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Expectations and Reality check. Evaluation of Impact Assessments of Upgrading Strategies for Food Security: case study Tanzania

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Introduction

Rural food insecurity continues to be an unfortunate shadow of many regions ofTanzania.The international research and development project Trans-SEC (Graef et al. 2014) addresses this problem by implementing food securing upgrading strategies (UPS) along local and regional food value chains (FVC). In 2014 and 2015 two impact assessment waves were performed in two Tanzanian regions. The analysis of changes in perceptions from ex-ante (2014) to midterm ex-post (2015) impact assessments of UPS on local food securitycan provide a reference point for future project implementation, design and up-scaling opportunities.
The aim of this study was to assess the food security impact perception towards UPS through the exploration of differencesbetweenex-ante and ex-post midterm impact assessments, where local stakeholders,based on participatory developed evaluation criteria, scored the implemented strategies based on their personal experiences. Following the Framework of Participatory Impact Assessment (FoPIA) approach after Schindler et al (2016a), a sample of UPS implementers in focus group discussionsevaluated and scored nine different UPS for nine locally relevant food security criteria (FSC). The assessments were then discussed in the focus group to gain insights on the "impact arguments" and story lines behind seemingly odd scores. The outcome of these assessments was then compiled, compared and analyzed to understand specifics and differences within the village, between villages, and the regions, thus gaining a deeper understanding on the reasons behind different assessment outcomes.

Material and Methods

The study was performed in four rural villages of Tanzania. Idifu and Ilolo villages are located in Dodoma region, and Ilakala and Changarawe in Morogoro region. Dodoma is predominantly semi-arid (350–500 mm), characterized by crops like sorghum and millet and has as well long tradition of livestock husbandry (Mnenwa and Maliti, 2010). Morogoro has a sub-humid (600–800 mm) climate, with crops such aslegumes, maize, rice, sorghum and horticulture, and to somedegree is based on livestock production. These two regions are assumed to represent the majority of farming systems in Tanzania (USAID 2008).

The assessment scores were collectedin 2014 and 2015 using the FoPIA approach. FoPIA was originally developed by Morris et al.(2011)for land use policy impact assessment in the European context, later adapted by König et al.(2010; 2012; 2013) to assess land use policies in the context of developing countries, and recently further developed by Schindler et al.(2016 a) towards food

security assessments. The purpose of using FoPIA was to assess, in a structured methodological procedure, nine food security criteria (Table 1) previously developed through a participatory approach.

FoPIA consists of two phases (Schindler et al. 2016 a). In phase one the local food security context as well as the locally relevant assessment criteria was defined(Schindler et al. 2016 b). Phase two was destined to the selection of UPS and their assessment; this last phase is where the assessment scores for both periods were produced.

The impact assessment was performed on the selected UPS of each village; in total there were nine selected UPS, that included some UPS that were specific to a particular village(Schindler et al. 2016 a). The nine UPS are: "rain water harvesting and micro fertilization" (RWH/MF), "kitchen garden", "seed thresher/sheller", "improved cooking stoves", "sunflower pressing machine" (only in Idifu and Ilolo), "tree planting" (only in Ilolo), "byproduct for bioenergy" (only in Ilakala), 'improved storage bags", and "poultry integration" (only in Changarawe).

Impact assessment scores of both periods were used to perform statistical comparisons. Firstly, we calculated the arithmetic average, minimum and maximum scores for both periods (2014=T0, 2015=T1)and compared the scores 1) within the village, for example, in Idifu village for the UPS "kitchen garden" the impact assessment scores in T0 were compared to T1 for all nine FSC; 2) between regions, in this case the overall results of Dodoma region were compared to those of Morogoro region for both periods; and 3) across villages, this comparison allows, for example, to compare the scores of Idifu to the rest of the villages for every UPS. The independent samples of the four villages (Idifu, Ilolo in Dodoma region; Ilakala, Changarawe in Morogoro region) had non-normal distributions. To analyze the scoring result similarities and differences, we used the nonparametric Mann–Whitney U-test. The analysis was done using IBM SPSS Statistics 23.

Results and Discussion

Here we present a summary and examples of results and a discussion based on the three comparisons made.

Overall differences in impact assessment scores were found amongall threecomparisons performed. The analysis showed an average score decline from 2014 to 2015 of 0.39 points for all UPS. These results point out to a generally over optimistic expectations towards the UPS before they were actually implemented. In addition, the narratives indicated the poor implementation status, low engagement attitude when tangible benefits werenot achieved or requirea more long term perspective, and unexpected environmental events, such as extreme whether events. Table 1presents an example of the results for the case of "rain water harvesting and micro fertilization" in Changarawe.

