkina Faso, guinea fowl producers reported "zero" responses for adult bird mortality and the proportion of hens in lay, which appear implausible; they reported no substantive responses for the wage rate paid to hired labor or the interest rate on savings. Accordingly, data reported from the chicken VC are applied to the guinea fowl VC.

approach with three major limitations. First, the data rely on recall among survey respondents. Recall data are useful insofar as they can inform a counterfactual (how beneficiaries would likely behave, in the absence of the RISE II interventions); however, recall data are also subject to error and bias, as beneficiaries may inaccurately recall information from the past. Second, the "without intervention" (counterfactual) scenario represents survey participants' experiences before participating in Yidgiri/Yalwa (*i.e.*, in 2019) but the analysis does not isolate Yidgiri/Yalwa's contribution to the observed changes between the 'before' and 'after' intervention scenario. In other words, the impacts reflected in the CBA models cannot be solely attributed to Yidgiri/Yalwa. Finally, the "after intervention" scenario is really a "mid-intervention" scenario because Yidgiri and Yalwa are mid-implementation at the time of this analysis.

Labor Market Knowledge Gaps: The CBA models assume that labor markets are not perfectly efficient, which is in line with the available literature and a reasonable assumption given lack of evidence to the contrary. Accordingly, the value of labor for household members is assumed to be below the daily wage paid to hired labor. Because the value of household labor is not precisely known, the LEAP III team has followed USAID guidelines for valuing household labor. However, the uncertainty in the value of household labor represents an important knowledge gap because the choice of value for household labor has a substantial impact on the observed feasibility of participation in certain VCs.

USAID Expenditure Data: While the USAID investment cost has been carefully considered in light of expenditure data (see Annex 3), it has not been possible to exclude activity costs that are not directly associated with increases in farmer incomes resulting from the Yalwa or Yidgiri activities. It is therefore possible that the CBA models may overestimate the costs of the interventions included in the scope of the analysis.

Unquantified Benefits: Finally, the CBA models may omit some of the impacts of the RISE II interventions. For example, this analysis excludes consideration of intended benefits derived from literacy and numeracy training, training to improve nutritional knowledge and intake among beneficiaries, or environmental impacts. While many of the benefits from literacy and numeracy training might reasonably have short-term impacts on the beneficiaries' incomes, they may deliver dividends beyond the ten-year time horizon within this CBA. Other impacts which might have been included within the CBA, including nutritional and environmental impacts, were excluded based on guidance from USAID, prioritizing the analysis of more immediate income impacts. Nutritional impacts partially overlap with the income effects of the program, however, this is most likely an underestimation of the value of improved nutrition for the beneficiaries.

As additional data on activity performance becomes available, the CBA models could be updated to more accurately reflect the tally of costs and benefits generated by the Yalwa and Yidgiri activities.

3. RESULTS

This section of the report presents the major results of the CBA, organized according to the major components of the analysis: financial analysis, economic analysis, stakeholder analysis, and sensitivity analysis. The report then presents ecosystem services and resilience analysis briefly in turn.

3.1 FINANCIAL ANALYSIS

FINANCIAL RETURNS - AGRICULTURAL PRODUCERS

Table 3-1 presents the financial returns to the selected RISE II activities, showing returns by activity and by VC, for the typical agricultural producer (farmer) within the corresponding VC. Results are reported as FNPV and IRR.[29]

TABLE 3-1. FARMERS' FINANCIAL RETURNS BY ACTIVITY AND VC

	Yalwa (Niger)		Yidgiri (Burkina Faso)	
Value Chain	FNPV (CFA)	IRR	FNPV (CFA)	IRR
Cowpea				
Without warrantage				
Intercropping >> Intercropping	30,926	10%	20,816	8%
Intercropping >> Monocropping	8,397	4%	1,449,561	323%
Monocropping >> Monocropping	713,222	*N/A*	925,054	203%
With warrantage				
Intercropping >> Intercropping	44,095	13%	138,649	29%
Intercropping >> Monocropping	56,339	16%	1,673,259	371%
Monocropping >> Monocropping	759,553	*N/A*	1,160,720	252%
Poultry - Chicken	(494,058)	(91%)	2,361,526	*N/A*
Poultry - Guinea Fowl	31,547	5,777%	*N/A*	*N/A*
Small Ruminants - Goats	(1,512,945)	(89%)	(566,285)	(66%)
Small Ruminants - Sheep	1,629,753	*N/A*	(470,772)	*N/A*

COWPEA

Returns to cowpea are consistently positive but vary significantly according to cropping pattern and farmer participation in a WCS.

[29] The calculation of IRRs is subject to two limitations. First, an IRR cannot be calculated when the stream of net benefits does not cross zero (*i.e.*, when the stream is consistently positive or negative in every year). Second, the mechanics of the IRR calculation may exaggerate positive returns. Accordingly, the exceptionally high, positive IRRs reported for several VCs should be interpreted with care as illustrative of significantly positive financial performance, though a possible over-statement of benefits driven by both the mechanics of the IRR function and (at least for the Yalwa guinea fowl VC) a limited number of responses underpinning the primary data on which the model builds. The application of the alternative modified internal rate of return (MIRR) function to calculate more moderate but still positive financial returns would address the second limitation, but not the first.

Under Yalwa, the FNPV to cowpea production varies according to the cropping scenario. If not participating in a WCS, a typical farmer who previously and currently monocrops cowpea would enjoy the highest returns, exceeding those for a farmer who had or continues to intercrop cowpea. Under a WCS, the typical farmer who previously and currently monocrops cowpea reports the highest FNPV, while other farmers would report significantly lower (albeit positive) returns. Regardless of cropping pattern, a farmer would be expected to enjoy a higher FNPV under a WCS than not; however, very low participation rates suggest that the typical farmer in Niger does not participate in a WCS. This result suggests that Yalwa activity managers may wish to tailor their guidance to farmers: Farmers participating in the Yalwa activity who are currently intercropping cowpea might be encouraged to shift to monocropping (or simply growing more cowpea relative to other crops), provided that they also participate in a WCS, to maximize their financial returns. The results also suggest a financial incentive to direct cowpea farmers to participate in a WCS under Yalwa, regardless of cropping pattern.

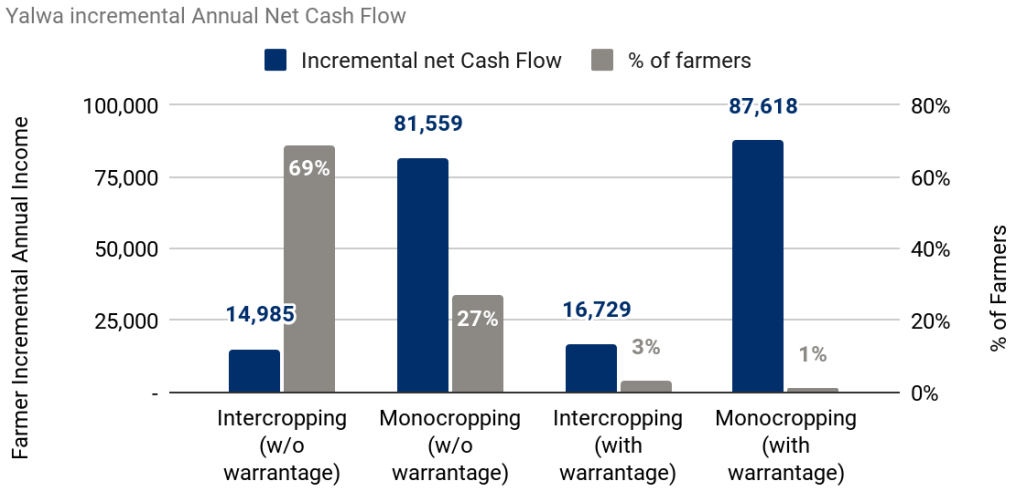

FIGURE 3-1. INCREMENTAL INCOME FOR COWPEA FARMERS WITH YALWA

Under Yidgiri, the FNPV to cowpea production is positive for all farmers regardless of cropping pattern or participation in a WCS. The magnitude of benefits is higher for all farmers if participating in a WCS, regardless of cropping pattern, suggesting that Yidgiri activity managers could prioritize efforts to encourage additional farmers to participate in a WCS: While 74 percent of beneficiary farmers surveyed report that they participate in a WCS, the activity could maximize benefits by reaching the remaining 26 percent of beneficiary farmers yet to join a WCS.

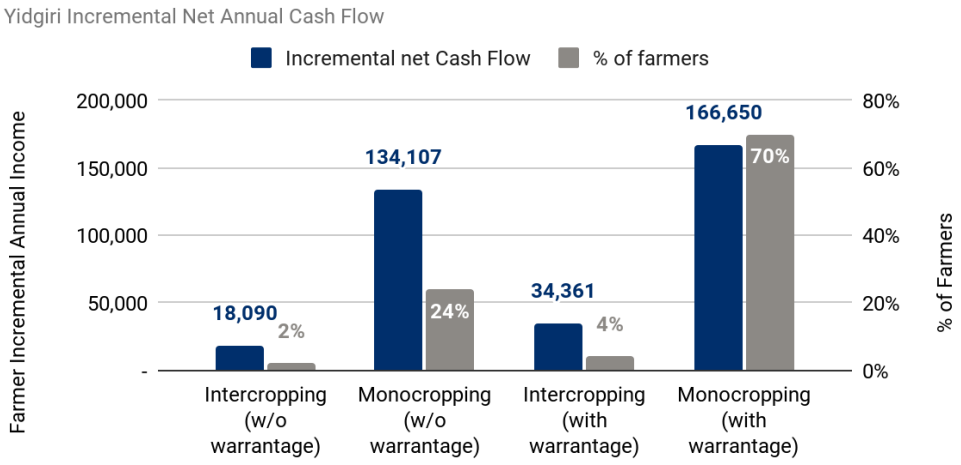

FIGURE 3-2. INCREMENTAL INCOME FOR COWPEA FARMERS WITH YIDGIRI

POULTRY - CHICKEN AND GUINEA FOWL

The financial returns to poultry production for a typical farmer diverge across the Yalwa and Yidgiri activities and according to animal type. Indeed, the financial returns to chicken production for a typical farmer are markedly different under the Yalwa and Yidgiri activities: Farmers are expected to experience a negative FNPV under Yalwa, but a strongly positive FNPV under Yidgiri. Conversely, the financial returns to guinea fowl production are (slightly) positive under Yalwa. Due to extremely limited primary survey data, the financial analysis for guinea fowl producers under Yidgiri is not reported.

An investigation of the annual "with project" cash flows reported by a typical chicken farmer is useful. Under the RISE II interventions, farmers benefiting from both Yalwa and Yidgiri report a positive net income or cash flow (**Figure 3-3**). However, the incremental impacts of the activities differ due to the incremental analysis and original point of comparison: Whereas a chicken farmer under Yalwa should experience a decline in farmer annual income compared to the before-Yalwa baseline, a typical chicken farmer has experienced a significant increase in income under Yidgiri. What accounts for the difference? The strongly negative financial returns to chicken production under Yalwa are rooted in a sharply higher feeding cost without significant increases in sales, which results in a lower net income. The exceptionally high financial returns to chicken production under Yidgiri are largely driven by strong increases in the production and sales of birds and eggs.

A key concern in interpreting the results across the poultry VCs is the reliability of estimating how mortality rates have changed under Yalwa and Yidgiri. This analysis should be interpreted with care as it is built on primary data that have been affected by atypical circumstances. An outbreak of avian flu affected poultry production in the Sahel in 2022, limiting the usefulness of a before-after analysis in the poultry VCs. In order to overcome these challenges, the authors attempted to triangulate data points surrounding bird productivity. In Burkina Faso, activity data was used to estimate how mortality rates improved. In Niger, secondary data estimates for mortality rates and how Yalwa impacted these rates were not available and so we could not estimate any significant improvements in mortality rates.

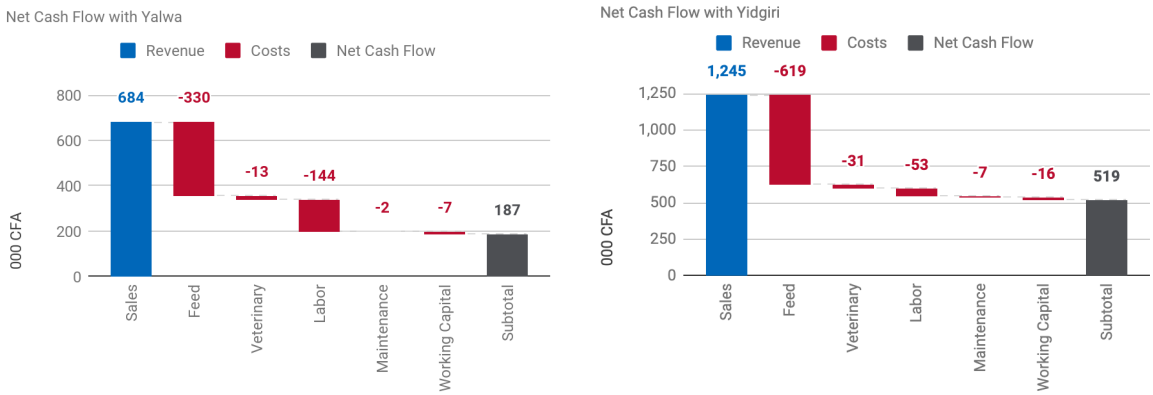

FIGURE 3-3. POULTRY-CHICKEN FARMER ANNUAL CASH FLOWS WITH RISE II IN NIGER (LEFT) AND BURKINA FASO (RIGHT)

SMALL RUMINANTS - GOATS AND SHEEP

The financial returns to small ruminant production vary according to activity and animal type. Financial returns are negative for both the typical farmer of goats and sheep under Yidgiri. However, a typical sheep farmer reports a positive FNPV under Yalwa, while a goat farmer reports a negative FNPV.

Regardless of the activity, sheep farmers appear to fare better than goat farmers. Under Yidgiri, the differences in performance between goat and sheep farmers results in a worse result for goat farmers: The typical goat farmer reports a relatively poorer performance than a typical sheep farmer, due to a weaker increase in revenues to offset rising costs of production. In Niger, a key difference in performance between goat and sheep farmers is the change in labor costs: Whereas the typical goat farmer reports a significant increase in household labor costs, the typical sheep farmer reports a reduction. *This reduction in the quantity of household labor required for small ruminant production is not consistent with the theory of change underpinning the Yalwa activity and represents an important consideration within the CBA models.*

For all small ruminant VCs, the cost of feeding is the most significant cost among small ruminant farmers and a major driver of the financial analysis. Attempts to increase herd size appear to have large implications for the costs of feeding in ways that appear to be infeasible for a typical farmer.

FINANCIAL RETURNS - PRODUCER ORGANIZATIONS

A limited analysis of the financial returns to a typical PO from its participation in RISE II activities offers insight into the longer-term sustainability of the RISE II interventions: These interventions may depend on the continued participation of POs to provide services such as aggregated purchase of inputs, coordination of WCS, and the organization of institutional and other sales of members' output.

Under Yalwa and Yidgiri alike, the financial analysis suggests that the typical PO is earning a positive FNPV (Table 3-2).[30] This evidence suggests that these POs should have a financial incentive - or at least not face a financial disincentive - to remain active in the market going forward.

TABLE 3-2. PRODUCER ORGANIZATIONS' FINANCIAL RETURNS BY ACTIVITY

	Yalwa (Niger)		Yidgiri (Burkina Faso)	
	FNPV (CFA)	IRR	FNPV (CFA)	IRR
Producer Organization	26,099,510	*N/A*	2,028,805	*N/A*

FINANCIAL RETURNS - VETERINARY SERVICE PROVIDERS

A limited analysis of the financial returns to a typical veterinary service provider from her or his participation in the selected RISE II activities offers insight into the longer-term sustainability of the Yalwa and Yidgiri activities, specifically within livestock VCs: These activities may depend on the continued availability of veterinary services within the market to serve livestock farmers. If, however, veterinary service providers are unable to earn a positive financial return from their activities, they may withdraw from the market, reducing the availability and increasing the cost of veterinary services available to rural livestock producers in the RISE II ZOIs.

Table 3-3 reveals that the typical veterinary service provider under Yalwa is earning a slightly negative FNPV over the life of the activity, which suggests that veterinary service providers may have a weak incentive to remain active in the market. The typical veterinary service provider reports slightly lower revenues than earned before their participation in Yalwa, based on the primary survey data; the magnitude of estimated losses suggests an opportunity for improved performance and course reversal. Yalwa activity managers could identify ways in which to expand the typical veterinary service provider's reach to deliver more visits, increasing their revenue (ideally without significantly increasing their fees charged to livestock producers) and thereby supporting the sustainability of Yalwa's investments in the poultry and small ruminants VCs. Under Yidgiri, the financial analysis suggests that the typical veterinary service provider is earning a positive FNPV. This evidence suggests that these veterinary service providers may have an incentive - or at least not face a financial disincentive - to remain active in the market going forward.

TABLE 3-3. VETERINARY SERVICE PROVIDERS' FINANCIAL RETURNS BY ACTIVITY

	Yalwa (Niger)		Yidgiri (Burkina Faso)	
	FNPV (CFA)	IRR	FNPV (CFA)	IRR
Veterinary Service Provider	(38,536)	*N/A*	1,578,806	*N/A*

[30] These results include an anomaly in the primary survey data, with the typical PO reporting that the unit price that it receives for cowpea crop residues and for poultry eggs is lower than the price paid to the PO members for these goods, suggesting that the PO is experiencing a loss for these aggregated sales organized on behalf of PO members. This anomaly does not apply to other outputs (cowpea grain) that are sold through the PO. This anomaly appears to contradict the theory of changing underpinning the Yalwa and Yidgiri interventions with respect to POs, and could suggest an issue for continued monitoring.

SUMMARY

The financial analysis, which builds on primary survey data, delivers mixed results for the typical farmer. Under Yalwa and Yidgiri alike, the returns for the typical cowpea farmer are consistently positive, though their magnitude depends both on cropping pattern and participation in a WCS. The typical chicken farmer under Yidgiri reports highly positive results, unlike under Yalwa; whereas the typical guinea fowl farmer enjoys a positive financial return under Yalwa. Under Yalwa, the typical sheep farmer enjoys a net benefit, whereas the typical goat farmer does not. The typical small ruminant farmer participating in the Yidgiri activity does not see significant benefits compared to her or his pre-RISE II situation. For those beneficiaries engaged at other stages in the target VCs - POs and veterinary service providers - the results of the financial analysis are generally positive.

The finding of any positive financial impact in terms of incremental income attributable to RISE II interventions is notable, insofar as it may conflict with evidence from other studies that reported worsening agricultural incomes in the Sahel in recent years. For example, a study from Burkina Faso found that agricultural producers broadly reported a reduction in agricultural revenues between 2019 and 2020 and again between 2020 and 2021, which the authors attribute to the effects of COVID-19 and related market closures and movement restrictions (Dejene *et al.*, 2021). A finding of a negative financial return is therefore consistent with wider evidence suggesting that shocks may have outweighed any positive effect of RISE II interventions; while a finding of a positive incremental financial impact attributable to RISE II interventions is all the more remarkable.

3.2 ECONOMIC ANALYSIS

Table 3-4 presents the economic returns to the selected RISE II activities, Yalwa and Yidgiri. These figures build on economic resource flows, which have been scaled for the number of beneficiaries per VC (and per scenario, within the cowpea VC) and discounted at the economic discount rate of 12 percent. These figures have been adjusted to reflect relevant market distortions and account for the cost of the USAID investment. Yalwa reports challenging activity-level performance, as reflected in a negative NPV figure at the activity level, particularly driven by losses in the goats and chicken VCs. Elsewhere, Yidgiri reports a positive NPV reflective of its activity-level performance, driven by exceptionally strong performances across the cowpea and chicken VCs that more than offset the weaker performance in the small ruminant VCs.

