**PAYMENTS FOR ECOSYSTEM SERVICES AND FOOD SECURITY IN THE DRYLANDS: EXPERIMENTAL EVIDENCE FROM A REDD+ INTERVENTION IN BURKINA-FASO**

RESPONSES TO REVIEWERS COMMENTS

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| Comments from Aidan Coville | Responses |
| Main point – need to strengthen the argument for why we think such a small transfer could have such significant impacts on food security. | Thanks for the comment. The main reason to expect such an effect from a small transfer is the timing of the transfer. People received the transfers at a time when they needed it the most. We have now stressed that point further throughout the manuscript, especially the intro and the results section. |
| You skirt through the literature on PES and some unconditional transfers, but I imagine there must be a number of CCTs that look at nutrition and food security outcomes. What do those find? | There is indeed an extensive literature on cash transfers - including the recent Bedoya et al. (2019) study of a graduation program in Afghanistan - which showed evidence of generally positive effects on food security outcomes (see Bastagli et al. 2016) for a review).  However, given the large variation across programs, and based on suggestions from the second reviewer, we distinguish between different types of cash transfers, and tried to link our study more directly to the literature on cash for work. There have not been many experimental studies of the impacts of C4W programs on food security outcomes. The available evidence includes the evaluation of a labor-intensive public work program in Malawi by Beegle et al. (2015), and a C4W program in Sierra Leone by Rosas Raffo et al. (2016).  The former found no evidence on food security, while the latter concludes on positive effects.  We include all these references in the manuscript- see introduction and discussions sections.  Our paper is the first to study the specific case of C4W where the cash is paid conditional on providing environmental goods and services. |
| The size of the transfer – would be good to compare it to other interventions that may or may not find food security impacts – ratio of transfer to baseline consumption is a nice way to have something comparative | Given that payments were subject to the survival rates of trees, the actual amounts received varied among participants. This differentiates our studied program and the C4W programs in the available literature. The individual payments ranged from about 840 FCFA ($1.40)  to  25,620  FCFA  (about  $43) with an average of 8300  FCFA  ($14), which represents approximately a week of food consumption for the median rural household in Burkina Faso (based on calculation from the LSMS data). Those transfers are very comparable to the ones referenced in the Malawi study cited above (~ $11). We clarified this further in the program description section of the paper. |
| The argument that the timing of the transfer was critical is a nice one – basically saying that the small-ish amount has a big effect because its delivered right when people need it most to smooth consumption. I read quickly so maybe I missed these points, but a couple clarifications on this:  i. When was the money actually transferred and was it a lump sum after verification or spread out?  ii. The endline survey took place in nov/dec, but the graph you show in fig 1 suggests that oct/nov (where I guess the food security questions are covering) have very low levels of food insecurity. So I don’t quite understand that – would make more sense if the survey was covering the jul-sep recall right?  iii.  Do you have any compliance data – who received what when? Weren’t any tables on this and would be nice to show to make the point. | The money was transferred as a lump sump after verification of tree survival rates, during field visits by the project team and a team of enumerator who helped facilitate the transfers through mobile money, and collect basic data on intent to use the money.  It was a one time transfer and it was clear to the recipient that no further installment is to be expected as part of this. We clarify this further in the text.  Thanks for this comment. This is absolutely true. The slight delay in the endline data collection means that the measured impacts are on the months of Sept/Oct for most indicators.  Since  is relatively low during that period food insecurity, this would suggest that our measured impacts are very conservative, and would be even larger had we tested impacts during the months with the highest prevalence of food insecurity.  Fair point, this is now added in the manuscript. See Figure A.9 on the box plot showing the distribution of payments.  Also, all the payments were made on May 2018. |
| Food consumption increases by 1780 in last week(?) which is about a quarter of the avg transfer  made – so this means that we need to make a story around why an 8000 transfer can have a 2000 increase in weekly perpetuity. Perhaps during lean period they use costly credit to smooth, loose out on employment opportunities due to lack of food, etc? seems like more along the mechanism of why the big change occurs is needed to strengthen the argument. | Even though the transfers were given at the beginning of the lean period, we did not measure the outcomes right away. We measure the outcomes a little bit later. The reference periods for our food security measures are the week or the month prior to the survey. That period corresponded to the end if not beyond the lean period.  This implies that the 1780 FCFA increase in food consumption expenditures observed, for the week prior to the survey (not in perpetuity) is a conservative estimate of the impacts that would have been captured right after the transfers, in the midst of the lean period. Also, the fact that only a quarter of the average transfer appears in the food consumption expenditures impact captured would be consistent with several hypotheses. It is possible that people had used up to 3/4 of the transfers up to then and saved the remaining, or allocated part of the transfers received to alternative non-food expenditures.  Survey responses at the time of the transfer suggest that people had intended to spend part of the transfers in non-food consumption goods such as clothing, health, schooling, etc.  We clarify this further in the text. |
| For some of the outcomes you show robustness by including lagged dep variable and not (with the ancova being your primary specification), but others you don’t (HFIAS) – is that because that’s not captured at baseline? | Yes, that's right. We clarify this in the manuscript. |
| Still on robustness, you include a version with multiple covariates but as far as I can tell, that doesn’t change the results in any way. Why should we then care about including that specification? The cleanest version is without covariates and then sometimes its useful to show when you add the covariates that are imbalanced at baseline, but it doesn’t seem like those are the variables included. Why the covariate choice then? | This is a good point. We include covariates that may have some potential influence on food security outcomes. The set of covariates chosen do include the two variables that showed unbalancedness in our balancing table. We leave the model with the covariates in the result tables just to show that the results do not change with the inclusion of those. But our preferred results, are those without covariates. Those are the results discussed in the resuts section and conclusion sections of the paper. |
| Kolmogorov smirnov, not smirnov kolmogorov | thanks for the note. This has been corrected. |

