Final Project Verification Report

Name of Reviewers:
Mateo Cariño (Senior internal reviewer)
Audit team:
Pablo Rodríguez-Noriega (Lead auditor)
Andrew Mbogholi (Local expert and witnessed auditor)

Date of Review: 11 July 2024

Project Name: Trees for Kenya – Kenya (Agroforestry System in Eastern Kenya).

Project Description:
This agroforestry project led by Trees for Kenya was established in 2019, whose target participants are smallholders in Embu and Tharaka Nithi which have degraded crop landscapes and are the most vulnerable to the impacts of climate change. The current land use activities are tea, coffee and subsistence crop farming, as well as existing agroforestry (begun in 2019) composed of mainly fruit trees, such as avocado, mango, and guava. These farmers live below $2 and rely purely on cash crops for their subsistence. In addition, farmers are facing a rapid and significant loss of topsoil and fertile lands, with increased risk of bush fires in the context of climate change.
The agroforestry design includes boundary planting and intercropping between cash crops, food crops, and trees. The agroforestry trees include a mix of shade, fruit-bearing, medicinal, live fences, and inter-cropping trees. These include *Grevillea robusta, Calliandra calothyrsus, Acrocarpus fraxinifolius, Persea americana, Pronus Africana,* and *Moringa olifera*. The maximum number of trees farmers can plant on their plots are 350/ha. Trees for Kenya has the goal to ensure the success of this project at a large scale, expanding to include all the smallholder farmers in their network. Trees for Kenya's aim for this project is to improve the livelihoods of smallholder farmers and their communities through income diversification (tree products and carbon finance), enhancing soil health for higher crop yield and less costly inputs, reduce massive soil erosions on farms, and improving farmer nutritional intake and biodiversity. Carbon finance will act as a financial cushion when farmers face crop loss, as well as an incentive for them to maintain the trees long-term.
At the time of project verification, the total number of farmers for whom the quantification of carbon benefits was performed was 12,553, with a total area of 4,514.11 ha, and a total amount of CRUs 9,164 verified.

List of Principal documents reviewed:

- Project ADD
- Laws/regulations:
    - Kenya National Agroforestry Strategy (2021-2030)

- Kenya Climate Smart Agriculture Strategy
  - National Climate Change Action Plan (NCCAP, 2018-2022).
  - Forest Conservation and Management Act, 2016.
  - Kenya Data Protection Policy 2018
- Legal/contractual documents
  - Participant Agreement
  - Trees for Kenya-Rabobank Partnership Agreement
- Tree planting Manual
- Evidence of training activities
- Reports to Donors
- Trees for Kenya Code of Conduct
- Agroforestry design
- Council meetings minutes
- Farmers database
- NGO registration document
- Project Business Case
- Land tenure documents
- Bank account documents
- Ground Truth and Measurement Report – Trees for Kenya – Kenya
- Pre-project tree adjustment model Report
- Remote sensing process description
- Acorn model validation (Internal document)
- Acorn – AKVO ground truth data collection (PowerPointint)
- Calculation Excel files:
  - Growth_curves_TreesforKenya_Kenya_50
  - TreesForKenya_GT_model_comparison
  - Verification Data Package_Trees for Kenya

Visited sites:

Plot ID	Farmer ID	Plot Area (ha)	Sampling Day	County	Coord X_Centroid	Coord Y_Centroid
KE119691 - 138200	12879233_1	0.335	11/20/2023	Embu	37.584	-0.422
KE067414 - 82222	24150917_1	0.207	11/20/2023	Embu	37.585	-0.422
KE054979 - 68084	1294552_1	1.692	11/20/2023	Embu	37.585	-0.421
KE055532 - 68648	4696885_1	0.295	11/20/2023	Embu	37.648	-0.426
KE055548 - 68667	5092807_1	0.282	11/20/2023	Embu	37.65	-0.427
KE055555 - 68669	5093053_1	0.567	11/20/2023	Embu	37.65	-0.428
KE055472 - 68588	3736811_1	1.272	11/20/2023	Embu	37.651	-0.425
KE055594 - 68708	7730141_1	0.892	11/21/2023	Embu	37.442	-0.357
KE055592 - 68709	7730142_1	0.672	11/21/2023	Embu	37.443	-0.356