TABLE 3-4. ECONOMIC RETURNS BY ACTIVITY

	Yalwa (Niger)			***Yidgiri (Burkina Faso)***		
Value Chain	**Beneficiaries (#)**	**NPV (USD)**	**ERR**	**Beneficiaries (#)**	**NPV (USD)**	**ERR**
Cowpea	20,875	($2,641,826)	(4%)	36,581	$30,084,434	149%
Poultry - Chicken	10,256	($7,982,260)	(83%)	12,162	$30,683,303	*N/A*
Poultry - Guinea Fowl	3,419	($1,437,237)	*N/A*	776	*N/A*	*N/A*
Small Ruminants - Goats	9,912	($16,278,165)	(89%)	2,805	($2,203,964)	(63%)

TABLE 3-4. ECONOMIC RETURNS BY ACTIVITY						
	Yalwa (Niger)			*Yidgiri (Burkina Faso)*		
Value Chain	**Beneficiaries (#)**	**NPV (USD)**	**ERR**	**Beneficiaries (#)**	**NPV (USD)**	**ERR**
Small Ruminants - Sheep	6,888	$6,961,255	*N/A*	15,894	($4,919,415)	*N/A*
TOTAL	**51,350**	**($21,378,233)**	**(38%)**	**68,218**	**$53,644,357**	***N/A***

A comparison of the economic returns to the cowpea VCs is particularly interesting to consider, given that the financial analysis suggested positive returns to a typical farmer under selected scenarios. As reflected in Figure 3-2, the economic analysis finds that in the case of Yalwa, positive financial returns to farmers are insufficient to offset the cost of the intervention or deliver positive economic returns at the country level. In the case of Yidgiri, the strongly positive financial returns more than offset the cost of the intervention to deliver a positive economic return at the activity level (Figure 3-3).

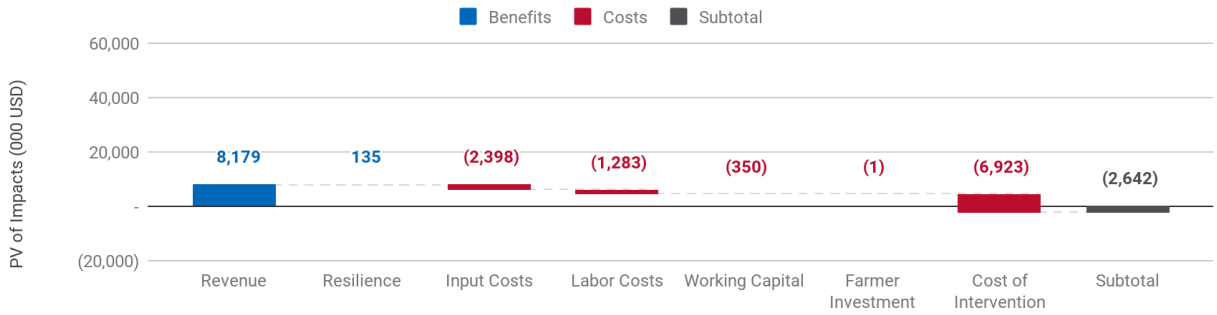

FIGURE 3-4. PV OF ACTIVITY-LEVEL IMPACTS IN NIGER - COWPEA VC

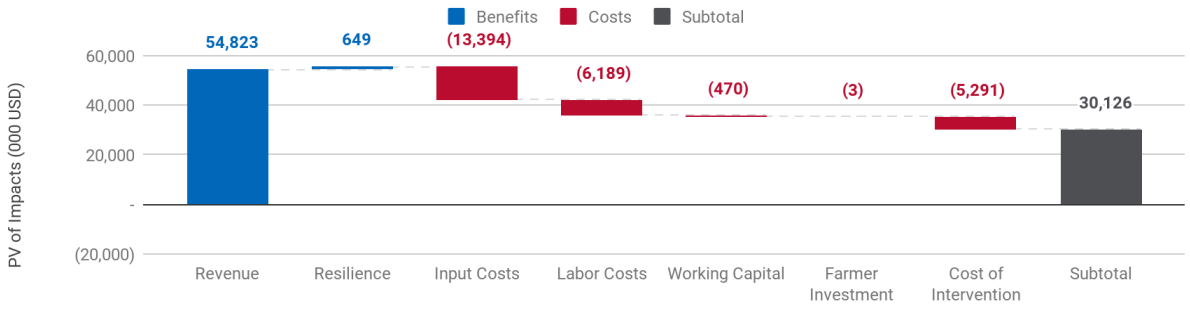

FIGURE 3-5. PV OF ACTIVITY-LEVEL IMPACTS IN BURKINA FASO - COWPEA VC

3.3 STAKEHOLDER ANALYSIS

GOVERNMENTS

Table 3-5 presents the estimated headline impact of the Yidgiri and Yalwa activities on the governments of Burkina Faso and Niger, respectively. The figures presented are the NPVs, discounted at the social discount rate (12 percent).

TABLE 3-5. GOVERNMENT FISCAL IMPACTS BY ACTIVITY

	Yalwa (Niger)		*Yidgiri (Burkina Faso)*	
Value Chain	**NPV (USD)**	**Cause of Externality**	**NPV (USD)**	**Cause of Externality**
Cowpea	$666,403	Tax on seeds & other inputs	($1,681,372)	Tax on seeds & other inputs Subsidy on fertilizer
Poultry - Chicken	($11,081)	Tax on feed & veterinary inputs	($214,884)	Tax on feed & veterinary inputs
Poultry - Guinea Fowl	($553)	Tax on feed & veterinary inputs	*N/A*	Tax on feed & veterinary inputs
Small Ruminants - Goats	($185,974)	Tax on feed & veterinary inputs	$81,040	Tax on feed & veterinary inputs
Small Ruminants - Sheep	$311,022	Tax on feed & veterinary inputs	$416,438	Tax on feed & veterinary inputs
TOTAL	**$779,818**		**($1,398,779)**	

GOVERNMENT OF NIGER

The GoN is expected to enjoy a net positive impact on its fiscal position as a result of the Yalwa activity. The GoN should collect higher incremental revenues associated with import taxes on inputs used in the production of cowpea and sheep. These should more than outweigh the lower incremental revenues attributable to lower import tax revenue due to a reduction in inputs used for the production of poultry and goats.

Note that this analysis assumes no effective public subsidy from the GoN on agricultural inputs received by farmer beneficiaries under RISE II.[31] This assumption may not accurately reflect the net impact of RISE II interventions on the fiscal balance of the GoN if subsidies are in fact delivered.

GOVERNMENT OF BURKINA FASO

The GoBF is expected to experience a net negative impact on its fiscal position as a result of the Yidgiri activity. Higher incremental revenues associated with the collection of import taxes on inputs for the production of small ruminants are expected to be outweighed by the lower incremental revenues associated with taxes on the (reduced) purchase of inputs for the production of poultry, as well as the

[31] See Annex 2 for a more detailed treatment of the public fertilizer support regime in Niger.

additional cost to the GoBF of public subsidies on fertilizer used in cowpea production. The results explicitly exclude any impact attributable to the guinea fowl VC, due to the lack of robustness of the underlying primary survey data and therefore the financial and economic analyses.

The analysis assumes a public subsidy on agricultural inputs received by farmer beneficiaries under RISE II.[32] This assumption may not accurately reflect the net impact of RISE II interventions on the fiscal balance of the GoBF if subsidies are not in fact delivered. For example, a recent study from Burkina Faso that found only 10% of farmers surveyed had received some form of economic assistance from governmental or non-governmental sources (*e.g.*, cash transfers or low-interest loans); among respondents to that survey, this proportion was higher among dairy producers than among crop producers (Dejene *et al.*, 2021).

The analysis may not precisely reflect the impact of RISE II interventions on the fiscal balance of the GoBF, insofar as temporary measures were introduced in a revised 2020 budget to provide relief in response to COVID-19. These measures included a reduction of import duties and VAT on essential items; a reduction in licensing fees for companies including in the transportation sector; and a further subsidy on agricultural inputs valued at FCFA 30 billion (Dejene *et al.*, 2021). Without further information on these fiscal measures, including the target of such measures, it is not possible to incorporate these into the CBA.

GENDER EQUITY AND SOCIAL INCLUSION

The impact of RISE II interventions on beneficiaries of focus - notably women and youth - encompasses quantitative analysis built on the CBA models and complementary qualitative analysis. This section addresses farmer beneficiaries.[33]

BENEFICIARY PROFILES AND INCOME IMPACTS

The proportion of women and youth among farmer beneficiaries who participated in the primary data collection, which is presented in **Figures 3-6 and 3-7**, is assumed to reasonably reflect their participation assuming a random sample of beneficiaries. The profile of the farmer beneficiaries reflects efforts to reach women beneficiaries, with women comprising more than half of farmer beneficiaries in most (but not all) value chains. However, these figures reflect some deviation from activity-level targets: For example, Yalwa has a target of 75 percent women beneficiaries,[34] but this level of participation is approached only within the small ruminants-goats VC. Yidgiri has a target of 60 percent of women beneficiaries,[35] and this level of participation is observed within the cowpea and small ruminants VCs but not in the poultry VCs. Similarly, the Yalwa and Yidgiri activities have intended to reach a minimum proportion of youth beneficiaries.[36] [37] Among farmer beneficiaries, the rate of youth participation is

[32] See Annex 2 for a more detailed treatment of the public fertilizer support regime in Burkina Faso.

[33] For a treatment of the gender and youth profile of non-farmer beneficiaries including PO respondents and veterinary service providers, please refer to the Data Collection Report.

[34] The Yalwa activity indicates a target of 75 percent women participants (CNFA, 2022b).

[35] The Yidgiri activity indicates a target of 60 percent of women participation among agricultural producers (CNFA, 2021 March 10).

[36] According to the USAID Youth in Development Policy, youth are defined as individuals within the cohort aged 10-29. According to national-level youth policies of Burkina Faso and Niger as well as the African Youth Charter, youth are defined as individuals between 15-35 years of age. Calculations are provided with respect to both definitions.

[37] The Yalwa activity indicates a target of 25 percent youth participants (CNFA, 2022b). Yidgiri activity documents reflect a target of 30 percent youth participation among agricultural producers (CNFA, 2021 March 10).

below target when applying the more conservative USAID definition of youth, with the exception of the poultry-guinea fowl VC under Yidgiri. [38]

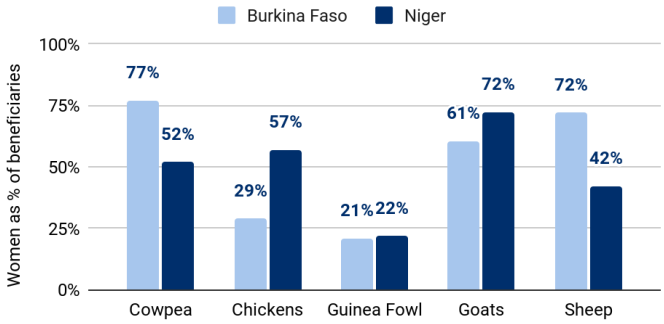

FIGURE 3-6. WOMEN'S PARTICIPATION AMONG FARMER SURVEY RESPONDENTS BY VC - YALWA ACTIVITY (NIGER) AND YIDGIRI ACTIVITY (BURKINA FASO)

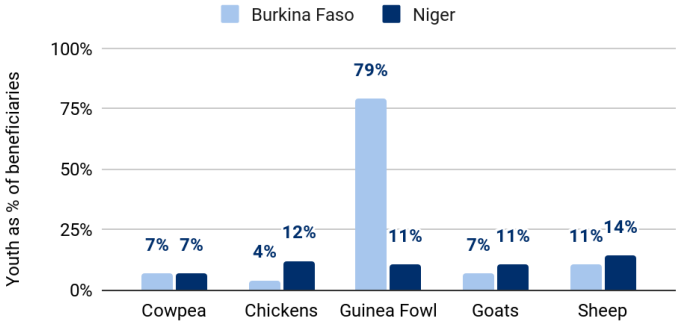

FIGURE 3-7. YOUTH PARTICIPATION AMONG FARMER SURVEY RESPONDENTS BY VC - YALWA ACTIVITY (NIGER) AND YIDGIRI ACTIVITY (BURKINA FASO)

Next, the analysis considers the magnitude of benefits delivered to women beneficiaries per VC. **Table 3-6** presents the aggregation of the FNPV of a typical beneficiary (*i.e.*, discounted at the farmer's discount rate) across all women beneficiary farmers.[39] This aggregation accounts for both the scale of net impact per VC, as well as the number of women beneficiaries per VC. Under Yalwa, the greatest positive impact on women's income is reported in the sheep VC, while negative results or financial losses for women are recorded in the chicken and goat VCs. Under Yidgiri, the cowpea and chicken VCs deliver net benefits for women beneficiaries though the women's benefits are significantly greater from the cowpea VC. Conversely, Yidgiri delivers net losses for women beneficiaries farming producing small ruminants. Note that this gendered stakeholder analysis excludes the guinea fowl VC from its calculations for Yidgiri, again due to the limited robustness of the primary data and financial analysis for this VC.

[38] The youth participation rate within the poultry - guinea fowl VC under Yidgiri is based on a very small number of observations (n = 13), and so should be interpreted with caution.

[39] The proportion of women beneficiaries is the proportion of women respondents to the farmer survey. The total number of women beneficiaries is calculated as the proportion of women beneficiaries multiplied by the target number of beneficiaries per VC.

By number, a majority of women beneficiaries should experience net financial benefits through their participation Yalwa based on activity performance to date. However, when aggregated across VCs, women beneficiaries under Yalwa capture a disproportionate share of the total net impacts (losses) to farmers,[40] due to their clustering in the chicken and goat VCs and their under-representation in the better performing cowpea, guinea fowl, and sheep VCs. This analysis further suggests that men beneficiaries are capturing a disproportionate share of net benefits, driven by their clustering in the sheep VC. This result appears to be consistent with the observation that Nigerien farmers may prefer to raise sheep over goats, as their higher status commands a higher market value. The reason for which women beneficiaries are clustered in goat production while men dominate sheep production is not immediately clear. Moreover, this gendered clustering is not fully consistent with secondary documents which suggest that Nigerien men typically produce large ruminants while women produce small ruminants (sheep and goats) (CNFA, 2015) though their husbands may tend to control the final sale of animals (Some, 2018). One possible explanation for the gendered clustering may be that men have become more engaged in higher-value or more commercially-oriented VCs such as sheep, though this remains to be confirmed.

Under Yidgiri, more than 70 percent of women beneficiaries (by number) should experience net financial benefits through their participation in the activity. When the value of net financial impacts is aggregated across VCs, we find that women beneficiaries account for 54percent of total net impacts (benefits) to farmers.[41] The disparity between women's rate of participation as beneficiaries and their relative share of aggregated benefits is driven by the clustering of women's participation in the lower-performing small ruminant VCs and their under-representation within the better performing chicken VC. [42]

TABLE 3-6. AGGREGATED NPV FOR WOMEN BENEFICIARIES BY ACTIVITY AND VALUE CHAIN (CFA)

VC	Women as Share of Beneficiaries (%)	Number of Women Beneficiaries (#)	FNPV (CFA)
Yalwa (Niger)			
Cowpea	52%	10,855	1,823,370,818
Poultry - Chicken	57%	5,846	(1,533,133,644)
Poultry - Guinea Fowl	22%	752	11,405,896
Small ruminants - Goats	72%	7,137	(8,125,420,690)
Small ruminants - Sheep	42%	2,893	3,541,076,078
TOTAL	**54%**	**27,483**	**(4,282,701,543)**
Yidgiri (Burkina Faso)			
Cowpea	77%	28,167	24,176,896,627

[40] Calculated as the ratio of the FNPV for women beneficiaries to the FNPV for all beneficiaries.
[41] Calculated as the ratio of the FNPV for women beneficiaries to the FNPV for all beneficiaries, excluding the guinea fowl VC.
[42] Women's rate of participation rises to 64 percent when the calculation excludes the guinea fowl VC.

TABLE 3-6. AGGREGATED NPV FOR WOMEN BENEFICIARIES BY ACTIVITY AND VALUE CHAIN (CFA)			
VC	**Women as Share of Beneficiaries (%)**	**Number of Women Beneficiaries (#)**	**FNPV (CFA)**
Poultry - Chicken	29%	3,527	7,647,241,882
Poultry - Guinea Fowl	21%	163	*N/A*
Small ruminants - Goats	67%	1,879	(713,417,588)
Small ruminants - Sheep	60%	9,536	(1,747,266,301)
TOTAL	**63%**	**43,272**	**29,363,454,620**

Similarly, the analysis considers the magnitude of benefits delivered to youth beneficiaries per VC. **Table 3-7** presents the aggregation of the FNPV of a typical beneficiary (*i.e.*, discounted at the farmer's discount rate) across all youth beneficiary farmers.[43] This aggregation accounts for both the scale of net impact per VC, as well as the number of youth beneficiaries per VC. This stakeholder analysis once again excludes the guinea fowl VC from its calculations for Yidgiri.

By number, some 56 percent of youth beneficiaries should experience net financial benefits through their participation in Yalwa based on activity performance to date. In terms of aggregation of net impacts across youth beneficiaries, Yalwa's greatest impact on youths' income is reported in the sheep VC followed by the cowpea VC, while negative results or financial losses for youth are recorded in the goat VC and chicken VCs. Of note, youth beneficiaries capture a disproportionate share of the total net benefits to farmers, particularly due to their clustering in the sheep VC; indeed, the net financial impacts captured by all youth beneficiaries are positive (benefits), while those captured by non-youth adults are negative (losses).

Under Yidgiri, approximately 68 percent of youth beneficiaries (by number) should experience net financial benefits through their participation in the activity based on performance to date.[44] Aggregating the net financial impacts across VCs, we find that the cowpea and chicken VCs deliver net benefits for youth beneficiaries though youths' benefits are greatest from the cowpea VC. However, youth beneficiaries producing small ruminants under Yidgiri experience net losses. When aggregated across VCs, youth beneficiaries under Yidgiri are found to capture only 5 percent of total net impacts (benefits) to farmers.[45] The gap between the rate of participation by youth beneficiaries and their relative share of aggregated benefits is driven in part by their low participation in the chicken VC. [46]

[43] The proportion of youth beneficiaries is the proportion of youth respondents to the farmer survey. The total number of youth beneficiaries is calculated as the proportion of youth beneficiaries multiplied by the target number of beneficiaries per VC.
[44] Calculated as the ratio of the number of beneficiaries enjoying a positive FNPV to the number of total beneficiaries, excluding the guinea fowl VC.
[45] Calculated as the ratio of the FNPV for youth beneficiaries to the FNPV for all beneficiaries, excluding the guinea fowl VC.
[46] The youth participation rate is approximately 7 percent, whether the calculation includes or excludes the guinea fowl VC.

TABLE 3-7. AGGREGATED NPV FOR YOUTH BENEFICIARIES BY ACTIVITY AND VALUE CHAIN			
VC	**Youth as Share of Beneficiaries (%)**	**Number of Youth Beneficiaries (#)**	**FNPV**
Yalwa (Niger)			
Cowpea	8%	1,670	294,552,551
Poultry - Chicken	12%	1,231	(322,764,978)
Poultry - Guinea Fowl	11%	376	5,702,948
Small ruminants - Goats	11%	1,090	(1,188,511,120)
Small ruminants - Sheep	14%	964	1,212,282,985
TOTAL	**10%**	**5,331**	**1,262,386**
Yidgiri (Burkina Faso)			
Cowpea	7%	2,561	2,197,899,693
Poultry - Chicken	4%	486	1,054,791,984
Poultry - Guinea Fowl	79%	613	*N/A*
Small ruminants - Goats	12%	337	(80,185,778)
Small ruminants - Sheep	7%	1,113	(266,943,463)
TOTAL	**7%**	**5,110**	**2,905,562,436**

PRODUCTION PARAMETERS BY GENDERED CONTROL OF INCOME

Additional analysis has been undertaken to assess whether key production parameters vary according to the gender of the farm household member who controls the income earned from the VC in question. This analysis is a useful complement to the gendered analysis of beneficiary incomes, presented above.