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| Comments from Patrick Premand | Strategy to address/ our comments |
| It would benefit from framing this more in the environmental/climate change literature (including by discussing more the environmental benefits).  The comparison to social protection program is much less clear, because the magnitude of the benefits and the type of program is very different.  I wouldn’t mix up cash transfers (small regular transfers over a long period of time), cash-for-works (cash conditional on work for a few weeks/months), and cash grant interventions.  Comparisons to cash-for-works may make the most sense, especially given few cash-for-works evaluation can document both the environmental and welfare effects | Thanks a lot for the suggestion. We have revised the introduction accordingly |
| In the Sahel, we often see low correlation between average consumption (poverty levels) and (temporary) food security measures. Low food consumption/poverty and food insecurity are not necessarily equivalent, so I would try not to conflate the two. See for instance Schnitzer, 2018; or Premand and Schnitzer (2018). | Thanks for the note. Our indicator here is food consumption expenditures, not total consumption expenditures which are used generally for poverty classification. Food consumption - the value of all the food consumed (purchased or not) - is expected, by definition, to be correlated with food insecurity. However, we believe that this distinction does not really affect our conclusions that PES transfers can help mitigate the food security issues plaguing the drylands of the Sahel region. |
| you seem to be referring to different types of programs:   * cash transfer/safety net program (of the type reviewed by \_ * cash for works * cash grants interventions (Haushofer in Kenya)   I would try to be more precise about the comparisons. The cash-for-works literature might be your best hook, including given the fact that environmental benefits of cash-for-works are often claimed but rarely documented. The cash-for-works often operate in the lean season. If you can document both environmental benefits and welfare effects then it becomes a very important contribution.  I am less clear how this compares to regular cash transfer programs (of the types mentioned above). C  Cash grants interventions are completely different. | This is a good point. We have tried to link this more directly to the cash for work literature. There remains limited rigorous empirical evidence on C4W programs. And this is the first paper to provide some evidence of C4W in the environmental space. in the introduction, we call cash transfers, all types of interventions that involve handing cash to people, with a footnote clarifying that this is an abusive use of the term.  Based on our definition, |
| I would refer to meta-analysis rather than individual studies here.   * For cash transfers, Fiszbein & Schady, more recently Andrews ans Ralston, and Bastagli et al. | We have included these citations now, thanks for the suggestions |
| you need some discussion of how delayed payments may affect mechanisms for impacts. You may also be worried that this activity displaced work the year when the trees were taken care off, decreasing food security then. Can you speak to this potential adverse short-term effect? | Thanks a lot for the comments. In theory, the PES schemes could have yielded negative impacts due to the displacement of labor from agricultural activities. This is one of the reasons why this study makes sense in order to access if they really make a difference in food security outcomes.  Since we find overwhelming evidence of positive effects on our outcome of interest, we do not discuss potential areas where the program may have failed to deliver the intended goals. That would only support our results further. |