KE054888 - 67992	11022996_1	0.763	11/21/2023	Embu	37.445	-0.355
KE217161 - 372715	9523463_1	0.266	11/21/2023	Embu	37.447	-0.355
KE120195 - 138723	33652346_1	1.737	11/21/2023	Embu	37.444	-0.382
KE119939 - 138478	23830723_1	0.621	11/21/2023	Embu	37.445	-0.383
KE054875 - 67976	10728166_1	0.402	11/21/2023	Embu	37.456	-0.377
KE055193 - 68308	23341986_1	0.233	11/21/2023	Embu	37.457	-0.377
KE054927 - 68031	12407155_1	2.536	11/22/2023	Tharaka Nithi	37.741	-0.41
KE055027 - 68132	13250786_1	0.211	11/22/2023	Tharaka Nithi	37.742	-0.403
KE055458 - 68575	36593637_1	0.295	11/22/2023	Tharaka Nithi	37.743	-0.403
KE055511 - 68625	4448977_1	1.465	11/22/2023	Tharaka Nithi	37.743	-0.405
KE067854 - 82662	28329074_1	0.144	11/22/2023	Embu	37.469	-0.399
KE067841 - 82651	27617588_1	0.277	11/22/2023	Embu	37.469	-0.399
KE207151 - 345796	1d6e4791-bf3b-4ea6-839d-9916e808d588	0.667	11/22/2023	Embu	37.469	-0.401
KE068012 - 82824	3758686_1	0.879	11/22/2023	Embu	37.471	-0.4
KE160011 - 217531	4929875_1	0.68	11/23/2023	Kiambu	36.738	-1.098
KE159048 - 214624	11349743_1	0.424	11/23/2023	Kiambu	36.739	-1.099
KE177219 - 267426	08b0dd47-721c-4b06-8a48-4eefd578152d	0.366	11/23/2023	Kiambu	36.742	-1.099
KE195008 - 310125	dd281c9c-d840-473f-995c-d30fd6cc0794	0.177	11/23/2023	Kiambu	36.593	-1.085
KE194919 - 309941	8d11510f-6a3f-47ac-81b4-d30c482c614d	0.781	11/23/2023	Kiambu	36.594	-1.088

Ground truth data plots visited and measured. As part of the verification process, some of the plots used for the development of the remote sensing model were visited :

- GTD ID: KEN_TreesforKenya_20230130_139218_5. 2 subplots were measured and another one visited.
- GTD ID: KEN_TreesforKenya_20230131_178462_30. 1 subplot measured.
- GTD plots between plots IDs: KE068012 – 82824 and KE067854 – 82662

List of individuals interviewed:

Trees for Kenya Staff

- [redacted], CEO
- [redacted], Project manager
- [redacted], Nursery attendant

Field technicians Trees for Kenya

- [redacted]
- [redacted]
- [redacted]

Stakeholders:

- [redacted]. Assistant of chief in charge of Administration.
- [redacted]. Subcounty Agricultural officer
- [redacted]. Donor representative form the organization MOYU
- [redacted]. Head of Remote Sensing in Acorn-Rabobank.
- [redacted]. Head of Certification in Acorn-Rabobank
- [redacted]. Innovation consultant in the Remote sensing team in Acorn-Rabobank.

Lead Farmers

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

Project participants (farmers)

<u>Embu County</u>

7 Farmers Kigumo - Runyejes
8 Farmers in Mbuvori
4 Farmers plots in Mbuvori

<u>Taharaka Nithi County</u>

4 Farmers in Kigumo and Tharaka

<u>Kiambu county</u>

6 Farmers in Ikinu Kiambu

Description of field visit:
The field visit was a 5-day onsite work, interviewing the local partner, project participants and other stakeholders, and visiting project farms and nurseries, as described in the following table.