Within the survey of agricultural producers, participants indicated the household member responsible for controlling the income earned through each VC: adult male member of the household, adult female member of the household, child male member of the household, or child female member of the household. The number of responses to these questions varied by country and VC (ranging from 16 to 183 responses in Burkina Faso, and 12 to 83 responses in Niger). Tables 3-8 and 3-9 provide a comparison of selected, key production parameters for each VC disaggregated by the gender of the person responsible for controlling the income from the VC. Tables 3-8 and 3-9 show, for each key production parameter, the number of responses reported for each gender group, and the grouped

means.[47] Statistically significant differences in gender group means, determined through t-tests yielding a p-value lower than 5 percent, are also indicated. The analysis only considers adults, as few children were reported to control income in any VC. Results are grouped across livestock types (poultry and small ruminants); results for poultry production therefore reflect responses from guinea fowl producers.

In Burkina Faso, several key production parameters show statistically significant differences in the weighted mean value within income decision-making groups. Within the cowpea VC, households in which cowpea income is controlled by women used significantly more fertilizer and achieved significantly higher cowpea yields and sales value than households where cowpea income is controlled by men.[48] Conversely, within the livestock VCs, households in which poultry or small ruminant income is controlled by women reported significantly higher mortality rates of roosters and male ruminants than households where poultry or small ruminant income is controlled by men. The differences in mortality rates between female- and male-controlled income are particularly noteworthy given that the vaccination rates reported per group are comparable and high for the production of both poultry and ruminants. This suggests that something other than infectious disease may disproportionately lead to the early death of livestock when women control the income from livestock production.

TABLE 3-8. PRODUCTION PARAMETERS BY INCOME DECISION-MAKING GROUP (YIDGIRI)

Variable	Unit	Weighted mean within income decision-making group		Number of responses			weighted p-value (* p < 0.05)	
		Female	Male	Female	Male	Total		
Cowpea yield per ha	kg	393	228	24	40	64	0.0359	*
Cowpea yield per ha (pre-RISE II)	kg	199	180	93	90	183	0.5544	
Cowpea sales value per ha	CFA	130,542	50,500	23	41	64	0.0409	*
NPK fertilizer use per ha	kg	71	44	22	40	62	0.0287	*
Number of roosters produced	#	81	20	8	13	21	0.0643	
Number of hens produced	#	100	8.4	8	13	21	0.1667	
Rooster mortality rate	%	15%	1.3%	8	13	21	0.0010	*
Hen mortality rate	%	21%	11%	7	13	20	0.5131	
Poultry vaccination rate	%	100%	100%	7	9	16	0.5452	
Number of male ruminants produced	#	20	9.1	17	27	44	0.3003	
Number of female ruminants produced	#	7.0	4.4	17	27	44	0.4042	
Number of young ruminants produced	#	6.9	1.9	17	27	44	0.1449	
Adult male ruminant mortality rate	%	23%	0.72%	17	26	43	0.0117	*
Adult female ruminant mortality rate	%	12%	0.78%	11	25	36	0.1625	

[47] Since the reported values in this section are mean values, they are not directly comparable to the median values used to parameterize the CBA models.

[48] Of note, the means have not been controlled for possible differences in cropping pattern or the share of the plot dedicated to cowpea production.

TABLE 3-8. PRODUCTION PARAMETERS BY INCOME DECISION-MAKING GROUP (YIDGIRI)								
Variable	Unit	Weighted mean within income decision-making group		Number of responses			weighted p-value (* p < 0.05)	
		Female	Male	Female	Male	Total		
Young ruminant mortality rate	%	15%	0.06%	11	18	29	0.1695	
Small ruminants vaccination rate	%	95%	93%	17	27	44	0.7442	

In Niger, households in which cowpea income is controlled by women achieved significantly higher cowpea sales value than households where cowpea income is controlled by men, but no significant difference in with-project cowpea yields. Without the project (pre-RISE II), households where cowpea income was controlled by men reportedly achieved significantly higher yields than households where cowpea income was controlled by women. Comparing the with- and without-project differences in yields suggests that households in which women control the income from the cowpea VC have made relatively greater gains in yields than men since participating in RISE II.

TABLE 3-9. PRODUCTION PARAMETERS BY INCOME DECISION-MAKING GROUP (YALWA)								
Variable	Unit	Weighted mean within income decision-making group		Number of responses			weighted p-value (* p < 0.05)	
		Female	Male	Female	Male	Total		
Cowpea yield per ha	kg	324	248	12	12	24	0.3393	
Cowpea yield per ha (pre-RISE II)	kg	102	223	8	78	86	0.0482	*
Cowpea sales value per ha	CFA	21,635	6,286	15	11	26	0.0368	*
NPK fertilizer use per ha	kg	44	47	13	12	25	0.7984	
Number of roosters produced	#	11	3.9	6	10	16	0.0894	
Number of hens produced	#	9.0	12	6	12	18	0.4414	
Rooster mortality rate	%	23%	87%	5	8	13	0.1513	
Hen mortality rate	%	22%	27%	5	12	17	0.6336	
Poultry vaccination rate	%	100%	96%	2	10	12	0.4930	
Number of male ruminants produced	#	1.7	3.1	14	8	22	0.3374	
Number of female ruminants produced	#	3.9	6.9	14	8	22	0.3003	
Number of young ruminants produced	#	1.7	3.5	14	8	22	0.1555	
Adult male ruminant mortality rate	%	0%	24%	8	7	15	0.2935	
Adult female ruminant mortality rate	%	14%	5%	12	6	18	0.3510	
Young ruminant mortality rate	%	34%	0%	8	6	14	0.3198	

TABLE 3-9. PRODUCTION PARAMETERS BY INCOME DECISION-MAKING GROUP (YALWA)								
Variable	**Unit**	**Weighted mean within income decision-making group**		**Number of responses**			**weighted p-value (* p < 0.05)**	
		Female	**Male**	**Female**	**Male**	**Total**		
Small ruminants vaccination rate	%	85%	84%	14	8	22	0.9785	

INCREMENTAL LABOR IMPACTS

An important consideration within this analysis is the impact of the Yalwa and Yidgiri activities on labor, particularly household labor among farmer beneficiaries. Primary data reveals that the incremental labor required for the production of target crops and livestock under RISE II has varied across stakeholders, VCs, and countries (Figure 3-8 and Figure 3-9). Farmers use mainly family labor with a limited number of days being attributed to hired labor. This is consistent with recent evidence from Burkina Faso, which found that farmers reduced the amount of hired labor between 2019 and 2021 (Dejene *et al.*, 2021), although the specific reasons for this decrease were not explained within that study.

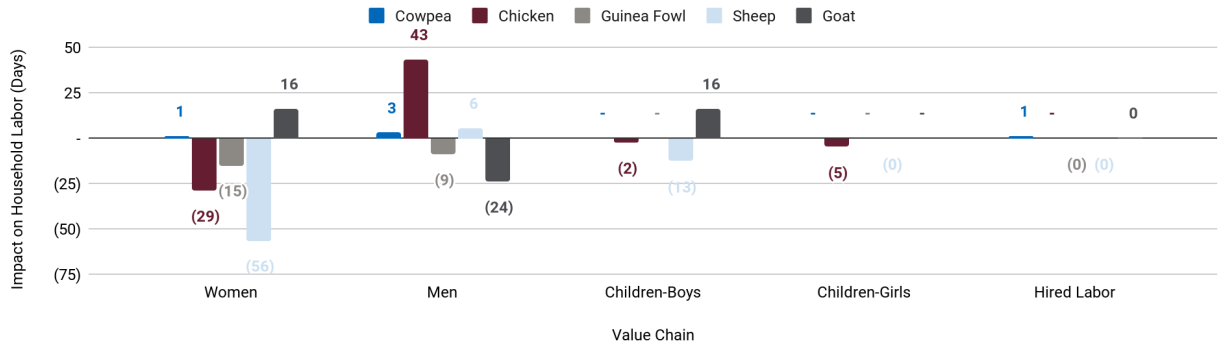

FIGURE 3-8. CHANGES IN HOUSEHOLD LABOR REQUIRED IN NIGER PER VC (DAYS PER YEAR)

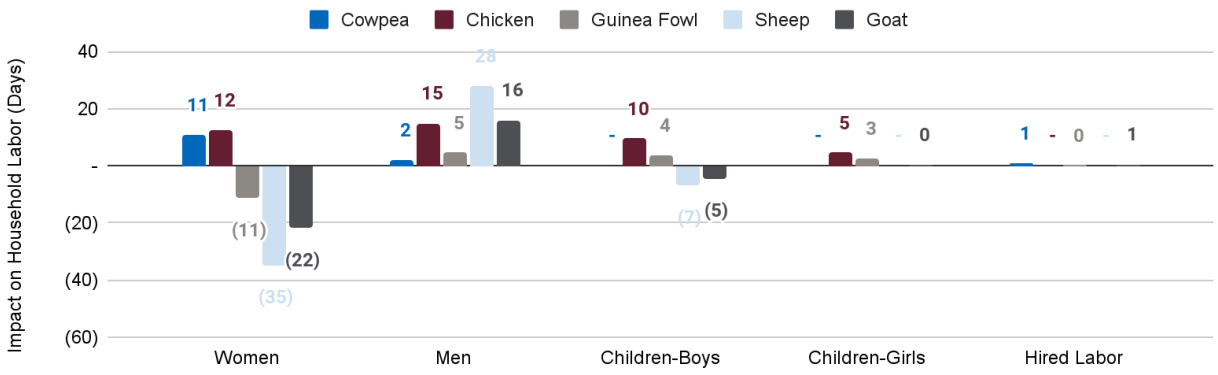

FIGURE 3-9. CHANGES IN HOUSEHOLD LABOR REQUIRED IN BURKINA FASO PER VC (DAYS PER YEAR)

Primary data generated from the survey of farmers participating in the Yalwa and Yidgiri activities offers insights into the possible effects of a change (increase or decrease) in household labor on adult females, girls (female children < 15 years), and boys (male children <15 years).[49]

Under Yidgiri, farming households consistently report changes that suggest they are benefiting from the Yidgiri activity. Since participating in the Yidgiri activity, women are reported to benefit financially from higher incomes earned and increased financial autonomy. Financial benefits reportedly have positive effects on children within their households who enjoy higher living standards, greater satisfaction of their basic needs (food, clothing), and expanded access to education. Respondents' relatively more pronounced mention of improvements in education versus nutrition is noteworthy and even surprising, given that the Yidgiri activity specifically seeks to improve nutritional status by stimulating demand for and consumption of more nutritious foods.[50] There is some indication that increased labor requirements for livestock production place a disproportionately greater burden on women, which may reduce their time available for other tasks including commercial and leisure activities; the survey responses offer little insight as to impacts on social activities that develop or maintain social networks, which are known to be important for women's and communities' resilience (Oasis Initiative *et al.*, 2018; Sagara & Smith, 2018). There is mixed evidence as to the impact of activities on the time of children under 15, with far more responses suggesting that children now enjoy additional time to pursue education or leisure; the most notable exceptions are clustered around children's time dedicated to the care of livestock (small ruminants), which was reported by a minority of respondents to have an important negative impact on boys' time available to pursue formal education.

In Niger, unlike in Burkina Faso, respondents producing cowpea, poultry, or small ruminants under Yalwa did not specifically report positive effects on household members that might be derived from higher incomes, such as women's financial empowerment or an improvement in living standards to the benefit of women or children in the household. The negative effects of the increase in household labor dedicated to agricultural production include a reduction in leisure and educational time for children, with potentially serious impacts on longer-term health, educational achievement, and social development.

[49] The data in fact reveal concurrent trends rather than definitive causal impact. See the Data Collection Report for a fuller treatment of these issues and underlying survey data.

[50] One of the three focus areas of the Yidgiri activity is to increase the consumption of nutritious, safe, and affordable foods by increasing demand for diverse food sources and by employing social behavior change interventions targeting women and youth (CNFA, 2022).

3.4 SENSITIVITY ANALYSIS

This section briefly presents the critical parameters that significantly affect the financial or economic analysis of RISE II interventions by VC. Because the model structures are generally consistent within a given VC, the critical parameters identified apply to Yalwa and Yidgiri alike.

Table 3-10 presents the critical parameters that drive the financial or economic analysis of the cowpea VC and their current values as applied within the CBA models for Yalwa and Yidgiri. **Table 3-11** presents the critical parameters that drive the financial or economic analysis of the poultry VCs and their current values as applied within the CBA models for Yalwa and Yidgiri. **Table 3-12** presents the critical parameters that drive the financial or economic analysis of the small ruminant VCs and their current values as applied within the CBA models for Yalwa and Yidgiri. The recommended ranges are stipulated to guide potential users to reasonable rates in the event they should wish to update the models to explore activity performance under different assumptions.

TABLE 3-10. CRITICAL PARAMETERS FOR SENSITIVITY ANALYSIS WITHIN CBA - COWPEA VC

Parameter	Impacts									Value		Recommended Range
	B1	B2	B3	C1	C2	C3	C4	C5	C6	Yalwa	Yidgiri	
Land Area Cultivated per Farmer (HA)	✓			✓	✓	✓				2	2	0.25 - 3
Cowpea Yields - with project (kg/HA)	✓	✓								250	300	150 - 800
Deviation in Expected Yield (%)	✓					✓				0%	0%	(25%) - 30%
Post-Harvest Losses - without project (%)	✓					✓				Cowpea: 4.0% Millet: 10.0% Sorghum: 10.0%	Cowpea: 14.0% Millet: 20.0% Sorghum: 20.0%	0% - 30%
Post-Harvest Losses - with project (%)	✓					✓				Cowpea: 0.0% Millet: 5.0% Sorghum: 5.0%	Cowpea: 8.3% Millet: 12.0% Sorghum: 12.0%	0% - 20%
Farmgate Prices (CFA/kg)	✓	✓	✓							Cowpea: 150 Millet: 237 Sorghum: 224	Cowpea: 485 Millet: 262 Sorghum: 200	Cowpea: 125 - 500 Millet: 200 - 400 Sorghum: 150 - 400
Deviation in Market Price (%)	✓					✓				0%	0%	(30%) - 60%
Premium on Price of Cowpea with Warrantage (%)	✓		✓					✓		18%	27%	0% - 100%
Participation in Warrantage Credit Scheme (%)	✓									4%	74%	0% - 100%
Deviation in Price of Farming Inputs (%)				✓						0%	0%	(20%) - 20%
Value of Family Labor as Proportion of Minimum Wage (%)					✓					50%	50%	25% - 75%
Frequency of Drought (Years)		✓								6	6	1 - 10

TABLE 3-11. CRITICAL PARAMETERS FOR SENSITIVITY ANALYSIS WITHIN CBA - POULTRY VCs

Parameter	Impacts								Value		Recommended Range
	B1	B2	C1	C2	C3	C4	C5	C6	Yalwa	Yidgiri	
Egg Off-Take (%)	✓	✓	✓	✓	✓		✓		Chicken: 31% Guinea Fowl: 33% (w/o), 67% (w)	Chicken: 0% Guinea Fowl: *N/A*	17% - 42%
Chick and Grower Mortality Rate (%)	✓	✓	✓	✓	✓		✓		Chicken: 13% Guinea Fowl: 20%	Chicken: 10% Guinea Fowl: *N/A*	1% - 99%
Adult Mortality Rate (%)	✓	✓	✓	✓	✓		✓		Chicken: 0% Guinea Fowl: 8%	Chicken: 10% Guinea Fowl: *N/A*	0.1% - 30%
Annual Manure Production per Bird (kg/bird)	✓	✓							Chicken: 1 Guinea Fowl: 1	Chicken: 4 Guinea Fowl: *N/A*	0.5 - 5
Price of Outputs - Chicken (CFA/unit)	✓	✓							Hen: 2,250 Cockerel: 2,750 Egg: 100 Manure: 200	Hen: 2,500 Cockerel: 3,000 Egg: 100 Manure: 30	Hen: 2,000 - 3,000 Cockerel: 2,500 - 3,500 Egg: 75 - 125 Manure: 25 - 250
Price of Outputs - Guinea Fowl (CFA/unit)	✓	✓							Hen: 2,250 Cockerel: 2,750 Egg: 100 Manure: 200	Hen: *N/A* Cockerel: *N/A* Egg: *N/A* Manure: *N/A*	Hen: 2,000 - 3,000 Cockerel: 2,500 - 4,000 Egg: 75 - 125 Manure: 25 - 250
Value of Family Labor as Proportion of Minimum Wage (%)					✓				50%	50%	25% - 75%
Frequency of Disease Outbreak (Years)		✓							7	7	1 - 10

TABLE 3-12. CRITICAL PARAMETERS FOR SENSITIVITY ANALYSIS WITHIN CBA - SMALL RUMINANT VCs

Parameter	Impacts										Value		Recommended Range
	B1	B2	B3	C1	C2	C3	C4	C5	C6	C7	Yalwa	Yidgiri	
Herd/Flock Size at Baseline (#)	✓	✓	✓	✓	✓	✓				✓	Goat: 4 Sheep: 3 (w/o), 5 (w)	Goat: 10 Sheep: 7	2 - 20
Young Ruminant (<1 Year) Mortality Rate (%)	✓	✓	✓	✓	✓	✓				✓	Goat: 10% (w/o), 6% (w) Sheep: 0%	Goat: 10% (w/o), 6% (w) Sheep: 15% (w/o), 7% (w)	1% - 50%
Adult Mortality Rate (%)	✓	✓	✓	✓	✓	✓				✓	Goat: 12% (w/o), 15% (w) Sheep: 25% (w/o), 0% (w)	Goat: 15% Sheep: 10%	1% - 30%
Proportion of Manure Used (%)	✓	✓									Goat: 1% Sheep: 3%	Goat: 2% Sheep: 3%	0% - 100%
Price of Milk (CFA/liter)	✓										Goat: 350 Sheep: 400	Goat: 750 Sheep: 1,000	200 - 1,200
Price of Manure (CFA/kg)	✓										Goat: 250 Sheep: 200	Goat: 150 Sheep: 250	100 - 300
Price of Animals - Goats (CFA/head)		✓	✓								Does: 28,500 Bucks: 18,500 Culled: 11,000	Does: 25,900 Bucks: 28,500 Culled:16,250	Does: 25,000 - 30,000 Bucks: 15,000 - 30,000 Culled: 10,000 - 20,000
Price of Animals - Sheep (CFA/head)		✓	✓								Ewes: 35,000 Rams: 60,000 Culled: 21,000	Ewes: 40,000 Rams: 72,500 Culled: 62,500	Ewes: 30,000 - 45,000 Rams: 50,000 - 80,000 Culled: 20,000 - 70,000
Quantity of Cereal Bran per head per day				✓							Does: 0.8 Bucks: 0.7 Ewes: 1.0 Rams: 0.5	Does: 1.5 Bucks: 1.5 Ewes: 1.5 Rams: 1.5	0.2 - 2
Value of Family Labor as Proportion of Minimum Wage (%)						✓					50%	50%	25% - 50%

3.5 ECOSYSTEM SERVICES

Ecosystem services (ES) are treated within the RISE II CBA activity in very limited form, focused on the greenhouse gas (GHG) emissions associated with small ruminant production under the Yalwa and Yidgiri activities.[51] The impact estimates, which apply secondary data for GHG emissions and the social cost of carbon in both Burkina Faso and Niger, determine that there is a negative impact of incremental livestock production.[52] **Table 3-13** presents the results of this analysis, expressing the NPV of the incremental GHG emissions at the country level (*i.e.*, aggregated across all beneficiaries). All figures are presented as negative figures, as they represent a cost to the country. The environmental impact (cost) associated with goat production is greater in magnitude than that attributed to sheep production under Yalwa, while the inverse is reported under Yidgiri. This result generally reflects the proportion of beneficiaries raising goats versus sheep under each activity (see **Table A3-1**).