				RWH/MF							
				t0				t1			
Region	Village	Sustainability Dimension	Food Security Criteria	n	min	max	average	n	min	max	average
Morogoro	Changarawe	SOC 1	Food availability	11	2	3	2.05	12	1	3	2.17
		SOC 2	Social relations	11	0	3	1.95	12	0	3	2.25
		SOC 3	Working conditions	11	1	3	1.86***	12	-2	3	(-0.25)***
		ECO 1	Production	11	2	3	2.86	12	1	3	2.33
		ECO 2	Income	11	1	3	2.55*	12	1	3	1.75*
		ECO 3	Market participation	11	1	3	1.68	12	1	3	2.17
		ENV 1	Soil fertility	11	2	3	2.55*	12	1	3	1.83*
		ENV 2	Available soil water	11	2	3	2.55*	12	1	3	2.17*
		ENV 3	Agrodiversity	11	2	3	2.73	12	2	3	2.67

Table 1: Comparison within village: example of Changarawe. * Criteria with a significant difference (α≤0.05). ** Criteria with a significant difference (α≤0.01). *** Criteria with a significant difference (α≤0.001). RWH/MF=Rain water harvesting and micro fertilization.

Impact assessments comparison within village

Regarding the differences within the village the following UPS had the biggest change in scores:

a) UPS ”improved storage bags” had an average difference for all FSC of 1.49 points lower compared to T0, however this result represent only Ilakala where the UPS was active in both periods. With the exception of *soil fertility* and *available soil water*, all FSC had significant changes. Highly significant changes (P≤0.001) were found for s*ocial relations, income* and *agrodiversity.* Farmers commented that the UPS will encourage more production, better quality; and additionally this UPS provide additional bargaining power because they can store the grains and wait for better prices. However the decline in scores evidenced an adjustment of perceptions on the potential benefits of this UPS. Instead, the improved storage bags” were only partially implemented at the time of the second assessment; thus did not enablefull experienceyet.

b) UPS “poultry integration” showed an assessment on average for all FSC 0.91 points lower than T0.Only the village Changarawe implemented this UPS. Highly significant changes (P≤0.001) were found for *food availability* and *income.* In this case, farmers commented that low rainfall affected production and that because the UPS is still in its infancy the input requirements act as an entry barrier for some farmers; these two implementation issues made difficult for participants to report changes.

c) UPS “*rain water harvesting and micro fertilizing*” (RWH/MF) impact assessment was 0.60 points lower in average for all FSC compared to T0. In Idifu the biggest change is for *market participation* (p≤0.001), in this case farmers mentioned that there are no markets available for their produce. For Ilolo the biggest changes were found for *soil fertility* and *available soil water*; farmers reported that additional fertilizer will need to be purchased and that this might be unaffordable for some, additionallyfarmers reported that the specific knowledge required to construction of tied ridges may be difficult to develop. In Ilakala all FSC scores declined. The biggest changes (P≤0.001) were found for *production, income* and *food availability;* for these changes farmers reported issues related to the results of pigeon pea in combination with maize was not as expected.Thus the yields were not sufficientto have surplus to bring to market. Also, farmers reported confusion about the involvement of the community and group members for the implementation of the UPS, conflicts with livestock keepers, work load underestimations, and the economic problems associated to the additional fertilizer needed to maintain soil fertility. Changarawe had on average 0.41 points less than expected. The biggest significant change from T0 was in social dimension for *working conditions* (P≤0.001). This change reflects a change in perception and a prior miscalculation of work load. Farmers reported that lack of experience was troublesome for building the tied ridges; additionally identifying proper spacing maize for intercropping was difficult.

d) For UPS “improved cooking stoves” an average increase of 1.29 points was found for all FSC compared to T0. This result is considerably influenced by the assessments in Changarawe that were in average 1.99 points higher for all FSC compared to T0; where with the exception of *market participation*, all FSC had highly significant changes (P≤0.001). In the case of Idifu *working conditions* increased significantly (p≤0.001), from 0.27 in T0 to 2.18 in T1. For this changes farmers mentioned that reductions in work load and increased spare time for other activities were the consequence of using the improved stoves.

Impact assessments comparison betweenregions

The analysis of regional differences included only the following UPS: “rain water harvesting and micro fertilizing” (RWH/MF), “kitchen garden”, “seed thresher/sheller”, “improved cooking stove” and “improved storage bags”.