Activity	Location	Date/time
Meeting with Trees for Kenya staff	Trees for Kenya local office, Gikuuri, Embu	20 Nov 2023 Morning
Meeting with local stakeholders [redacted]. Assistant of chief in charge of Administration.	Trees for Kenya local office, Gikuuri, Embu.	20 Nov 2023 Morning
Meeting with Nursery Attendant [redacted]	Trees For Kenya Nursey, Gikuuri, Embu.	20 Nov 2023 Morning
Meeting with local stakeholders [redacted]. Subcounty Agricultural officer	Trees for Kenya local office, Gikuuri, Embu.	20 Nov 2023 Morning
Site visit and data collection; Interviews with farmers and lead farmer ([redacted]), plot and trees measurement.	**7 Farmers plots in Kigumo - Runyejes**	20 Nov 2023 Morning and Afternoon
Site visit and data collection; Interviews with farmers and field technician ([redacted]), plot and trees measurement.	**8 Farmers plots in Mbuvori**	21 Nov 2023 Morning and Afternoon
Visit and measurement in ground truth data plot (GTDP)	GTD ID: KEN_TreesforKenya_20230130_139218_5 2 subplots measured and another one visited	21 Nov 2023 Afternoon
Site visit and data collection; Interviews with farmers and Lead Farmers ([redacted]), plot and trees measurement.	**4 Farmers in Kigumo and Tharaka**	22 Nov 2023 Morning
Visit and measurement in ground truth data plot (GTDP)	GTD ID: KEN_TreesforKenya_20230131_178462_30 1 subplot measured	22 Nov 2023 Morning
Visit to nursery and interview with workers	**Nursery:** Maka Agroforestry Trees Nursery	22 Nov 2023 Morning
Site visit and data collection; Interviews with farmers and Lead Farmers ([redacted]), plot and trees measurement.	**4 Farmers plots in Mbuvori**	22 Nov 2023 Afternoon
Visit and measurement in ground truth data plot (GTDP)	GTD plots between plots IDs: KE068012 – 82824 and KE067854 – 82662	22 Nov 2023 Afternoon

Travel Embu-Nairobi	Embu-Nairobi	22 Nov 2023 Afternoon
Site visit and data collection; Interviews with farmers, Lead Farmer ([redacted]) and Field Technicians ([redacted]). Plot and trees measurement.	**6 Farmers in Ikinu Kiambu**	23 Nov 2023 Morning and Afternoon
Meeting with Rabobank-Acorn ([redacted] and [redacted]) and Plan Vivo Consultant ([redacted])	Rabobank Nairobi office	24 Nov 2023 Morning
Interview with project donor: MOYU, [redacted]	Remote meeting	24 Nov 2023 Morning
Documentation review (project documents, maps, carbon calculations, contracts, etc.) and interviews with project staff ([redacted])	Rabobank Nairobi office	24 Nov 2023 Morning
Audit team internal meeting	Rabobank Nairobi office	24 Nov 2023 Afternoon
Closing meeting	Rabobank Nairobi office	24 Nov 2023 Afternoon

Verification Opinion: It can be concluded that the project meets all the verification requirements of the Acorn Framework and Methodology (**Positive Verification Opinion**)

Table 1. Summary of draft report on Corrective Actions

Theme	CARs	NIRS	PCARs
Applicability conditions	0	0	0
Biomass measurement	3	0	0
TOTAL	3	0	0

Table 2. Summary of final report on Corrective Actions

Theme	CARs	NIRS	PCARs
Applicability conditions	0	0	0
Biomass measurement	0	0	0
TOTAL	0	0	0

Table 3– Summary of open Forward Actions (if any)

Forward Action Requirement (FAR)	Description	Process to Resolve	Time Frame to be Closed By
No FARs have been identified			

Table 4– Assessments requested by reviewers from ADD and/or technical specification review process

Relevant requirements within Methodology	Description of concern	Validator comments	Corrective actions (if any)	ACORN response	Resolved?
		After assessing the project against the raised concerns, please include comments on whether any aspects of the project are non-compliant with the Plan Vivo Standard.	*Please write "none" if no correction actions required.*	*If corrective actions required, ACORN must provide response detailing changes made to address concerns.*	*(for validator) Has ACORN's response resolved the concerns.*