TABLE 3-13. INCREMENTAL ES IMPACTS OF RISE II INTERVENTIONS VIA SMALL RUMINANT VCs (USD)

	Yalwa (Niger)	***Yidgiri (Burkina Faso)***
Small Ruminants - Goat	($148,160)	($1,148)
Small Ruminants - Sheep	($30,235)	($40,307)

Turning to ecosystem or environmental dependencies, the desk review has confirmed that dependencies on the environment underpin nearly all agricultural activities. The dependencies reported for the small ruminant VCs are a case in point as they are directly relevant to stakeholders' financial performance. While the dependencies on the environment have not been explicitly modeled within this CBA, a brief treatment and simple arithmetic exercise are offered here.

Yidgiri and Yalwa promote the use of improved feeds by small ruminant farmers, but average feed costs and daily quantity requirements reported in the primary survey are sufficiently high as to prevent the feasibility of year-round feeding of ruminants. Secondary sources suggest that ruminants are largely fed by grazing in communal lands, with supplementary feeding using improved livestock feed for brief periods to fatten ruminants prior to sale (USAID, 2016; Dan Gomma *et al.*, 2021). The CBA model, therefore, assumes that small ruminants are fed primarily by natural grazing, and are fed with commercial feed for fattening for a 90-day period prior to sale.[53] The continued dependence of small ruminant producers on grazing lands implies an ecosystem service dependency that can be valued based on the cost of the feed that producers would otherwise need to purchase for their livestock if grazing land were not available. These ecosystem service values are presented in **Figure 3-10** below. The figure compares small ruminant farmers' total costs of production "with" Yidgiri or Yalwa to the additional costs that small

[51] During the CBA methodology development phase of this RISE II CBA activity, the LEAP III team identified a set of ES dependencies and impacts associated with the selected RISE II interventions (Yalwa and Yidgiri) that could be valued in this CBA. During subsequent conversations with USAID, most of the identified ES dependencies and impacts were deprioritized and removed from the methodology. Nevertheless, the LEAP III team committed to provide a brief review of ES dependencies and impacts relevant to the Yalwa and Yidgiri activities, which is provided in Annex 4.

[52] Estimates of the cost of GHG emissions rely on estimates of the social cost of carbon as published by Ricke *et al.* (2018), which put the social cost of carbon at $2.521 per ton of carbon dioxide in Burkina Faso; and $2.856 per ton of carbon dioxide in Niger. Estimate refers to the median estimate of the social cost of carbon (Ricke *et al.*, 2018).

[53] The LEAP III team validated this assumption for Niger through personal communications Yalwa IP staff.

ruminant producers would incur if pasture land for ruminant grazing was unavailable. Specifically, these numbers represent the cost to replace pasture feeding with purchased (or own-sourced) inferior feed[54] (cowpea haulms). The estimates account for 275 days of feeding for ruminants that are sold (365 days less the 90-day improved feeding period which is already accounted for in the annual costs "with" the project) and 365 days of feeding for the balance of the herd.

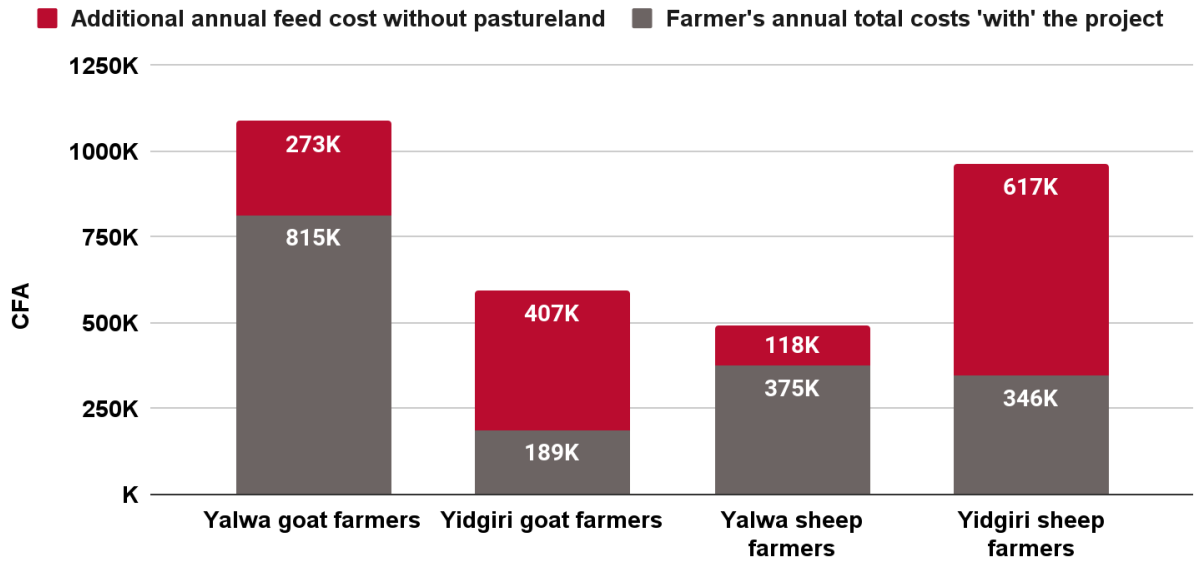

FIGURE 3-10. COST TO REPLACE PASTURE GRAZING WITH FEED COMPARED TO RUMINANT FARMERS' ANNUAL TOTAL COSTS WITH THE PROJECT

3.6 RESILIENCE ANALYSIS

The results of the quantitative resilience analysis are reflected within the financial analysis section presented above, insofar as the financial analysis incorporates the benefit corresponding to *B2: Improved Resilience in the Face of Shocks*. For the sake of clarity, the benefits modeled as B2 are isolated and presented explicitly in this section. The results of this analysis, expressing the present value of the incremental resilience impact at the household level (*i.e.*, for a typical beneficiary, discounted at the farmer's discount rate), are presented both in Figure 3-11 and Table 3-14. Comparatively, the resilience benefits delivered are lowest on a per-beneficiary basis within the poultry-guinea fowl VC (under Yalwa), and only slightly higher within the poultry-chicken VC and cowpea VC (under Yalwa and Yidgiri). The resilience benefits are highest for the small ruminants VCs, though this is largely due to the way in which resilience benefits are modeled: The calculation of resilience benefits estimates that small ruminant producers gain from the reduction in animal mortality associated with improved veterinary services, which are recorded in every year as opposed to only during the years when a drought (cowpea) or outbreak of Newcastle disease (poultry) occurs.

[54] The values are calculated using the average quantity of both types of feed (improved feed and cowpea haulms) per animal per day reported by survey participants, and the average price of cowpea haulms reported by survey participants.

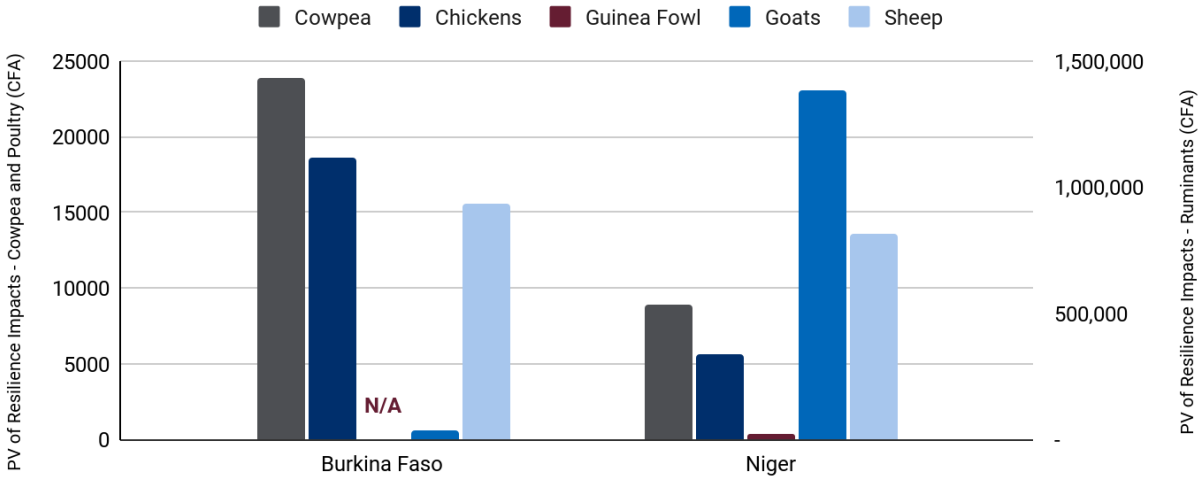

FIGURE 3-11. PRESENT VALUE OF RESILIENCE IMPACTS [55]

TABLE 3-14. INCREMENTAL RESILIENCE IMPACTS OF RISE II INTERVENTIONS BY VC (CFA)

	Yalwa (Niger)	*Yidgiri (Burkina Faso)*
Cowpea		
Intercropping >> Intercropping	8,077	15,624
Intercropping >> Monocropping	13,627	12,421
Monocropping >> Monocropping	7,676	20,631
Poultry - Chicken	5,672	18,624
Poultry - Guinea Fowl	311	*N/A*
Small Ruminants - Goat	1,383,241	33,456
Small Ruminants - Sheep	811,135	932,834

Useful to inform this analysis is a brief treatment of primary survey data inquiring whether farmers had obtained or held agricultural insurance against risks such as inclement weather or pests. Results are grouped across livestock types (poultry and small ruminants); results for poultry production therefore reflect responses from guinea fowl producers. The results, presented in Table 3-15, reveal higher rates of insurance coverage among farmers in Burkina Faso than in Niger, where nearly no farmers reported holding agricultural risk insurance.

[55] The figure presents the present value of resilience impacts for an average cowpea farmer to account for differences in cropping patterns.

TABLE 3-15. PROPORTION OF FARMERS HOLDING AGRICULTURAL INSURANCE IN PAST 12 MONTHS BY VC		
	Yalwa (Niger)	***Yidgiri (Burkina Faso)***
Cowpea	0.0%	10.3%
Poultry	0.2%	1.3%
Small Ruminants	0.8%	11.2%

3.7 LIMITATIONS

These CBA models are based on a rigorous methodology but remain subject to several limitations that may tend to exaggerate costs while understating benefits. While the USAID investment cost has been carefully considered in light of expenditure data (see **Annex 3**), it has not been possible to exclude activity costs that are not directly associated with increases in farmer incomes resulting from the Yidgiri or Yalwa activities. Separately, the calculation of benefits may be understated due to the exclusion of selected non-income benefits (*e.g.*, improvements in literacy or nutrition) from the CBA models. Additionally, the benefits may be subject to downward bias as a result of the reliance on primary data that is subject to recall error (including seasonality considerations); that lacks a true counterfactual (the data represents a "before and after" intervention comparison); and that is indicative of mid-term rather than full-term performance. As additional data on activity performance becomes available, the CBA models could be updated to more accurately reflect the tally of costs and benefits generated by the Yalwa and Yidgiri activities.

Two major knowledge gaps are present in these findings. First, Yidgiri and Yalwa seek to generate additional benefits (including literacy and nutrition) that are not quantified in this analysis.[56] Second, the value of household labor is both unknown and highly influential over the results of the analysis. The following figures demonstrate the influence of these knowledge gaps on the CBA findings. **Figure 3-12** shows that, even if there is no opportunity cost of household labor, stakeholders would still have experienced an economic decline since the start of Yalwa. However, if the economic value of the unquantified benefits (nutrition and literacy) of Yalwa exceeds $21 million, then Yalwa would be on track to generate net economic benefits through improvements in the financial performance of farmer beneficiaries. **Figure 3-13** shows that the positive findings observed for Yidgiri are robust even if the true opportunity cost of beneficiaries' time is much higher than assumed in this analysis.

[56] The LEAP III team had proposed to quantify additional environmental and nutritional impacts in the original RISE II CBA methodology, but excluded those from the final CBA methodology at the request of USAID.

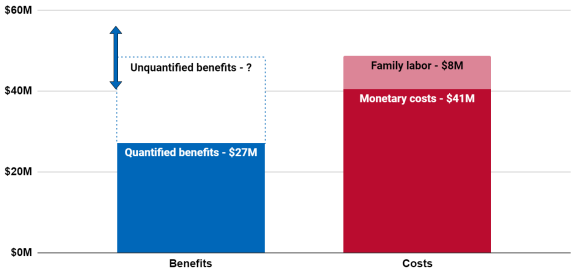

FIGURE 3-12. INFLUENCE OF KNOWLEDGE GAPS ON YALWA FINDINGS

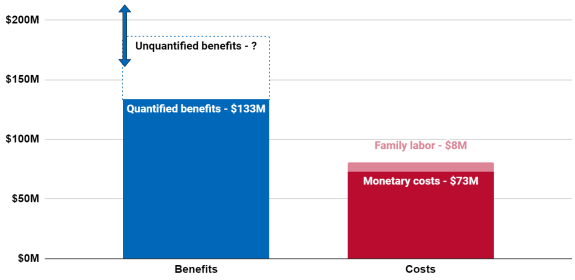

FIGURE 3-13. INFLUENCE OF KNOWLEDGE GAPS ON YIDGIRI FINDINGS

4. CONCLUSIONS AND RECOMMENDATIONS

This section briefly summarizes key results elaborated in Section 3, which are used to derive the conclusions and recommendations that follow within this section. The CBA models assess the economic and financial performance of both the Yalwa and Yidgiri activities. These analyses provide evidence to conclude that the Yidgiri activity is on track to deliver the intended benefits at the activity level or for most beneficiaries; and that the Yalwa activity is not yet delivering the intended net benefits at the activity level, despite generating net benefits for some but not yet all beneficiaries. This analysis highlights the difficult and complex challenges of assisting these beneficiaries - particularly farmers - as they face low crop yields, high animal mortality rates, and high costs of inputs such as fertilizers and feed relative to their earnings. In this way, these results are perhaps unsurprising, as the conclusions drawn confirm the general observation that the Sahel is an exceptionally challenging environment for agricultural producers and related VC actors.

YALWA

This CBA finds that the Yalwa activity, which supports farmers and other VC actors in three regions of Niger, is on track to deliver mixed results for its farmer and non-farmer beneficiaries. Financial analysis shows that not every typical farmer participating in the Yalwa activity will enjoy a positive impact from that participation: A farmer producing chicken or goats reports a negative return, while a farmer producing cowpea, guinea fowl, or sheep enjoys a positive return. For a cowpea farmer, the financial returns are positive and vary widely depending on her or his former and current cropping pattern and participation in a WCS. For non-farmer beneficiaries, the results are similarly mixed: The average PO reports a positive financial return, while a veterinary service provider reports a negative financial return that could provide a disincentive to remain operating in the market.

The economic analysis, which reflects Yalwa's performance across its more than 50,000 beneficiary farmers, incorporates USAID's investment cost and accounts for major economic distortions and (for small ruminant VCs only) selected environmental externalities. This analysis suggests that Yalwa delivers a negative ENPV, particularly driven by the negative performance recorded in the chicken and goat VCs.

Considering women and youth beneficiaries, Yalwa's impact builds on the financial analysis for a typical farmer. Aggregation across all women or youth beneficiaries accounts for both the scale of net impact per VC, as well as the differential rates of participation by women and youth across VC, and reveals divergent results. Women beneficiaries under Yalwa account for a disproportionate share of total net impacts (losses) to all farmers. However, when aggregated across VCs, youth beneficiaries under Yalwa enjoy net benefits whereas non-youth farmers record net losses. Both results are driven by women and youth beneficiaries' relative participation in the high-performing sheep VC.

Finally, according to the stakeholder analysis conducted as part of this CBA, the GoN is expected to experience a net positive impact on its fiscal position as a result of the Yalwa activity: The GoN is projected to collect higher incremental revenues associated with import taxes on agricultural inputs used by Yalwa farmer beneficiaries.

YIDGIRI

This CBA finds that the Yidgiri activity, which supports farmers and other VC actors in three regions of Burkina Faso, also delivers mixed results for its beneficiaries. Financial analysis shows that the typical farmer beneficiary under Yidgiri will not consistently enjoy a positive impact from that participation: A farmer producing cowpea or chicken should enjoy a positive financial return while producers of small ruminants are projected to incur losses. For a cowpea farmer, the magnitude of those positive financial returns varies widely depending on her or his former and current cropping pattern and participation in a WCS. For non-farmer beneficiaries, the results are consistently positive: A typical PO and veterinary service provider both report a positive financial return, suggesting an incentive to remain in operation within the sector.

The economic analysis reflects Yidgiri's performance across approximately 68,000 beneficiary farmers while accounting for both USAID's investment cost (excepting for the guinea fowl VC), major economic distortions, and (for the small ruminant VCs) selected environmental externalities. This analysis suggests that Yidgiri delivers a positive ENPV, driven by the strongly positive performance recorded in the cowpea and chicken VCs.

Considering women and youth beneficiaries, Yidgiri's impact builds on the financial analysis for a typical farmer. Aggregation across all women or youth beneficiaries, which accounts for the scale of net impact per VC and the differential rates of participation by women and youth across VCs, reveals that these beneficiary groups enjoy positive net impacts that nevertheless fall below their rate of participation in the activity. Women beneficiaries under Yidgiri capture 54 percent of the total net impacts (benefits) to farmers, less than their proportionate share as they are under-represented in the better-performing chicken VC. Similarly, when aggregated across VCs, youth beneficiaries under Yidgiri capture only 5 percent of the total net impacts (benefits) to farmers, again because of their under-representation in the chicken VC.

Finally, according to the stakeholder analysis conducted as part of this CBA, the GoBF is expected to experience a net negative impact on its fiscal position as a result of the Yidgiri activity. Notably, the incremental cost of fertilizer subsidies available to cowpea producers is estimated to outweigh the collection of higher incremental revenues associated with import taxes on agricultural inputs.

RQ1

Are the targeted activities (Yidgiri and Yalwa) effective uses of USAID funding?

Economic analysis suggests that the Yidgiri activity is on track to deliver net economic benefits at the activity level. The Yidgiri activity reports a positive ENPV (**Figure 4-1**), suggesting that it represents an effective use of USAID funding. These net economic benefits are driven by the primary data which suggest that many farmers have adopted improved practices that increased their crop yields or livestock production, generating higher revenues that exceed their increased costs of production. The primary survey data that form the basis of the economic analysis thereby suggests that most farmers are better off compared to their position before the implementation of the Yidgiri activity.

Conversely, economic analysis finds that the Yalwa activity is not yet delivering net economic benefits at the activity level. Yalwa is currently on track to deliver a negative ENPV (**Figure 4-2**). Under Yalwa,

USAID funding could be used more effectively if farmer-level performance could be improved through reductions in their input or labor costs, increases in benefits including revenues, or both.