The UPS scores for RWH/MF in both regions were similar for the two assessments periods. Dodoma averaged 1.99 in T0 while Morogoro averaged 2.56 points in the same period; highly significant differences (P≤0.001) were found for *food availability,* where expectations for this

UPS were 1.08 higher in Morogoro. In T1 there is a slight decline in impact assessments but Morogoro is ahead of Dodoma with an impact assessment score of 1.50 and 1.84 respectively; highly significant differences (P≤0.001) were found for *food availability*, where results for this UPS were 1.16 points higher in Morogoro. The rest of FSC had no significant differences.
For the UPS *"kitchen Garden"* in T0 Morogoro averaged 2.21 compared to Dodoma that averaged 1.71, although score differences existed in all FSC, no statistically significant differences were found in this period. However in T1 Dodoma scores for all FSC are in average 1.10 points higher than Morogoro; highly significant differences (P≤0.001) were found for *working conditions, soil fertility* and *available soil water.*
The UPS "seed thresher" produced similar results for T0 in both regions, although Morogoro had higher impact assessment scores, no statistically significant differences were found. On the other hand for T1 significant differences were found in *food availability* (P≤0.05), *production* (P≤0.01),and *agrodiversity*(P≤0.05).
For theUPS "improved cooking stoves" the expected impact in T0 was significantly different among regions. Dodoma had an average impact score of 1.09, while Morogoro had an average impact score of 0.39. Specifically *social relations* and *production had highly significant differences* (P≤0.001). Regarding T1 Morogoro results averaged 2.38 while Dodoma averaged 1.69. Morogoro dramatically increased its assessment by 1.99 points higher in average than in T0. In spite of that there were only significant differences for criteria: *food availability* (P≤0.05) and *available soil water* (P≤0.05).
The UPS "improved storage bags" was active in both regions only in T1. The impact assessment results were similar for both regions; Dodoma averaged 1.48 while Morogoro averaged 1.38 points. This similarity may be a consequence of the early stages of implementation of this UPS. The only significant difference (P≤0.05) was in available *soil water* criterion.

Impact assessments comparison acrossvillages
The last comparison performed was across villages, this allowed the identification trough a pair wise comparison of which village was outperforming the others. In this comparison regarding T0 assessments, significant differences were found particularly for *RWH&MF*, were for example Idifu, with an average score of 2.83, had highly significantly differences (P≤0.001) in *market participation* with village Ilolo (average score 1.23) (both in rural, semi-arid Dodoma region) and Changarawe (average score 1.68) (sub-humid Morogoro region). This shows that the relatively greater distance from regional markets of Idifu compared to the other villages may positively encourage greater expected benefits from this UPS.
On the other hand, T1 assessments showed that Changarawe had the highest presence of significant differences when compared to other villages, particularly for the UPS "kitchen garden" and RWH&MF. For example the UPS "kitchen garden" for FSC *soil fertility* had highly significant differences (P≤0.001) across villages, Changarawe had an average T1 score of -0.67 whereas Idifu 2.58, Ilolo 2.00 and Ilakala 1.00; this result reflects the differences in perception that the villages had regarding the interactions between the UPS and FSC. Additionally for T1, Idifu had several highly significant differences (P≤0.001) for the UPS "seed thresher" and "improved storage bags" particularly for *agrodiversity*.

Summing up, the decline in impact assessment scores from 2014 to 2015 was remarkably present in the economic dimension. Market access was a shared concern among villages, especially in Dodoma region. Increasing market access should become a priority for development projects for agricultural development in east Africa (FAO et al. 2015; Nyende, 2011). The impact arguments and discussions in the workshops signaled that there is more training needed for the proper use of fertilizers and water harvesting techniques, coinciding with the conclusions of Chianu et al. (2012). We found that Changarawe, which is the closest to regional markets, was highly sensible to workload miscalculations and improvements in working conditions. This result shows

evidence that the possibility to allocate labour in off-farm activities should be considered in the design of UPS.

Reflections on the FoPIA methodology

The use of impact arguments as soft qualitative data during the FoPIA assessments was primordial for the contextualization of the changes on impact assessments. This contextualization provides the "story lines" (König et al. 2010) behind differences in scores. Impact arguments and implementation status proved and important tool to understand midterm evolution of results. Due to the time lag between project deployment and achievement of tangible results farmers may lose engagement; thus is important that even if the assessment is performed at an early stage and only a portion of the ultimate benefits is observable, the judgment on the potential of UPS should consider the time lag.

Conclusions and Outlook

The analysis performed confirmed differences in impact assessment of UPS at the three levels of comparison (within the village, between villages, and between regions). The overall performance of UPS showed a slight decline in 2015 as compared to 2014. The methodology used allowed to contextualize the changes in perceptions through the use of qualitative data and "story lines". Farmer's perceptions were negatively affected by managerial performance, climate related shocks and "time lag", however if theoretically all managerial issues and climate related shocks would not have been present the potential positive impact of UPS is still high.

An additional finding was that in case farmers could materialize improvements at an early stage, their engagement, positive attitude and impact assessment of UPS is positively influenced. Thus, the analysis of the potential of UPS should consider the implementation status of the strategy.

Finally, our results can be used for re-aligning research activities because it highlights unexpected changes in perceptions; provides information for management decision; and provides evidence of achieved food security impact on locally relevant criteria. The analysis of the change in impacts of UPS in ongoing projects is critical to understand why they fail or succeed and a precondition to up-scaling of UPS. This work addressed this gap, thus it provides a step forward for making food securing UPS implementations more efficient and ultimately enhancing the project success.

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