Methodology requirements to assess

Theme: Applicability Conditions

Section 4 applicability condition a	
A. Requirement:	*The project intervention meets the agroforestry definition (see Section 3), and any trees planted are native or naturalized species.*
B. Guidance Notes for Validators	Please give an opinion as to whether the concept of agroforestry is followed or pursued and tree species being planted meet these criteria. This can be checked using a number of sources: • Visual observations of local tree-growing practices • Discussions with farmers, communities, and project staff • Discussions with local experts (forestry and biodiversity experts) Published information (refer to this in the validation report if used) Through interviews with Local Partner and participants, assess whether the Local Partner promotes the use of native species in agroforestry systems.
C. Findings (describe)	Findings of requirement 4.1.7 of the Validation report: In the site visit and by analyzing the provided list of project species, it was confirmed that selected species are native, naturalized or commonly used species in the forestry/agricultural sector. Naturalized species are fundamentally fruit species or timber species. No negative potential impacts of these species have been identified. The ADD, in its Part F. 2, includes the list of the main species used in the project, classifying them as native or naturalized and including a description of the potential impacts and/or benefits of naturalized species. All project species have been observed in the project area, outside the project boundary, as common tree species used in agroforestry activities. Some of them were also observed in monoculture systems, both fruit and timber species (e.g., *Grevillea sp.* and *Mangifera sp.*). No evidence was found that project species are invasive in the project area. During the visit it was confirmed that the local partner is aware of the importance of using native species and that the planting activities are done using a mix of species with different objectives (fruit, shade, soil improvement). Although it was confirmed that Eucalyptus is not used in the project it was observed that this tree species was planted in some farms before the project started. Eucalyptus is commonly used in the country as timber/fibre species. However, it is considered by the local partner as a species with potential negative impacts (mainly worsening soil quality and depleting ground water resources).

	During the field visit, 2 nurseries were visited, one managed by Trees for Kenya and the other one by a local community with the support of the Local partner. In both visits, it was confirmed that the produced species were native or naturalized, as mentioned above.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 4 applicability condition b	
A. Requirement:	*The project area must not have been cleared of native vegetation within 5 years of the start of the project intervention.*
B. Guidance Notes for Validators	Assess the evidence to demonstrate that the land was not cleared prior to the project intervention. If: a. The evidence provided by satellite imagery that shows the absence of trees in the smallholder land at T-5 (5 years prior to the smallholder joining the project), confirms that the satellite image used appears to match the smallholder land that it is ascribed to. b. The evidence provided through other forms of proof, assess the accuracy of this proof by e.g. speaking to the smallholder and communities. c. If b, assess an appropriate number of smallholder plots whose evidence was provided through non-satellite-imagery means, i.e. other forms of proof. d. If the Local Partner confirms that deforestation has occurred 5 years prior to the start of project activities: Confirm whether the deforestation was caused by the perverse incentive to later claim CRUs and give an opinion as to whether, based on the Local Partner's mitigation measures, it is likely to occur again.
C. Findings (describe)	Findings of requirement 4.1.2 and 5.1.1 of the Validation report: In the field visit, it has been confirmed by direct observation, in the 28 plots visited, and in the interviews with the farmers and with Local Partner staff that the farms have been agricultural or agroforestry lands for more than 5 years, in most cases for more than 15-20 years. In the interviews with the Local Partner, it was confirmed that in the onboarding process, it is necessary

	to confirm that the farmer's land is an agroforestry land that was not converted from forest land to agricultural land in the past five years. During the review of the GIS information, it was corroborated that project lands are in an agricultural region with no evidence of recent deforestation in the area. Although some project plots are close to the forest, to the agricultural frontier, no evidence of recent deforestation was found in these areas either. The ADD includes information to confirm the fulfilment of this requirement (see Part B and Part M.1), and Acorn has confirmed that a T-5 check was performed for all project parcels.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 4 applicability condition c			
A. Requirement:	*The project area consists of individual plots that are between 0.1 and 10 ha.*		
B. Guidance Notes for Validators	Prior or during the site visit, the validator can check that the areas of sampled project sites are less than 10 ha via the remote-sensing polygons previously obtained by Acorn. If, when visiting the site, the boundary of the polygon appears to map appropriately onto the boundary of the smallholder's land, then the smallholder's land is likely less than 10 ha.		
C. Findings (describe)	As stated in the ADD, confirmed in the GIS file that includes the polygons of the project parcels, and confirmed during the site visit (in the interviews with the farmers and in the GPS measurements) all project parcels are between 0.1 and 10 ha. (See also findings of requirement 4.2.2. in the Validation report).		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		