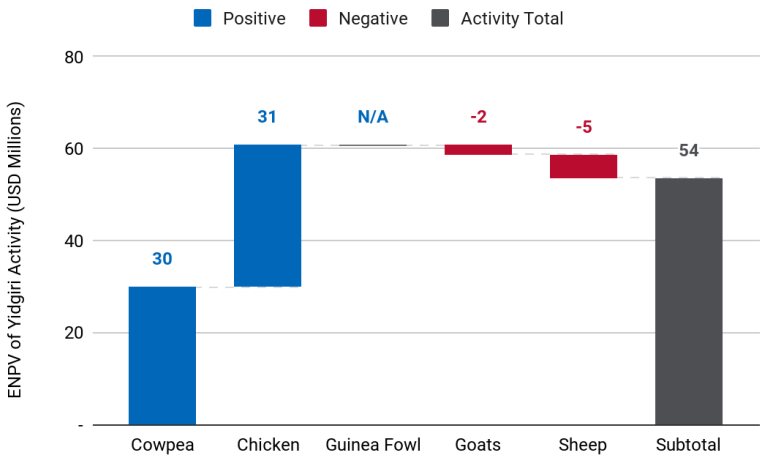

FIGURE 4-1. ENPV OF YIDGIRI ACTIVITY (USD MILLIONS)

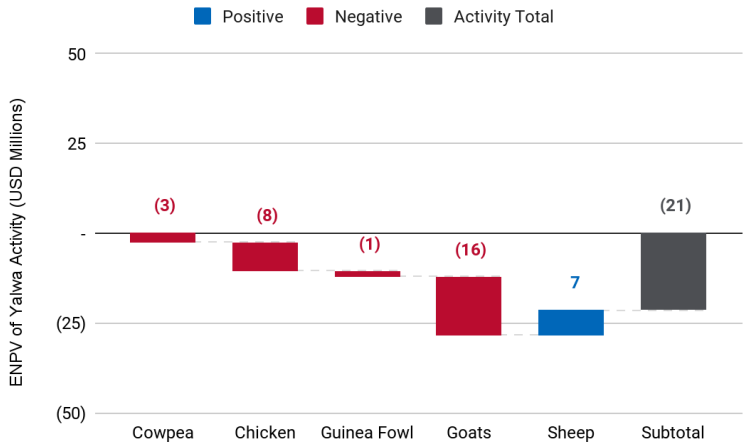

FIGURE 4-2. ENPV OF YALWA ACTIVITY (USD MILLIONS)

Based on these conclusions, it is recommended that USAID and IPs continue to assess the performance of the Yalwa and Yidgiri activities by applying updated data to the CBA models, whether data generated from ongoing or planned data collection efforts or by collecting additional data to address perceived data gaps or weaknesses. By updating the models into the future, including to reflect activity performance beyond mid-2022, the CBA models can help USAID and IPs to assess the economic performance of the Yalwa and Yidgiri and make a clearer and more robust assessment of the effectiveness of USAID development funding.

RQ2

Are the targeted activities (Yidgiri and Yalwa) generating benefits, from a societal (i.e., economic) perspective and from a stakeholder (i.e., financial) perspective?

The Yidgiri activity appears to generate net benefits from a societal (economic) perspective when aggregated across VCs: The net benefits generated from the cowpea and poultry-chicken VCs exceed the net costs generated within the small ruminant VCs. From a stakeholder (financial) perspective, the Yidgiri activity similarly generates net benefits for a typical farmer in the cowpea and poultry-chicken VCs but not for a farmer producing small ruminants (Figure 4-3). Looking to the non-farmer beneficiaries, the Yidgiri activity additionally appears to generate net benefits for other actors in the same VCs including POs and veterinary service providers.

The Yalwa activity does not yet generate net benefits from a societal (economic) perspective, though performance varies across the VCs targeted. The net benefits generated within the small ruminants-sheep VC fall short of the net costs generated within the cowpea, poultry, and small ruminants-goat VCs. The Yalwa activity generates net benefits from a stakeholder (financial) perspective for farmers in the cowpea, poultry-guinea fowl, and small ruminants-sheep VCs but not those in the chicken or goat VCs (Figure 4-3). As for non-farmer beneficiaries, the Yalwa activity is on track to deliver net benefits for POs but not for veterinary service providers.

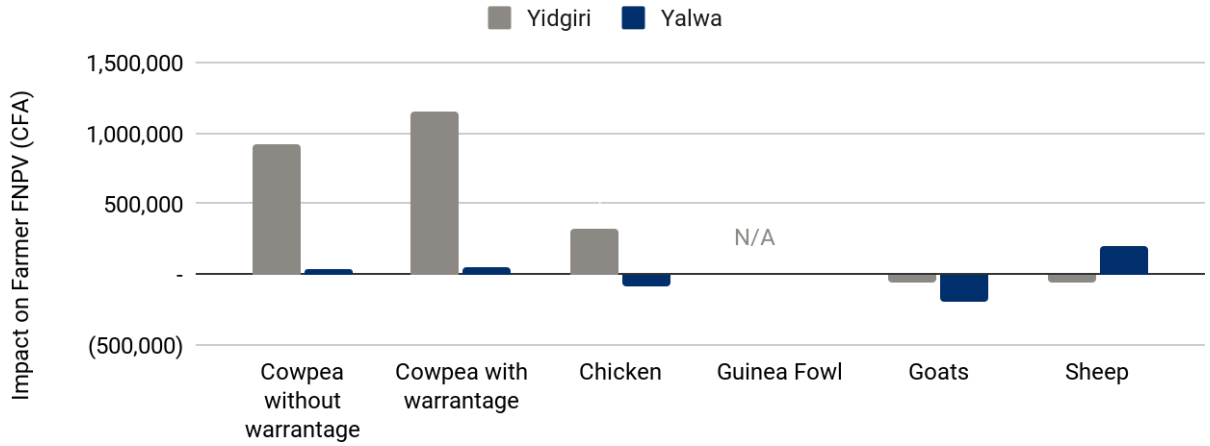

FIGURE 4-3. IMPACT OF YALWA AND YIDGIRI ACTIVITIES ON FARMERS (FNPV OVER 10 YEARS)

The CBA of the Yalwa and Yidgiri activities suggests some strong areas of activity performance in generating benefits from both a societal and stakeholder perspective while identifying other areas where performance appears to be lagging. Given that headline performance is inhibited by very difficult operational circumstances and that benefits may be understated within this analysis, the fact that the Yidgiri activity is on track to generate net benefits from a societal perspective is even more remarkable. That said, both activities have areas for improvement. To that end, it is recommended that USAID and IPs continue to monitor performance with a particular focus on those VCs that are not yet generating benefits from either an economic or financial perspective. To improve performance at the stakeholder level, IP activity managers could focus on those VCs and their corresponding critical parameters that may be under their control or influence (see RQ5); improvements at the farmer level should help boost economic benefits at an activity level.

RQ3

How are the net impacts of the targeted activities (Yidgiri and Yalwa) affected by net impacts and dependencies on the environment?

The net impacts of the Yidgiri and Yalwa activities are not significantly affected by the subset of net impacts on the environment that were included within this CBA. This conclusion holds at both the activity level and at the level of the small ruminant VCs, which are the only VCs for which environmental impacts associated with incremental GHG emissions were estimated.

As the dependencies on the environment have not been explicitly modeled within the CBA, it is therefore not possible to determine their influence on the net impacts of the Yidgiri or Yalwa activities. Nevertheless, dependencies on the environment underpin nearly all agricultural activities. Under the Yalwa and Yidgiri activities, these dependencies are most notable for the small ruminant VCs: Small ruminant production in Niger and Burkina Faso depends heavily on the ecosystem services provided by communal pasturelands for small ruminant grazing. Therefore, a key concern for both Yidgiri and Yalwa is the extent to which farmers may continue to rely on pasturelands for small ruminant grazing in the face of increased competition for land access and use; any decline in access to pastureland would require farmers to feed their ruminants from other sources, which could undermine the feasibility of small ruminant production.

Because the environmental impacts that have been modeled within this CBA - the costs associated with incremental GHG emissions - do not significantly affect the overall performance of the Yidgiri and Yalwa activities, there is no basis to recommend any significant change to the current implementation of either activity. However, if the (modeled) environmental impacts are modest, environmental dependencies are critical to activity performance. Accordingly, it is recommended that any plan to expand the Yidgiri or Yalwa activities should revisit the environmental impacts and dependencies and explore cooperation with other activities under the RISE II Initiative focused on the management of applicable natural resources such as pastureland.

RQ4

To what extent are the targeted activities (Yidgiri and Yalwa) generating benefits for women and youth stakeholders?

This analysis finds that both Yidgiri and Yalwa generate net benefits for youth stakeholders. Yidgiri also generates net benefits for women stakeholders. These conclusions are supported by the aggregation of net impacts across women and youth beneficiaries - specifically farmer beneficiaries - at the activity level.

At the activity level, Yidgiri generates net benefits for both women and youth stakeholders, specifically women and youth farmers. This conclusion is supported by the finding that Yidgiri generates a positive FNPV when aggregated across all women beneficiaries and across all youth beneficiaries. This result is driven by strongly positive returns enjoyed by women and youth farmers producing cowpea and chicken, outweighing negative returns calculated for women and youth farmers producing small ruminants.

Similarly, the Yalwa activity generates net benefits for youth stakeholders at the activity level as reflected in a positive FNPV when aggregated across all youth farmers. This result is driven by positive returns

enjoyed by youth farmers producing cowpea and sheep, exceeding the negative returns calculated for youth farmers producing chicken and goats. However, the Yalwa activity does not generate net benefits for women beneficiaries at the activity level: Women beneficiaries' participation is concentrated in the chicken and goat VCs, where the typical farmer experiences negative returns, outweighing the cumulative positive benefits reported for women farmers producing cowpea or sheep.

The targeted activities could generate increased benefits for women and youth stakeholders, specifically agricultural producers, by increasing the rates of women and youth participation in those VCs for which farmer beneficiaries experience positive financial impacts. Yidgiri and Yalwa activity managers could redouble efforts to reach activity targets for women to comprise 60-75 percent of beneficiaries and youth to comprise 25-30 percent of beneficiaries over the remaining life of the activities. For those VCs in which farmer beneficiaries experience negative financial impacts, Yidgiri and Yalwa activity managers could work to deliver positive financial impacts for farmers by identifying and working to address weak areas of performance (see RQ5 below).

RQ5

From a programmatic perspective, which are the key parameters to target to ensure the delivery of net benefits to stakeholders?

From a programmatic perspective, Yidgiri and Yalwa activity managers should continue to monitor those parameters that have a significant effect on CBA results.

- Cowpea VC: Key parameters to monitor include farmers' crop yields, crop prices, input costs (both volumes and unit prices), and participation and price premiums associated with participation in a WCS.
- Poultry VCs: Key parameters to monitor include animal production parameters including animal mortality, input costs (especially for feed and veterinary services), and market prices for production outputs including eggs and birds.
- Small Ruminant VCs: Key parameters to monitor include animal production parameters such as animal productivity and mortality, input costs (especially for feed volumes and prices and veterinary services), and market prices for animals, milk, and manure.

Concerning the cowpea VC, the lessons for activity managers concerning WCS participation appear to be consistent across the Yalwa and Yidgiri activities: Participating in a WCS is associated with higher financial returns for farmers, regardless of cropping pattern. Under Yalwa, the very low rate of WCS participation among beneficiary farmers suggests significant scope for activity managers to encourage WCS adoption to increase farmer incomes and boost activity-level performance. Under Yidgiri, activity managers should similarly assess whether and how the expansion of WCS participation could increase the magnitude of farmers' financial benefits.

Concerning the poultry-chicken VC, Yalwa activity managers should explore and potentially address farmers' apparent preferences around whether to sell or consume eggs or to use them for the production of adult birds. Concerning the poultry-guinea fowl VC, Yidgiri activity managers should utilize data collection efforts to update the CBA model and identify areas of strength or weakness within the performance of farmers within the VC. Sensitivity analysis preliminarily suggests that production and mortality rates are particularly important to assess financial performance and thus the potential delivery of net benefits to farmer beneficiaries within the guinea fowl VC.

Concerning the small ruminants VCs, Yalwa and Yidgiri activity managers could work with farmers to optimize the use of manure, a potentially important source of income if sold on the market (or a source of value if used on the farm). Sensitivity analysis suggests that increasing the usage rate of manure (whether used on farm or sold on the market) could be a potentially important source of income for farmers in addition to the value currently earned from the direct sale of animals.

Finally, the economic analysis of Yidgiri and Yalwa performance hinges on the aggregation of benefits across the target number of beneficiaries. Yidgiri and Yalwa activity managers should continue to recruit farmer participation within their respective activities in line with established beneficiary targets, even prioritizing the recruitment of farmers to those VCs that offer the greatest potential to deliver net financial benefits as well as to achieve stakeholder participation targets among women and youth.

REFERENCES

AFP. (2022, March 30). "More than 2 million people threatened by the food crisis in Burkina Faso." *Africa Live*. Retrieved from: https://africa.cgtn.com/2022/03/30/more-than-2-million-people-threatened-by-the-food-crisis-in-burkina-faso/.

Ahmaduzzaman, M. (2020). "Peste des petits ruminants (PPR) in Africa and Asia: A systematic review and meta-analysis of the prevalence in sheep and goats between 1969 and 2018." *Veterinary Medicine and Science* 6(4): 813-833. DOI: 10.1002/vms3.300

Anderson, L., &; Gugerty, M. K. (2011). "Environmental Implications of Livestock Series: Goats." *Evans School Policy Analysis and Research (EPAR)*, (No. 156), 1–14. Retrieved August 3, 2022.

Bankova, D., Kumar Dutta, P., & Ovaska, M. (2022, May 30). "The War in Ukraine is fuelling a global food crisis." *Reuters*. Retrieved from: https://graphics.reuters.com/UKRAINE-CRISIS/FOOD/zjvqkgomjvx/.

Bassi, J.A., Dugje, I.Y., & Aminu, D. (2018). "Agronomic performances of pearl millet (*Pennisetum glaucum* L.) R. Br.) varieties intercropped with legumes in Sahelian Savanna of Nigeria." *Journal of Agricultural and Crop Research* 7(11): 194-203. DOI: 10.33495/jacr_v7i11.17.138

Cadmus Group LLC; & Sun Mountain International, LLC. (2018a). "2017 Burkina Faso Tropical Forest and Biodiversity (FAA 118/119) Assessment." Prepared under USAID Global Environmental Management Support Project (GEMS II).

Cadmus Group LLC; & Sun Mountain International, LLC. (2018b). "2017 Niger Tropical Forest and Biodiversity (FAA 118/119) Assessment." Prepared under USAID Global Environmental Management Support Project (GEMS II).

CNFA. (2021a). "The USAID Yidgiri Activity: Fiscal Year (FY) 2021, Annual Progress Report (October 1, 2020 - September 30, 2021)."

CNFA. (2021b). "The USAID Yidgiri Activity: Fiscal Year (FY) 2022, FY22 Annual Work Plan (October 1, 2021 - September 30, 2022)."

CNFA. (2021, October 28 (2021c)). "The USAID Yalwa Activity: Fiscal Year (FY) 2022, Annual Work Plan (October 1, 2021 - September 30, 2022), Abridged Version."

CNFA. (2016, August 31 (2016a)). "Resilience and Economic Growth in the Sahel - Accelerated Growth (REGIS-AG) Value Chain and End Market Assessment: Cowpea." Report to USAID.

CNFA. (2016, August 31 (2016b)). "Resilience and Economic Growth in the Sahel - Accelerated Growth (REGIS-AG) Value Chain and End Market Assessment: Poultry." Report to USAID.

CNFA. (2016, August 31 (2016c)). "Resilience and Economic Growth in the Sahel - Accelerated Growth (REGIS-AG) Value Chain and End Market Assessment: Small Ruminants." Report to USAID.

CNFA. (2015). "Resilience and Economic Growth in the Sahel - Accelerated Growth (REGIS-AG) Project in Niger and Burkina Faso: Gender Integration Plan." Report to USAID.

Coulibaly, Pane Jeanne d'Arc; Ouattara, Badiori; Gaiser, Thomas; Worou, Nadine; TOndoh, Ebagnerin; Okae-Anti, Daniel; & Sedogo, Michel Papaoba. (2018). "Cropping two sorghum varieties under

irrigation, an intensification strategy to mitigate climate change induced effect in Burkina Faso, West Africa." *International Journal of Agriculture and Environmental Research* 4(3). ISSN: 2455-6939.

CRI. (n.d.). "RISE I CBA Model - Poultry - Burkina Faso." CBA model prepared for USAID.

CRI. (n.d.). "RISE I CBA Model - Small Ruminants - Burkina Faso." CBA model prepared for USAID.

Dejene, Samson; Kabir, Razin; Minot, Nicholas; Nabwire, Leocardia; Narayanan, Sudha; Rice, Brendan; van Campenhout, Bjorn; & Vos, Rob. (2021). "Impact of COVID-19 on food value chains in Bangladesh, Burkina Faso, and Uganda." *IFPRI Working Paper*.

Dinev, I. (2012). *CEVA Hand Book of Poultry Diseases*. CEVA & INEV.

Don Gomma, Abdou; Issa, Salissou; Gambo, Yahoussa; Abdou, Mahamadou Malam. (September 2021). "Technical and economic evaluation of three (3) feed formulas based on local resources for the fattening of red goats in Maradi in Niger." *International Journal of Innovation and Applied Studies*.

Elkin, E. & Gebre, S. (2022, May 1). "Can the World Feed Itself? Historic Fertilizer Crunch Threatens Food Security." *Bloomberg*. Retrieved from: https://www.bloomberg.com/news/articles/2022-05-01/farmers-are-struggling-to-keep-up-food-supply-as-fertilizer-prices-surge.

FAO. (2022). "GIEWS Country Brief - Burkina Faso." 2022 March 11.

Gardes, F. & Thiombiano, N. (2017). "The value of time and expenditures of rural households in Burkina Faso: a domestic production framework." *CES Working Papers* 2017(27). Paris: Universite Paris 1 Pantheon Sorbonne. Retrieved from: https://halshs.archives-ouvertes.fr/halshs-01535172/document. halshs-01535172f.

IFDC. (2022). "Fertilizer Sector Reform Project in Niger (PARSEN)." Retrieved from: https://ifdc.org/projects/fertilizer-sector-reform-support-project-in-niger-parsen/.

Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4), Working Group 1 (WG1), Chapter 2, Changes in Atmospheric Constituents and in Radiative Forcing, Table 2.14, page 212, https://www.ipcc.ch/report/ar4/syr/

Kashi, B., Simpson, D., Simón, C., Higgins, M., Manion, N., Bruner, A. (2018). "Integrating Ecosystem Values into Cost-Benefit Analysis: Recommendations for USAID and Practitioners." Retrieved from: https://www.conservation-strategy.org/sites/default/files/field-file/Integrating_Ecosystem_Values_into_Cost-Benefit_Analysis-Recommendations_for_USAID_and_Practitioners.pdf

Koigi, B. (2020, August 10). "Fertilizer Reform in Niger: An Important Step toward Food Security." *Africa Agribusiness*. Retrieved from: https://africabusinesscommunities.com/agribusiness/features/fertilizer-reform-in-niger-an-important-step-toward-food-security/.

Kuo, C-Y., Salci, S., & Jenkins, G.P. (2015). "Measuring the Foreign Exchange Premium and the Premium for Non-Tradable Outlays for 20 Countries in Africa." *South African Journal of Economics* 83(2): 269-285. DOI: 10.1111/saje.12068.

Laborde, D. & Mamun, A. (2022). *Food and fertilizer restrictions during the Ukraine-Russia crisis.* Dataset [accessed: 2022, July 4]. Retrieved from:

https://docs.google.com/spreadsheets/d/e/2PACX-1vTBH0AbRa8aL-E6uHtsiRBwx5-ZuGUExikKSaQoxh7sYYJFtekOGQClUPblyUZpqyW27USuyqzCQNf6/pub?gid=296608313&single=true&output=csv

Mantip, S.E., Shamaki, D., & Farougou, S. (2019). "Peste des petits ruminants in Africa: Meta-analysis of the virus in isolation in molecular epidemiology studies." *Onderstepoort Journal of Veterinary Research* 86(1): a1677. DOI: 10.4102/ojvr.v86i1.1677

Millennium Ecosystem Assessment. (2005). "Ecosystems and Human Well-being: Synthesis." Island Press, Washington, DC. https://www.millenniumassessment.org/documents/document.356.aspx.pdf

Moussa, B., Nkonya, E., Meyer, S., Kato, E., Johnson, T., & Hawkins, J. (2016). "Economics of Land Degradation and Improvement in Niger." In: Nkonya, E., Mirzabaev, A., & von Braun, J. (eds), *Economics of Land Degradation and Improvement - A Global Assessment for Sustainable Development*. Springer, Cham. DOI: 10.1007/978-3-319-19168-3_17.

Oasis Initiative; University of California, Berkeley; & SAREL. (2018). "Women's Empowerment and Resilience in Niger: An Ethnographic Study." USAID. https://pdf.usaid.gov/pdf_docs/PA00TFXV.pdf

OIE. (2022). "Country Disease Dashboard." Retrieved from: https://wahis.oie.int/#/dashboards/country-or-disease-dashboard [accessed 2022, May 25].

OIE. (2022b). "Listed Disease: Peste des petits ruminants." Retrieved from: https://www.woah.org/en/disease/peste-des-petits-ruminants/ [accessed 2022, May 26].

OIE. (2019). "Chapter 3.7.9. Peste des Petits Ruminants (Infection with Peste des Petits Ruminants Virus)." *OIE Terrestrial Manual 2019*. Retrieved from: https://www.woah.org/fileadmin/Home/eng/Health_standards/tahm/3.07.09_PPR.pdf.

Oumarou, Halilou; Falalou, Hamidou. (2015). "Water use, transpiration efficiency and yield in cowpea (*Vigna unguiculata*) and peanut (*Arachis hypogaea*) across water regimes." *Crop and Pasture Science* 66(7). DOI: 10.1071/CP14182. Retrieved from: https://www.researchgate.net/publication/279164132_Water_use_transpiration_efficiency_and_yield_in_cowpea_Vigna_unguiculata_and_peanut_Arachis_hypogaea_across_water_regimes

Ricke, K., Drouet, L., Caldeira, K., & Tavoni, M. (2018). "Country-level Social Cost of Carbon." *Nature Climate Change*. DOI: 10.1038/s41558-018-0282-y. Available at: https://country-level-scc.github.io/explorer/.

Sagara, Brad. (2018). "Resilience Measurement Practical Guidance Note Series 2: Measuring Shocks and Stresses." Produced by Mercy Corps as part of the Resilience Evaluation, Analysis and Learning (REAL) Associate Award. https://www.fsnnetwork.org/sites/default/files/2020-10/Resilience%20Measurement%20Practical%20Guidance%20Series%202.pdf

Sagara, B. & Smith, L. (2018). "Resilience Measurement Practical Guidance Note Series 4: Resilience Analysis." Produced by Mercy Corps as part of the Resilience Evaluation, Analysis and Learning (REAL) Associate Award. Retrieved from: https://www.fsnnetwork.org/sites/default/files/2020-10/Resilience%20Measurement%20Practical%20Guidance%20Note%20Series%204.pdf.

Saif, Y.M., Fadly, A.M., Glisson, J.R., McDougald, L.R., Nolan, L.K., & Swayne, D.E. (2008). *Diseases of Poultry, 12th Edition*. Wiley-Blackwell.

Sanou, Josias, Bationo, Babou Andre, Barry, Silamana, Nabie, Loyehoun Dorothee, Bayala, Jules, & Zougmore, Robert. (2016). "Combiing soil fertilization, cropping systems and improved varieties to minimized climate risks on farming productivity in northern region of Burkina Faso." *Agriculture & Food Security* 5(20):

Schubert, Kristen. (2020). *Resilience Measurement Practical Guidance Note Series 7: Cost-Benefit Analysis (CBA) in Resilience Programming.* Produced by Mercy Corps as part of the Resilience Evaluation, Analysis and Learning (REAL) Associate Award. https://www.fsnnetwork.org/sites/default/files/2021-01/GN07_Cost-Benefit%20Analysis%20in%20Resilience%20Programming_Final_0.pdf

Sedeik, M.E., Elbestawy, A.R., El-shall, N.A., Abd El-Hack, M.E., Saadeldin, I.M., & Swelum, A.A. (2019). "Comparative efficacy of commercial inactivated Newcastle disease virus vaccines against Newcastle disease virus genotype VII in broiler chickens." *Poultry Science* 98(5): 2000-2007. DOI: 10.3382/ps/pey559

Smith, L., Brown, D., Hedley, D., & Frankenberger, T. (2021). "Resilience in the Sahel-Enhanced (RISE) Program Impact Evaluation: Endline Survey Report, Volume I." Washington, DC: Resilience Evaluation, Analysis, and Learning (REAL) Associate Award.

Smith, L.; Frankenberger, Tim. 2020. "Resilience in the Sahel-Enhanced (RISE) Program Impact Evaluation: Report of a Recurrent Monitoring Survey." Produced by TANGO International and Save the Children as part of the Resilience Evaluation, Analysis and Learning (REAL) Associate Award.

Some, Batamaka. (2018, July). "Resilience in the Sahel Enhanced (RISE) II Gender Analysis." Retrieved from: https://pdf.usaid.gov/pdf_docs/PA00T7JP.pdf.

Stem, C. (1993). "An economic analysis of the prevention of peste des petits ruminants in Nigerien goats." *Preventive Veterinary Medicine* 16: 141-150. DOI: 10.1016/0167-5877(93)90084-7.

Tarnagda, Z., Yougbare, I., Kam, A., Theta, M.C., & Ouedraogo, J.B. (2011). "Prevalence of infectious bronchitis and Newcastle disease virus among domestic and wild birds in H5N1 outbreaks areas." *Journal of Infection in Developing Countries* 5(8): 565-570. DOI: 10.3855/jidc.1441

The Mitchell Group, Inc.; Institut de Management Conseils et Formation; & McCauley, John. (2016, March). "Sahel Resilience Learning (SAREL): RISE Baseline Survey Report, March 2016 (Revised Version)." Sahel Resilience Learning (SAREL) Project.

Theriault, V., Smale, M., & Haider, H. (2018). "Economic incentives to use fertilizer on maize under differing agro-ecological conditions in Burkina Faso." *Food Security* 10: 1263-1277. DOI: 10.1007/s12571-018-0842-z.

USAID. (2020a). "Cooperative Agreement No. 72068520CA00001: Yidgiri Cooperative Agreement."

USAID. (2020b). "Cooperative Agreement No. 72068520CA00003: Yalwa Cooperative Agreement."

USAID. (2020c). "Niger Markets and Nutrition Supplemental Initial Environmental Examination."

USAID. (2019). "RISE II Supplemental Initial Environmental Examination - Burkina Faso."

USAID. (2018). "Resilience in the Sahel Enhanced (RISE) II Project Appraisal Document."

USAID. (2016). "Value Chain and End Market Assessment - Small Ruminants." https://www.usaid.gov/sites/default/files/documents/1867/USAID_REGIS-AG_Small_Ruminant_Value_Chain_and_End_Market_Assessment.pdf

Watt, Jenny; Peyrow, Kamin; Schmidt, Stephanie; & Kashi, Bahman. (2017). "Integrating Gender in Cost-Benefit and Cost-Effectiveness Analysis: Final Report." Learning, Evaluation, and Analysis Project - II.

Whittington, Dale, & Cook, Joseph. (2019). "Valuing Changes in Time Use in Low-and Middle-income Countries." *Journal of Benefit-Cost Analysis* 10(S1): 51-72. DOI:10.1017/bca.2018.21

Wilkins, Henry. (2022, February 17). "Terrorist Cattle Rustling Part of Toxic Mix of Food Insecurity in Sahel." *Voice of America*. Retrieved from: https://www.voanews.com/a/terrorist-cattle-rustling-part-of-toxic-mix-of-food-insecurity-in-sahel/6446556.html.

World Bank. (2021). *Niger Spring 2021 Economic Update: Maximizing Public Expenditure Efficiency for Rebuilding Better*. World Bank, Washington, DC. World Bank. Retrieved from: https://openknowledge.worldbank.org/handle/10986/35901. License: CC BY 3.0 IGO.

World Bank. (2021). "Inflation, consumer prices (annual %) - Burkina Faso." DataBank. https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=BF [retrieved A2022, August 8].

World Bank. (2020). "Implementation Completion and Results Report IDA-H5210, IDA-H9740, TF-17447 in the Amount of US$113.05 Million Equivalent to the Burkina Faso Agricultural Productivity and Food Security Project." *World Bank*. Retrieved from: https://www.gafspfund.org/sites/default/files/inline-files/Burkina-Faso-Agricultural-Productivity-and-Food-Security-Project.pdf.

World Bank (n.d). "Climate Change Knowledge Portal - Burkina Faso: Vulnerability." https://climateknowledgeportal.worldbank.org/country/burkina-faso/vulnerability [retrieved 2022, August 10].

World Bank. (n.d.). "Exchange rate (LCU per US$, period average) - Burkina Faso." DataBank. https://data.worldbank.org/indicator/PA.NUS.FCRF?locations=BF [retrieved 2022, August 2].

World Bank. (n.d.). "Exchange rate (LCU per US$, period average) - Niger." DataBank. https://data.worldbank.org/indicator/PA.NUS.FCRF?locations=NE [retrieved 2022, August 11].

WTO. (2017). "Trade Policy Review: Members of the West African Economic and Monetary Union (WAEMU) - Annex 2: Burkina Faso." *World Trade Organization*. Retrieved from: https://www.wto.org/english/tratop_e/tpr_e/s362-02_e.pdf.

WTO. (2017b). "Trade Policy Review: Members of the West African Economic and Monetary Union (WAEMU) - Annex 6: Niger." *World Trade Organization*. Retrieved from: https://www.wto.org/english/tratop_e/tpr_e/s362-06_e.pdf.

WTO. (n.d.). "Burkina Faso - Tariffs and Imports: Summary and duty ranges." Retrieved from: https://www.wto.org/english/res_e/statis_e/daily_update_e/tariff_profiles/BF_E.PDF.

WTO. (n.d.). "Niger - Tariffs and Imports: Summary and duty ranges." Retrieved from: https://www.wto.org/english/res_e/statis_e/daily_update_e/tariff_profiles/NE_E.pdf.

ANNEX 1. CBA METHODOLOGY

The CBA methodology tables are presented in a separate annex document due to their large size.

ANNEX 2. TREATMENT OF MARKET DISTORTIONS

Economic analysis is used to evaluate the benefits and costs accruing to society as a whole. Economic analysis differs from financial analysis in its valuation of resources: While financial analysis relies on market prices to value inputs and outputs, economic analysis adjusts market prices to account for known market distortions including trade tariffs, taxes, and subsidies.

COMMODITY-SPECIFIC CONVERSION FACTORS AND DIRECT MARKET DISTORTIONS

The CBA of RISE I incorporated the use of commodity-specific conversion factors (CSCFs) into the economic analysis to account for market distortions to the prices of inputs and outputs. These CSCFs generally reflected modest market distortions (Table A2-1) attributable to taxes and subsidies applied by the governments of Burkina Faso and Niger. However, the basis on which these CSCFs were calculated and the sources of data underpinning their calculation were not fully notated, complicating the ability of the LEAP III team to verify and update them.

TABLE A2-1 MEAN AND RANGE OF COMMODITY-SPECIFIC CONVERSION FACTORS APPLIED WITHIN RISE I MODELS

	Burkina Faso	Niger
Cowpea *mean* *range*	0.993 [57] 0.848-1.236	1.006 [58] 0.855-1.243
Poultry *mean* *range*	0.933 0.739-1.000	0.933 0.739-1.000
Small Ruminants *mean* *range*	0.900 0.749-1.000	0.898 0.7434-1.000

The RISE II CBA activity has integrated the market distortions directly into the calculation of each benefit or cost and deliberately omitted the re-calculation and application of CSCFs for several reasons:

- An up-to-date database of CSCFs is not available for either Burkina Faso or Niger.
- Recent, reliable data that would be necessary to calculate CSCFs directly is similarly unavailable for either Burkina Faso or Niger. For example, the calculation of foreign exchange premiums (FEP) and non-tradeable premiums (NTP) produced by Kuo *et al.* (2015) does not include either Burkina Faso or Niger.

[57] The RISE I models applied CSCFs that varied depending on whether the major crop output (cowpea) is assumed to be exportable or importable. In Burkina Faso, the mean CSCF for the cowpea VC is 0.993 under the base case scenario, when cowpea is treated as an exportable good; the CSCF for the cowpea VC is 0.985 when cowpea is treated as an importable good.

[58] The RISE I models applied CSCFs that varied depending on whether the major crop output (cowpea) is assumed to be exportable or importable. In Niger, the mean CSCF for the cowpea VC is 1.006 under the base case scenario, when cowpea is treated as an exportable good; the CSCF for the cowpea VC is 0.998 when cowpea is treated as an importable good.

- A review of the available calculations from the RISE I CBA suggests that the introduction of CSCFs should not introduce material differences to the economic analysis from the more streamlined approach described below.
- Any loss of precision in the economic analysis is justified by delivering CBA models that omit "black box" calculations in favor of transparency for end-users, which is understood to be a major objective of the CBA of RISE II.

Instead, the CBA for the RISE II investments takes a transparent and pragmatic approach to economic analysis: Financial cash flows have been adjusted to account for direct tariffs, taxes, and subsidies specific to major inputs and outputs relevant to the Yalwa and Yidgiri activities. This represents a more transparent and easily understood approach to economic analysis than was applied in the CBA of RISE I, which more than offsets the potential loss in precision to the economic analysis.

Table A2-2 presents the distortions affecting the major inputs and outputs of the VCs relevant to the RISE II interventions, which have been identified to date.

TABLE A2-2. DIRECT MARKET DISTORTIONS

	Yalwa (Niger)	Yidgiri (Burkina Faso)	Data Sources
OUTPUTS			
Agricultural goods - import tariff - simple average MFN applied	15.3%	15.8%	Niger: WTO (n.d.) Burkina Faso: WTO (n.d.)
Agricultural goods - export tariff	3%[59]	N/A	Niger: WTO (2017b)
Cowpea - customs duty[60]	0%	0%	Niger: CNFA (2016) Burkina Faso: CNFA (2016)
Cowpea - import fees[61]	0%	0%	Niger: CNFA (2016) Burkina Faso: CNFA (2016)
Cowpea - value added tax[62]	0%	0%	Niger: CNFA (2016) Burkina Faso: CNFA (2016)
Cereals & preparations - import tariff - average MFN applied[63]	13.6%	13.6%	Niger: WTO (n.d.) Burkina Faso: WTO (n.d)
Poultry - customs duty[64] [65]	0%	0%	Niger: CNFA (2016b) Burkina Faso: CNFA (2016b)

[59] In Niger, this export duty is termed a "statistical export charge" and is applied to all products exported except for minerals, calculated on the basis of CIF value with a minimum unit value determined by the Nigerien authorities. The minimum unit values are intended to generate a minimum amount of revenue from export taxes; and, accordingly,, the minimum unit values may be well below the market value (WTO, 2017b).

[60] This rate is applied to ECOWAS member states.

[61] This rate is applied to ECOWAS member states.

[62] This rate is applied to ECOWAS member states.

[63] Cowpeas (HS 071335) are understood to fall under the "Cereals & preparations" product group.

[64] This rate is applied to ECOWAS member states.

[65] HS codes: live chickens (HS 01051199 and HS 01059400); live guinea fowl (HS 01051500 and HS 01059950).

TABLE A2-2. DIRECT MARKET DISTORTIONS			
	Yalwa (Niger)	**Yidgiri (Burkina Faso)**	**Data Sources**
Poultry - import fees[66]	0%	0%	Niger: CNFA (2016b) Burkina Faso: CNFA (2016b)
Poultry - value added tax[67]	0%	0%	Niger: CNFA (2016b) Burkina Faso: CNFA (2016b)
Poultry - export tax	*see "Agricultural goods - export tariff"*	CFA 50 per head [68]	Burkina Faso: WTO (2017)
Poultry meat - customs duty	20%-35%	20%-35%	Niger: CNFA (2016b) Burkina Faso: CNFA (2016b)
Small ruminants - customs duty[69] [70]	0%	0%	Niger: CNFA (2016c) Burkina Faso: CNFA (2016c)
Small ruminants - import fees[71]	0%	0%	Niger: CNFA (2016c) Burkina Faso: CNFA (2016c)
Small ruminants - value added tax[72]	0%	0%	Niger: CNFA (2016c) Burkina Faso: CNFA (2016c)
Small ruminants - export tax[73]	*see "Agricultural goods - export tariff"*	CFA 250 per head[74]	Burkina Faso: WTO (2017)
Value added tax	19%	18%	Niger: WTO (2017b) Burkina Faso: CNFA (2016)
INPUTS			
Agricultural goods - import tariff - simple average MFN applied	15.3%	15.8%	Niger: WTO (n.d.) Burkina Faso: WTO (n.d.)
Agricultural equipment - public subsidy		N/A[75]	Burkina Faso: WTO (2017)
Draught animals - public subsidy	N/A	N/A[76]	Burkina Faso: WTO (2017)

[66] This rate is applied to ECOWAS member states.

[67] This rate is applied to ECOWAS member states.

[68] In Burkina Faso, this export duty is formally known as a "livestock subsector contribution" applied to live poultry (WTO, 2017). CNFA (2016c) refers to this as the FODEL tax.

[69] This rate is applied to ECOWAS member states.

[70] HS codes: live goats (HS 010420); live sheep (010410).

[71] This rate is applied to ECOWAS member states.

[72] This rate is applied to ECOWAS member states.

[73] This rate is applied to ECOWAS member states.

[74] In Burkina Faso, this export duty is formally known as a "livestock subsector contribution" applied to live goats and sheep (WTO, 2017). CNFA (2016c) refers to this as the FODEL tax.

[75] In 2014, the government of Burkina Faso subsidized agricultural inputs including improved seed varieties, agricultural equipment, and draught animals (WTO, 2017). WTO (2017) does not report the value of these subsidies per eligible farmer.

[76] In 2014, the government of Burkina Faso subsidized agricultural inputs including improved seed varieties, agricultural equipment, and draught animals (WTO, 2017). WTO (2017) does not report the value of these subsidies per eligible farmer.

TABLE A2-2. DIRECT MARKET DISTORTIONS			
	Yalwa (Niger)	**Yidgiri (Burkina Faso)**	**Data Sources**
Fertilizer - customs duty	N/A	N/A	
Fertilizer - public subsidy		45%-60%[77]	Burkina Faso: WTO (2017)
Fuel - internal tax	12%[78]	CFA 50 per liter [79]	Niger: WTO (2017b) Burkina Faso: WTO (2017)
Fuel - public subsidy	N/A	N/A	
Petroleum - import tariff - average MFN applied	7.7%	7.7%	Niger: WTO (n.d.) Burkina Faso: WTO (n.d.)
Seeds (improved) - public subsidy	N/A[80]	N/A[81]	Niger: WTO (2017b) Burkina Faso: WTO (2017)
Vaccines - public subsidy	N/A[82]		Niger: WTO (2017b)

FERTILIZER SUPPORT PROGRAMS & DISTORTIONARY EFFECTS

In the RISE II countries - Burkina Faso and Niger - under-developed input markets have been a longstanding limitation to the efficient production of crops including cowpea. Farmers' use of fertilizers is often low, with marked reliance on locally available inputs such as animal manure as an alternative to imported fertilizers including NPK, DAP, and urea.[83] In both Burkina Faso and Niger, the enabling environment has a strong effect on the availability of inputs including imported fertilizers: A high degree of government control of access to fertilizers is intended to protect licensed producers or agents and prevent the import of sub-standard products, but the result is to limit the number of suppliers and overall availability of these products (CNFA, 2016a).

Access to mineral fertilizers (including NPK, DAP, and urea) by farmers is a central concern of the Yalwa and Yidgiri activities, which encourage farmers' expanded use of inputs so as to increase the yield of crops, namely cowpea. The Yalwa and Yidgiri activities seek to improve crop farmers' access to mineral

[77] In Burkina Faso, "Since 2008, the State has subsidized 45% to 60% of the selling price of fertilizer, depending on its market price" (WTO, 2017: 176). A more recent estimate of the value of the fertilizer subsidy is not immediately available.
[78] In Niger, the internal tax on petroleum products is added to the refinery price, and is applied to premium petroleum and gas oil, Kerosene is exempt from the internal tax, but is subject to customs duty (WTO, 2017b).
[79] Burkina Faso's fuel tax applies to petroleum products and to diesel fuel; premium grade petroleum is taxed at CFA 125 per liter (WTO, 2017).
[80] Through the Niger National Institute for Agricultural Research, the government of Niger has historically produced seed that is made available to breeders at subsidized prices, which they then sell to producers (WTO, 2017b). WTO (2017b) does not report the type of seeds targeted or the value of this subsidy per eligible farmer.
[81] In 2014, the government of Burkina Faso subsidized agricultural inputs including improved seed varieties, agricultural equipment, and draught animals (WTO, 2017). WTO (2017) does not report the value of these subsidies per eligible farmer.
[82] The Central Livestock Laboratory produces seven types of vaccine, three of which are provided free to breeders; while the remainder are available at subsidized prices (WTO, 2017b). WTO (2017b) does not specify which vaccines are subsidized; or the effective value of the partial subsidy. CNFA (2016c) notes that PPR vaccines are sometimes publicly subsidized and typically free.
[83] Mineral fertilizers are typically imported from outside of West Africa (CNFA, 2016a).

fertilizers via facilitation of market linkages between POs and input suppliers, bulk or joint purchases via POs to reduce unit costs, and (in Niger) efforts to support reforms of the fertilizer subsidy system. Activity logical frameworks could be jeopardized by an outright lack of mineral fertilizers on the market or inaccessibility due to excessive prices for farmers.

The price and availability of mineral fertilizers derived from natural gas or other fossil fuels have become a major concern globally as a result of supply chain disruptions linked to, *inter alia*, COVID-19 and the war in Ukraine (Elkin & Gebre, 2022, May 1). Rising prices and reduced availability affect both farmers, who require fertilizer to produce crops, as well as governments that offer fiscal support to ensure farmers' access to fertilizers. Intermediate actors such as seed producers are also adversely affected by disruptions in fertilizer supply. Over the longer term, food consumers will be affected as insufficient fertilizer supplies trigger reductions in crop yields and crop quality and nutritional content, exacerbating food insecurity (Elkin & Gebre, 2022, May 1).

As the expanded use of fertilizers is a key intervention under the Yalwa and Yidgiri activities, a basic understanding of the fertilizer support programs in Niger and Burkina Faso, respectively, is useful to inform model parameters and assumptions. While a full analysis of the fertilizer support programs in RISE II countries is beyond the scope of the RISE II CBA activity, a brief summary of the fertilizer policy regimes in Burkina Faso and Niger has been prepared to inform the CBA models, specifically sensitivity analysis.

FERTILIZER POLICY REGIME AND IMPACTS - BURKINA FASO

Soils in Burkina Faso are generally characterized by phosphorous deficiency, which limits crop productivity even when precipitation is favorable. While the efficient use of mineral fertilizers and organic manure (in combination with good cultivars) can increase agricultural productivity, the use of fertilizers remains limited among Burkinabe farmers (CNFA, 2021b). Research has shown that fertilizer use at market prices may be unprofitable by Burkinabe crop farmers (Theriault *et al.*, 2018).

The government of Burkina Faso has taken action to promote the use of fertilizers by farmers and thereby increase agricultural production, engaging directly in the distribution of inputs as well as by offering subsidies. The government supplies professional producers' groups with inputs including fertilizers, "though this is still insufficient and lacks the sustainability a market solution would provide" (USAID, 2018: 7).[84] Public subsidies on fertilizer (NPK, urea) have targeted staple crops (Theriault *et al.*, 2018). As of 2017, the WTO estimated that, "Since 2008, the State has subsidized 45% to 60% of the selling price of fertilizer, depending on its market price" (WTO, 2017: 176). While the official value of the subsidy was set at 50 percent, transaction costs (poor road infrastructure, illicit taxes) meant that the effective subsidy rate enjoyed by staple crop producers was only 25 percent below full market value (Theriault *et al.*, 2018).[85] Subsidized fertilizer comprised only a small share (17 percent) of total fertilizer consumed in the country, according to earlier research (Theriault *et al.*, 2018, citing Wanzala-Mlobela *et al.*, 2013). A current estimate of the value of the fertilizer subsidy is not immediately available.

The government of Burkina Faso has developed action plans to reform its programs to deliver agricultural inputs including fertilizer, shifting towards a voucher system executed in coordination with

[84] It is not clear whether all POs may benefit from this direct distribution, or whether this is reserved for selected crops such as cotton. See Theriault *et al.* (2018).
[85] The effective subsidy for urea was 28 percent of the market price, and for NPK was 23 percent of the market price (Theriault *et al.*, 2018).

private sector agrodealers (USAID, 2020a).[86] With the support of the World Bank, the government of Burkina Faso piloted an e-voucher system for fertilizer (and seeds) to benefit 69,000 farmers in 2019, which the Ministry of Agriculture was set to scale up in 2020 (World Bank, 2020). The current status of these reforms is not immediately known.

Currently, farmers' access to fertilizer is insufficient. "Unavailability of quality inputs at the right time, in the right place, at affordable prices, and in small packages, is one of the main causes of low use" (CNFA, 2021b: 29). The root cause(s) of the problem is not always clear: For example, in FY21, Yidgiri reported farmers were unable to secure the desired volumes of fertilizer due to a lack of credit to facilitate purchases and a shortage of fertilizer on the local market, which in turn was linked to supply chain (freight transportation) disruptions attributed to COVID-19 (CNFA, 2021a).

FERTILIZER POLICY REGIME AND IMPACTS - NIGER

Niger reports one of the lowest rates of fertilizer use in the world, at only 3 kg/HA of arable land annually. The government has intervened in order to increase fertilizer use and increase the production of agricultural crops (Koigi, 2020, August 10).

Historically, the public *Centrale d'Approvisionnement des Intrants et Materiels Agricoles* (Center for Agricultural Inputs and Materials Procurement or CAIMA) imported and commercialized inputs including agrochemicals (USAID, 2020b). CAIMA, which supplied fertilizer at a state-subsidized price, was the main source of fertilizer for agricultural producers in Niger. The system, which subsidized fertilizers by 50% on average, was costly, inefficient, and not targeted by either farmers or crops (World Bank, 2021). "However, due to frequent stock-outs, access to CAIMA products [was] uncertain. This uncertainty and the unavailability of inputs when needed the most disrupt[ed] the purchasing decisions of POs and unions that [were] poor or poorly organized and expose[d] them to the mercy of fluctuating prices of agricultural inputs" (CNFA, 2021c: 21-22).

In 2006, the government of Niger adopted a "Decentralized and Partnership Strategy for Inputs Supply for Sustainable Agriculture." The objectives of the strategy are to:

- Make the fertilizer supply process open and transparent;
- Focus the price strategy on the market to make fertilizers available for all farmers;
- Direct the subsidy program to the most vulnerable farmers; and
- Make appropriate fertilizers available and accessible to farmers.

The government of Niger's efforts to reform the fertilizer sector have benefitted from donor support. The United States Government (USG) is supporting reforms of Niger's fertilizer sector through the Fertilizer Sector Reform Support Project in Niger (PARSEN). PARSEN will run 2018-2022 and is directly funded by the Millennium Challenge Corporation (MCC) (IFDC, 2022); it is also supported via the Yalwa activity (USAID, 2020b). PARSEN seeks to expand producers' access to a range of fertilizers at competitive prices through the review of policies and regulations; a reformed grant program; and stronger private sector participation in fertilizer supply, production, and distribution. Efforts to date have

[86] The Yidgiri activity is to support the Ministry of Agriculture and Hydro-Agricultural Facilities (MoAH) to implement the fertilizer action plan within the Yidgiri ZOIs so as to: reform the administration of the public sector input subsidy program as a voucher program in conjunction with private sector agrodealers; sensitize stakeholders on the laws and regulations governing fertilizer production and trade; strengthen the National Association of Wholesalers and Retailers of Agricultural Inputs (AGRODIA) to support self-monitoring of quality; and monitor implementation of the action plans (USAID, 2020a).

resulted in administrative restructuring, capacity building, and the drafting and adoption of policy and regulatory frameworks (IFDC, 2022). Notably, the parastatal CAIMA has lost its mandate for fertilizers (World Bank, 2021) and responsibility for fertilizer provision has been transferred to three bodies (Koigi, 2020, August 10):

- Niger Fertilizer Market Observatory (OMEN) monitors and regulates the supply and distribution of fertilizer;
- Technical Committee for Fertilizers in Niger (COTEN) provides analyses and observations for decision-making; and
- Regional Fertilizer Technical Committees (CTER) operate at the regional level, in parallel with COTEN.

A voucher-based fertilizer subsidy was piloted in 2019; later, in 2021, an e-voucher program for the fertilizer subsidy was piloted and set to be expanded to additional areas of the country (IFDC, 2022). The current status of the voucher programs - whether they have been extended, to how many farmers, the value to farmers and the cost to the government - is not immediately known. However, the World Bank (2021) estimates that improved management of Niger's universal fertilizer subsidy program to increase the role of the private sector and to better target subsidies could generate fiscal savings equivalent to 0.15 percent of GDP.

PROSPECTIVE FARMER COPING STRATEGIES

The RISE II CBA models stop short of modeling prospective farmer responses to projected disruptions to the supply of imported mineral fertilizers, as these would represent a deviation from the Yalwa and Yidgiri interventions as described within activity documents. However, such alternatives could potentially be incorporated into the CBA models, with expected impacts on benefits (crop yields and revenues) and costs (input volumes and costs, labor costs). Prospective coping strategies might include:

Adjustments to Cropping Patterns: Farmers could opt to shift production towards crops that have lower fertilizer requirements (Elkin & Gebre, 2022, May 1). For example, cowpea is a legume that fixes nitrogen from the atmosphere in the soil, which makes it ideal to rotate with water-efficient cereals such as millet and sorghum (CNFA, 2016a). Farmers who are already producing millet and sorghum could be encouraged to introduce cowpea into their existing crop rotation; this could potentially involve an expansion of the beneficiary population of RISE II beneficiaries beyond farmers already producing cowpea.

Promotion of Locally Available Fertilizers: Farmers could increase their use of locally available fertilizers as an alternative to the promotion of imported mineral fertilizers that may be subject to greater price volatility. Many farmers in the RISE II ZOIs are already familiar with the use of organic fertilizers including animal manure, compost (CNFA, 2016a), and hygienic urine (Some, 2018). Guidance could be developed to guide farmers on the application of these alternatives based on soil nutrient content, crop nutrition requirements, and estimated future price dynamics.

Promotion of Precision Application of Fertilizers: Farmers could be supported to apply fertilizers more precisely in line with soil nutrient profiles, crop needs, and weather conditions. Application guidance could be developed on the basis of soil testing (Elkin & Gebre, 2022, May 1), farmer observation, and

weather forecasts. Guidance could build on existing farmer practices, such as Nigerien farmers' selective application of non-purchased organic inputs on sandy or degraded soils (Moussa *et al.*, 2016).

ANNEX 3. USAID INVESTMENT COSTS

Data on USAID investment costs is required to conduct both the financial and economic analyses. USAID investment costs have been estimated based on a combination of budget projection data and historical expenditure data.

EXCLUSION OF SHOCK CONTINGENCY BUDGET

The headline budgets for the Yalwa and Yidgiri activities include a shock contingency line item, in the amount of $2 million per activity. The shock contingency budget is to be expended within the USAID investment period (2020-2025), in part or in full, in the event that a predefined shock is recorded within the zone of influence. The shock contingency budget may be spent to respond to emerging shocks, support post-shock recovery, and protect development gains; the budget could be spent in diverse ways, including humanitarian-type relief and investment to offset beneficiaries' losses (*e.g.*, provision of additional seed or farming equipment). According to activity documentation provided by USAID and implementing partners, neither Yalwa nor Yidgiri had reported the occurrence of a predefined shock to justify the release of the shock contingency budget (in part or in full) as of early 2022.

The CBA of RISE II omits the shock contingency line item from the total USAID investment costs for both Yalwa and Yidgiri. The incorporation of the additional shock contingency funds into the resilience analysis is speculative, and lacks the robustness to justify its inclusion within this CBA: First, the amount of funding to be spent in response to a predefined shock may not reach the $2 million maximum figure. Second, the allocation of the shock response budget across one or more value chains may not follow the allocation of non-shock investment costs. For example, a drought or flood might reasonably affect all value chains; while an animal disease outbreak could affect one or multiple types of livestock. Therefore, the allocation of the shock contingency budget is not possible to apportion. Third, the form of the spending could vary as this is not narrowly set out in either the Yalwa or Yidgiri shock response contingency plans, with differential impacts on how agricultural incomes might be impacted.[87]

In the future, a more nuanced treatment of shock contingency budgets within the resilience analysis of a CBA, could usefully be explored to inform technical guidance for future CBAs.

ALLOCATION ACROSS VALUE CHAINS

Budget projection data (total investment costs) have been retrieved from activity documents including annual work plans and annual reports, which have been provided by USAID and implementing partners. Historical expenditure data has been obtained from RISE II IPs, for the period 2020-2022. The IPs have provided historical expenditure data that partially allocates expenditures across three broad value chains: cowpea, poultry, and small ruminants. The historical expenditure data do not further disaggregate within the poultry value chain (chicken versus guinea fowl) or within the small ruminants value chain (goats versus sheep). Moreover, the historical expenditure data do not attempt to disaggregate those expenditures that are not specific to a single value chain (*e.g.*, salaries for senior staff, office rental fees).

To estimate the financial and economic returns to investment, the remaining funds have been apportioned across the five value chains targeted under Yalwa and Yidgiri, and across the remaining

[87] A conservative approach could be to treat the shock contingency budget as a direct cash transfer, equally divided among all beneficiaries within the value chain.

investment period (2022-2025). Total expenditures have been apportioned on the basis of the historical expenditure data provided to the CBA team, with the implicit assumption that future expenditure patterns will not significantly differ from historical expenditure patterns. For the livestock value chains, the relative share of expenditures has been apportioned based on the share of survey respondents (also used to calculate the total number of beneficiaries per livestock VC). The relative share of incurred expenses (where available) and share of survey respondents by VC are displayed in **Table A3-1**. Finally, the intra-year distribution of funds across the remaining investment period has been scaled according to the projected number of beneficiaries entering the activity per year, to arrive at the total projected expenditure levels. The allocation of incurred and budgeted expenditures per activity, per year, and per VC are displayed in **Table A3-2**.

TABLE A3-1. ALLOCATION OF USAID INVESTMENT COST BY VC

Yalwa (Niger)		
	Share of Incurred Expenses	**Share of Survey Respondents (Farmers)**
Cowpea	35%	
Poultry *of which, Chicken* *of which, Guinea Fowl*	32%	 *75%* *25%*
Small Ruminants *of which, Goats* *of which, Sheep*	33%	 *59%* *41%*
TOTAL	100%	
Yidgiri (Burkina Faso)		
	Share of Incurred Expenses	**Share of Survey Respondents (Farmers)**
Cowpea	40%	
Poultry *of which, Chicken* *of which, Guinea Fowl*	18%	 *94%* *6%*
Small Ruminants *of which, Goats* *of which, Sheep*	42%	 *15%* *85%*
TOTAL	100%	

TABLE A3-2. ALLOCATION OF USAID INVESTMENT COSTS BY ACTIVITY, VC, AND YEAR

Yalwa (Niger)							
	Year 1 FY20 Mar-Sep 2020	**Year 2 FY21 Oct 2020-Sep 2021**	**Year 3 FY22 Oct 2021-Sep 2022**	**Year 4 FY23 Oct 2022-Sep 2023**	**Year 5 FY24 Oct 2023-Sep 2024**	**Year 6 FY25 Oct 2024-Mar 2025**	**TOTAL**
Cowpea	$648,154	$1,806,116	$1,900,512	$2,574,345	$2,574,169	$0	$9,503,296
Poultry-Chicken	$444,449	$1,238,479	$1,303,208	$1,765,265	$1,765,144	$0	$6,516,546
Poultry-Guinea Fowl	$148,150	$412,826	$434,403	$588,422	$588,381	$0	$2,172,182
Small Ruminants-Goats	$360,559	$1,004,716	$1,057,227	$1,432,072	$1,431,973	$0	$5,286,548
Small Ruminants-Sheep	$250,558	$698,193	$734,683	$995,168	$995,100	$0	$3,673,703
TOTAL	$ 1,851,869	$ 5,160,331	$ 5,430,033	$ 7,355,272	$ 7,354,768	$0	$ 27,152,273
Yidgiri (Burkina Faso)							
	Year 1 FY20 Feb-Sep 2020	**Year 2 FY21 Oct 2020-Sep 2021**	**Year 3 FY22 Oct 2021-Sep 2022**	**Year 4 FY23 Oct 2022-Sep 2023**	**Year 5 FY24 Oct 2023-Sep 2024**	**Year 6 FY25 Oct 2024-Feb 2025**	**TOTAL**
Cowpea	$540,277	$1,731,345	$1,636,221	$1,173,245	$1,680,887	$223,981	$6,985,957
Poultry-Chicken	$228,537	$732,359	$692,122	$496,283	$711,015	$94,744	$2,955,060
Poultry-Guinea Fowl	$14,587	$46,746	$44,178	$31,678	$45,384	$6,048	$188,621
Small Ruminants-Goats	$85,094	$272,687	$257,705	$184,786	$264,740	$35,277	$1,100,288
Small Ruminants-Sheep	$482,197	$1,545,226	$1,460,327	$1,047,121	$1,500,192	$199,903	$6,234,966
TOTAL	$1,350,692	$4,328,363	$4,090,553	$2,933,113	$4,202,217	$559,954	$17,464,892

ANNEX 4. ECOSYSTEM SERVICES

This section provides a brief qualitative review of the ecosystem services (ES) dependencies and impacts related to the Yalwa and Yidgiri activities.

ES are defined as "the benefits people obtain from ecosystems" (Millennium Ecosystem Assessment, 2005), of which there are four types:

- **Provisioning Services:** Services that allow for the production of basic goods for human consumption such as food, water, timber, and fuel
- **Regulating Services:** Services that regulate natural processes with which humans interact such as climate, weather, diseases, and the breakdown of waste materials
- **Cultural Services:** Services that provide recreational, aesthetic, spiritual, and relational benefits
- **Supporting Services:** Services that support the other three categories of services

A high-level goal of both RISE I and RISE II is to help farmers transition from the use of TAP to BAP. Successfully transitioning from TAP to BAP may depend on the integrity of upstream ES upon which agricultural production depends, such as soil fertility; and may have impacts (positive or negative) on downstream ES, such as potable water supply for human consumption. USAID's "Integrating Ecosystem Values into Cost-Benefit Analysis" (Kashi *et al.*, 2018) document, referred to henceforth as the ES CBA Guidelines, outlines a process for valuing the interactions (*i.e.*, dependencies and impacts) between an intervention and the natural environment.

DEPENDENCIES AND IMPACTS

The ES CBA Guidelines pose the following three questions to structure the process of identifying interactions between an intervention and surrounding ecosystems:

1. What are the likely negative impacts of the intervention on ecosystems and their services?
2. What are the likely positive impacts of the intervention on ecosystems and their services?
3. In what ways does the intervention's effectiveness and efficiency likely depend on the state of the ecosystems that surround it?

The LEAP III team consulted the Supplemental Initial Environmental Examinations (SIEEs) for Yidgiri and Yalwa to identify a large number of potential environmental impacts of RISE II. The potential environmental impacts listed in the SIEEs are framed as impacts that RISE II will strive to avoid. In the context of the ES CBA guidelines, these adverse potential impacts can be reformulated in terms of ES dependencies. **Table A4-1** identifies key supporting ES and links those with associated provisioning and/or regulating ES and RISE II impact dependencies.

TABLE A4-1. DEPENDENCIES OF RISE II ACTIVITIES ON ECOSYSTEM SERVICES		
Supporting Service	**Provisioning/Regulating Services**	**RISE II Impact Dependencies**
Soil formation, fertility, and erosion control	Food, livestock fodder, timber, and non-timber forest products provisioning	Crop yields, livestock yields, livestock mortality rates, cost of obtaining fuel, non-farm income, cost of landslide damages
Soil water absorption, drainage, and retention	Food, livestock fodder, timber, and non-timber forest products provisioning	Crop yields, livestock yields, livestock mortality rates, non-farm income, irrigation costs, cost of obtaining water, cost of obtaining fuel, cost of flood and landslide damages, prevalence of waterborne illness
Water purification	Water provisioning for human and livestock consumption	Cost of obtaining water, human health, livestock yields, livestock mortality rates, prevalence of waterborne illness
Evapotranspiration	Food, livestock fodder, timber, and non-timber forest products provisioning; Water provisioning for human and livestock consumption	Crop yields, cost of obtaining water, human health, livestock yields, livestock mortality rates
Pollination and pest control	Food, livestock fodder, timber, and non-timber forest products provisioning	Crop yields, livestock yields, livestock mortality rates
Carbon sequestration	Climate regulation	Social cost of carbon emissions, cost of obtaining fuel

Sources: USAID (2020c) and USAID (2019)

RISE II aims not only to avoid the negative environmental impacts listed above, but also to counter adverse environmental outcomes by influencing[88] the way in which land and natural resources are used. USAID's Tropical Forestry and Biodiversity Assessments for Burkina Faso and Niger both identify land degradation and intensive depletion and pollution of water (and the root causes of these dynamics) as very high environmental risks (Cadmus Group & Sun Mountain International, 2018a; 2018b). Therefore, any impacts that RISE II may generate related to land use and land cover change and natural resource exploitation could be associated with important ecosystem values.[89] A detailed discussion of these impacts was included in the RISE II CBA Methodology Report previously submitted by the LEAP III team.

[88] Both explicitly, through natural resource management governance systems; and implicitly, through improved productivity of natural resource exploitation, primarily through agricultural production.

[89] For a more detailed discussion of these ES impacts, refer to the RISE II CBA Methodology Report.

ANNEX 5. RISE I AND RISE II CBA PARAMETER VALUES

During the course of the RISE II CBA activity, differences in the headline results generated from the CBA models of RISE I (REGIS-ER and REGIS-AG activities) and RISE II (Yalwa and Yidgiri activities) were observed, prompting discussion between the LEAP III team and USAID technical staff. To inform these discussions, USAID requested a summary comparative table of key parameter values applied under the RISE I and RISE II CBA models. This annex responds to this request. In addition, this annex also highlights selected, key points of comparison between the methodologies and types of data used in the RISE I and RISE II CBA models.[90] In this way, this annex offers insight into the differences between the results of the CBA of RISE I and RISE II activities.

KEY METHODOLOGICAL DISTINCTIONS

Table A5-1 summarizes key points of comparison between the RISE I and RISE II CBAs, concerning both types of data applied and methodological assumptions.

TABLE A5-1. POINTS OF COMPARISON BETWEEN RISE I AND RISE II CBAs

Point of Comparison	CBA of RISE I Activities (REGIS-ER and REGIS-AG)	CBA of RISE II Activities (Yidgiri and Yalwa)
Primary data source	Ex-ante key informant interviews	Mid-implementation survey of a statistically representative sample of activity beneficiaries
Counterfactual scenario	**Crops**: Farmers use traditional agricultural practices. **Poultry and ruminants**: Farmers perform labor at the prevailing market wage.	**Crops**: Average performance of a mix of Yidgiri/Yalwa beneficiary farmers in 2019 (prior to receiving support from Yidgiri/Yalwa). Some have received support from REGIS-ER/REGIS-AG to transition to best agricultural practices, some have not. **Poultry and ruminants**: Average performance of Yidgiri/Yalwa beneficiary farmers raising poultry or ruminants in 2019 (prior to receiving support from Yidgiri/Yalwa).
"With project" scenario	**Crops**: 80% of farmers adopt best agricultural practices, 20% maintain traditional agricultural practices. **Poultry and ruminants**: Farmers raise poultry or ruminants with optimal production practices.	**Crops**: Average performance of a mix of Yidgiri/Yalwa beneficiary farmers in 2022. Some had previously received support from REGIS-ER/REGIS-AG to transition to best agricultural practices, some had not. **Poultry and ruminants**: Average performance of Yidgiri/Yalwa beneficiary farmers raising poultry or ruminants in 2022.

[90] A more detailed comparison of the methodologies and data used in the two CBAs is available in the CBA Methodology Report that was previously submitted to USAID by the LEAP III team.

The RISE I CBA models were developed using *ex-ante* projections based on data from key informant interviews. *Ex-ante* CBAs are susceptible to optimism bias for several reasons,[91] including the fact that they tend to assume that everything will go as planned (World Bank, 2010). Practically, this means that performance parameters in *ex-ante* CBA models are often calibrated using 'optimal' values (*e.g.*, crop yields achieved in test or demonstration plots), with deviations from the optimum explored through sensitivity analysis.

Indeed, desk research and conversations with USAID and IP staff have revealed that some of the chosen values for critical input parameters in the RISE I CBA models appear to be very optimistic. The RISE I CBA models assumed that farmers would adopt optimal production practices and achieve optimal production outcomes for the "with project" scenario (80 percent of crop farmers and 100 percent of livestock farmers). For example, **Figure A5-1** shows that the weighted average cowpea yield[92] assumed in the RISE I crop model for Niger (692 kg/ha) is significantly higher than historical FAO estimates of Niger's national average cowpea yield (up to 461 kg/ha). The error bars in the figure represent the range of cowpea yield values that were considered in the RISE I CBA sensitivity analysis; even the low-end yield estimate has proven to exceed the highest of historical national average values. On the other hand, the cowpea yield assumed for the "without project" scenario in the RISE I CBA (92 kg/ha) is consistent with the yield used in the "without project" scenario for the RISE II CBA (100 kg/ha)s, as well as the yield observed in the Yalwa baseline survey (95 kg/ha).

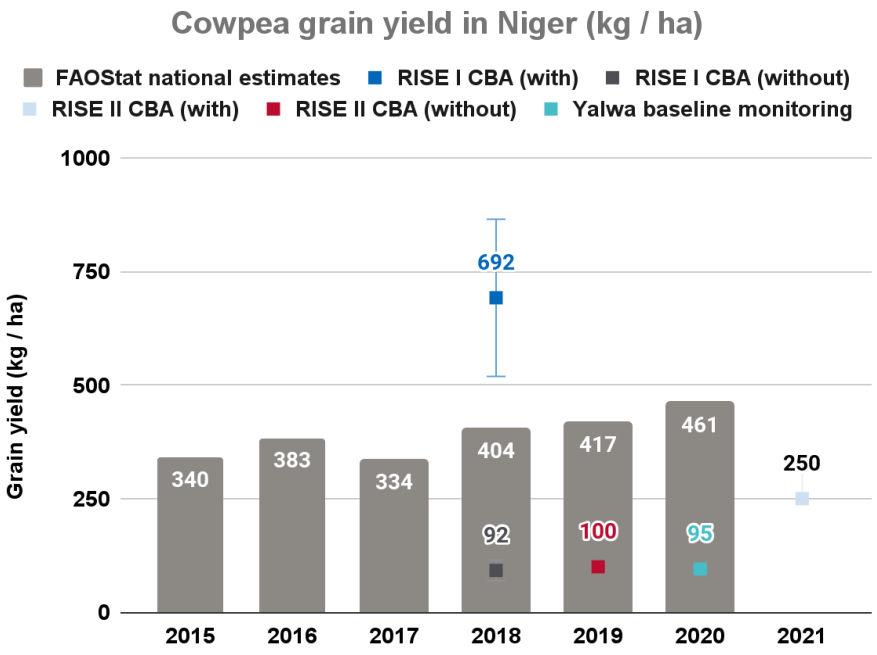

FIGURE A5-1. ESTIMATED COWPEA YIELDS IN NIGER OVER TIME

[91] Assessments of this potential bias are unfortunately rare, and the LEAP III team is not aware of any literature that systematically compares typical ERRs reported from *ex-ante* versus *ex-post* CBAs of activities similar to those of the selected RISE interventions.

[92] Accounting for 80% adoption of 'best agricultural practices.'

COMPARATIVE CBA PARAMETER VALUES

Tables A5-2 to A5-11 present key CBA model input parameter values used in the RISE II CBAs and the RISE I CBAs, to facilitate comparison between these. Values are based on a review of the RISE I CBA models, and reflect those currently applied to the RISE II CBA models. Additional data reported in RISE II documentation have been provided, where available, to enrich the comparison. The LEAP III team had requested additional data for comparison from the IPs in Niger and Burkina Faso as well as from the consulting firm conducting the ongoing RISE II impact evaluation. To date, the LEAP III team only received select data from the Yalwa IP in Niger, but Tables A5-2 to A5-11 include placeholder columns to facilitate further comparison with future data.

Within the tables, green cells indicate values that may be interpreted as relatively favorable (supporting a higher financial return to farmers), whereas red cells represent relatively unfavorable values (driving a lower financial return to farmers).

TABLE A5-2. COMPARISON OF KEY PARAMETERS IN CBA OF COWPEA VC - YALWA

Parameter	RISE II CBA		RISE I CBA		Yalwa M&E	RISE II Impact Evaluation	
	With	Without	With	Without	Baseline	With	Without
Average farm size (ha)	2	2	1	1			
Average cowpea yields (kg / ha)	250	100	692	92	95		
Average millet yields (kg / ha)	300	150	898	524	194		
Average sorghum yields (kg / ha)	200	75	832	532	111		
Average number of person-days required for cowpea production per hectare per year	27	23	138	104			
Cost of family labor (CFA / day)	501		998				
Cost of hired labor (CFA / day)	1,500		998				
Average quantity of NPK fertilizer used (kg / ha)	17	0.3	84	20			
Market price of cowpea (CFA / kg)	150		402	400	313		
Market price of cowpea residuals (CFA / kg)	35		100				
Market price of millet (CFA / kg)	237		239	247	261		
Market price of sorghum (CFA / kg)	224		224	226	180		
Market price of NPK fertilizer (CFA / kg)	440		269				
Market price of manure (CFA / kg)	10		5				
Market price of compost (CFA / kg)	150		8				
Post-harvest losses of cowpea (%)	0%	4%	13%	25%			
Post-harvest losses of millet (%)	5%	10%	14%	20%			
Post-harvest losses of sorghum (%)	5%	10%	14%	20%			

TABLE A5-3. COMPARISON OF KEY PARAMETERS IN CBA OF CHICKEN VC - YALWA							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Flock size (chicken)	15	13	11				
Adult Mortality Rate	0.0%	0.0%	0.2%				
Chick Mortality Rate	13.0%	13.0%	11.4%				
Average number of person-days required for poultry production per bird per year (chicken)	12.0	11.7	0.9				
Cost of family labor (CFA / day)	501	501	700				
Cost of hired labor (CFA / day)	500	500	700				
Feeding cost (CFA / bird / day)	48	42	28				
Proportion of hens in lay	23%	23%	50%				
Annual number of hens sold	130	130	312				
Annual number of roosters sold	138	138	312				
Annual number of eggs sold	81	81	0				
Eggs laid per hen per day	0.40	0.40	0.35				
Egg off-take rate	31%	31%	2%				
Average sales price of hens (CFA)	2,250	2,250	1,750				
Average sales price of cockerels (CFA)	2,750	2,750	2,000				
Average sales price of eggs (CFA)	100	100	50				
Average sales price of manure (CFA)	200	200	5				

TABLE A5-4. COMPARISON OF KEY PARAMETERS IN CBA OF GUINEA FOWL VC - YALWA							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Flock size (guinea fowl)	20	20	15				
Adult Mortality Rate	8.0%	8.0%	0.1%				
Keet Mortality Rate	20.0%	20.0%	8.3%				
Average number of person-days required for poultry production per bird per year (guinea fowl)	8.1	8.1	0.9				
Cost of family labor (CFA / day)	501	501	700				
Cost of hired labor (CFA / day)	500	500	700				
Feeding cost (CFA / bird / day)	48	29	21				
Proportion of hens in lay	20%	20%	50%				
Annual number of hens sold	0	0	52				
Annual number of roosters sold	0	13	52				
Annual number of eggs sold	15	12	416				
Eggs laid per hen per day	0.13	0.13	0.27				
Egg off-take rate	67%	33%	55%				
Average sales price of hens (CFA)	2,250	2,250	3,500				
Average sales price of cockerels (CFA)	2,750	2,750	3,500				
Average sales price of eggs (CFA)	100	100	100				
Average sales price of manure (CFA)	200	200	5				

TABLE A5-5. COMPARISON OF KEY PARAMETERS IN CBA OF GOAT VC - YALWA

Parameter	RISE II CBA		RISE I CBA		Yalwa M&E	RISE II Impact Evaluation	
	With	Without	With	Without	Baseline	With	Without
Herd Size	4	4	9				
Mortality rate for adult goats	15%	12%	4%				
Mortality rate <1 year	6%	10%	18%				
Cost of vaccinating	500	500	0				
Cost of deworming	200	200	400				
Cost of vet service per visit	200	200	250				
Annual number of adult males sold	1.0	1.0	2.4				
Annual number of adult females sold	2.0	2.0	0.9				
Sales Price of does	28,500	28,500	20,700		22,966		
Sales Price of bucks	18,500	18,500	27,000		26,957		

TABLE A5-6. COMPARISON OF KEY PARAMETERS IN CBA OF SHEEP VC - YALWA							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Herd Size	6	4	6				
Mortality rate for adult goats	0%	25%	9%				
Mortality rate <1 year	0%	0%	18%				
Cost of vaccinating	500	500	600				
Cost of deworming	600	600	400				
Cost of vet service per visit	500	500	500				
Annual number of adult males sold	2	1	1				
Annual number of adult females sold	2	3	1				
Sales Price of ewes	35,000	35,000	50,000		36,235		
Sales Price of rams	60,000	60,000	65,000		61,076		

TABLE A5-7. COMPARISON OF KEY PARAMETERS IN CBA OF COWPEA VC - YIDGIRI							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Average farm size (ha)	2	2	1	1			
Average cowpea yields (kg / ha)	300	150	750	58			
Average millet yields (kg / ha)	300	167	1009	666			
Average sorghum yields (kg / ha)	200	150	1128	732			
Average number of person-days required for cowpea production per hectare per year	35	21	141	112			
Cost of family labor (CFA / day)	578		996				
Cost of hired labor (CFA / day)	2,000		996				
Average quantity of NPK fertilizer used (kg / ha)	50	25.0	72	20			
Market price of cowpea (CFA / kg)	485		404	400			
Market price of cowpea residuals (CFA / kg)	91		25				
Market price of millet (CFA / kg)	262		343	349			
Market price of sorghum (CFA / kg)	200		284	276			
Market price of NPK fertilizer (CFA / kg)	400		368				
Market price of manure (CFA / kg)	19		5				
Market price of compost (CFA / kg)	21		7				
Post-harvest losses of cowpea (%)	8%	14%	13%	25%			
Post-harvest losses of millet (%)	12%	20%	16%	20%			
Post-harvest losses of sorghum (%)	12%	20%	16%	20%			

TABLE A5-8. COMPARISON OF KEY PARAMETERS IN CBA OF CHICKEN VC - YIDGIRI							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Flock size (chicken)	40	15	13				
Adult Mortality Rate	10.0%	18.0%	0.2%				
Chick Mortality Rate	10.0%	18.0%	12.0%				
Average number of person-days required for poultry production per bird per year (chicken)	2.0	2.4	0.9				
Cost of family labor (CFA / day)	578		700				
Cost of hired labor (CFA / day)	3333		700				
Feeding cost (CFA / bird / day)	41	37	12				
Proportion of hens in lay	15%	15%	75%				
Eggs laid per hen per day	0.18	0.18	0.23				
Egg off-take rate	0%	0%	26%				
Annual number of hens sold	194	74	208				
Annual number of roosters sold	252	108	208				
Annual number of eggs sold	0	0	208				
Average sales price of hens (CFA)	2,500	2,500	1,750				
Average sales price of cockerels (CFA)	3,000	3,000	2,000				
Average sales price of eggs (CFA)	100	100	50				
Average sales price of manure (CFA)	30	30	5				

TABLE A5-9. COMPARISON OF KEY PARAMETERS IN CBA OF GUINEA FOWL VC - YIDGIRI							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Flock size (guinea fowl)	20	20	15				
Adult Mortality Rate	10.0%	34.0%	0.0%				
Keet Mortality Rate	67.0%	67.0%	15.0%				
Average number of person-days required for poultry production per bird per year (guinea fowl)	3.7	8.6	0.9				
Cost of family labor (CFA / day)	578		700				
Cost of hired labor (CFA / day)	3333		700				
Feeding cost (CFA / bird / day)	38	33	21				
Proportion of hens in lay	15%	15%	85%				
Eggs laid per hen per day	0.87	0.87	0.18				
Egg off-take rate	44%	44%	68%				
Annual number of hens sold	0	0	104				
Annual number of roosters sold	12	3	104				
Annual number of eggs sold	130	30	572				
Average sales price of hens (CFA)	2,750	2,750	2,500				
Average sales price of cockerels (CFA)	3,750	3,750	2,500				
Average sales price of eggs (CFA)	75	75	100				
Average sales price of manure (CFA)	30	30	5				

TABLE A5-10. COMPARISON OF KEY PARAMETERS IN CBA OF GOAT VC - YIDGIRI							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Herd Size	5	5	9				
Mortality rate for adult goats	6%	6%	4%				
Mortality rate <1 year	15%	15%	18%				
Cost of vaccinating	500	500	0				
Cost of deworming	300	300	750				
Cost of vet service per visit	2,000	2,000	100				
Annual number of adult males sold	2.0	2.0	2.6				
Annual number of adult females sold	1.0	1.0	2.5				
Sales Price of does	25,900	25,900	20,800				
Sales Price of bucks	28,500	28,500	25,000				

TABLE A5-11. COMPARISON OF KEY PARAMETERS IN CBA OF SHEEP VC - YIDGIRI							
Parameter	**RISE II CBA**		**RISE I CBA**		**Yalwa M&E**	**RISE II Impact Evaluation**	
	With	**Without**	**With**	**Without**	**Baseline**	**With**	**Without**
Herd Size	7	7	6				
Mortality rate for adult goats	10%	10%	9%				
Mortality rate <1 year	7%	7%	18%				
Cost of vaccinating	500	500	600				
Cost of deworming	300	300	400				
Cost of vet service per visit	1,500	1,500	500				
Annual number of adult males sold	2	1	1.2				
Annual number of adult females sold	2	1	1.0				
Sales Price of ewes	40,000	40,000	50,000				
Sales Price of rams	72,500	72,500	60,000				