H. Forward Actions (describe, if applicable)	*None*
I. Others	*None*

Section 4 applicability condition d			
A. Requirement:	*All land within the project area is either cropland or degraded land and not on wetlands in the baseline scenario.*		
B. Guidance Notes for Validators	Prior or during the site visit, the validator can check on what type of land the areas of sampled project sites are located and are in line with the land cover assessment information previously obtained by Acorn in the leakage assessment. • Give your opinion on whether activities are taking place, and/or have taken place, on land that is degraded, damaged or destroyed or existing cropland. • Give your opinion on whether you believe that the activities being employed by the project participants will enhance/improve the land. This may be assessed during visits to project sites and discussions with project participants and staff of the local coordinating organization.		
C. Findings (describe)	Same findings in requirements 4.1.2. and 4.1.4. of the Validation Report. Se below: In the field visit, it has been confirmed by direct observation, in the 28 plots visited, and in the interviews with the farmers and with Local Partner staff that the farms have been agricultural or agroforestry lands for more than 5 years, in most cases for more than 15-20 years. In the interviews with the Local Partner, it was confirmed that in the onboarding process, it is necessary to confirm that the farmer's land is an agroforestry land that was not converted from forest land to agricultural land in the past five years. During the review of the GIS information, it was corroborated that project lands are in an agricultural region with no evidence of recent deforestation in the area. Although some project plots are close to the forest, to the agricultural frontier, no evidence of recent deforestation was found in these areas either. No wetlands were identified during the visit and based on the reviewed documentation, the project boundary does not include wetlands.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		

H. Forward Actions (describe, if applicable)	*None*
I. Others	*None*

Section 4 applicability condition e			
A. Requirement:	*The project interventions must not include activities that increase the total number, weight or number of grazing days for any livestock type, relative to the baseline scenario.*		
B. Guidance Notes for Validators	During site visits and interviews with the smallholders, check with the smallholders whether the activities of the project, or income from the project, have or will likely result in an increase in their total number, weight or number of grazing days for any livestock type.		
C. Findings (describe)	During the site visit and in the interviews with project participants it has been confirmed that most of the visited farmers have grazing animals (mainly cows and goats) in the project area. The number of animals per farm is usually 1-3 cows and 1-10 goats, and this livestock seems to be for family consumption. In the plots visited, these animals are stabled or confined and are fed with fodder obtained on the farm, from fodder crops and pruning material from planted trees. No evidence was gathered that the project activity may contribute to an increase in grazing activities. The main activity in the project parcels is agriculture (e.g. coffee, tea, corn,…). Livestock activity is secondary, and farmers did not show any interest in increasing the number of animals.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 4 applicability condition f	
A. Requirement:	*The project intervention must not include the planned harvesting of planted trees during or after the crediting period.*

B. Guidance Notes for Validators	During interviews with the smallholders, gauge the participants' likelihood of cutting down any trees during or after the crediting period. If they plan to cut trees after the crediting period, check whether the trees will be planted trees or pre-project trees. Avoid leading questions.		
C. Findings (describe)	During the validation it was evidenced that harvesting is not planned in the project. This is clear for the local partner, as discussed with Trees for Kenya staff, and is indicated in the Participants Agreement. However, during the interviews with the farmers, some of them mentioned that part of the planted trees will be used for fuel wood or timber. It is a common practice in the area that farmers plant timber trees for fuel wood production; they do frequent pruning and they also harvest the trees with this objective. This type of tree is planted at high densities (usually in rows in the plot limit every 1-2 meters) and is replanted after harvesting. It was corroborated during the visit that Lead Farmers and Trees for Kenya are sensitizing the farmers about this issue, and it is clear to the validation team that harvesting is not a planned project activity. The local partner understands that, even though harvesting is not planned, there is a logging risk, and it has been identified in Part L of the ADD (Reversal Risk Assessment).		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 4 applicability condition g	
A. Requirement:	*Heavy machinery must not be used for site preparation or management.*
B. Guidance Notes for Validators	Ask Local Partner about use of heavy machinery and note any sightings of heavy machinery in and around project areas.
C. Findings (describe)	Interviewed farmers confirmed that tree planting was done and will be done manually. Heavy machinery has not been observed in the project area nor signs of it use. Likewise, considering the final expected planting density and the characteristics of the project sites (e.g. with current perennial crops) it will not be feasible to use heavy machinery in terms of access and costs.

D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 4 applicability condition h			
A. Requirement:	*The project intervention must not increase the use of synthetic (nitrogen-containing) fertilizers relative to the baseline scenario.*		
B. Guidance Notes for Validators	Ask Local Partner and participants about use of synthetic fertilizers. Also note any sightings of synthetic fertilizer containers in and around project areas.		
C. Findings (describe)	Interviewed farmers confirmed that they do not use synthetic fertilizers for the planted trees. They use fertilizers for their crops and other type of agricultural activities, but not for project trees. It does not seem to be a common practice in the area to use synthetic fertilizers when planting trees. In the nurseries they use organic fertilizers and no evidence of other fertilizer used has been found.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	*None*		
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*		
G. Status (if applicable)	*N/A*		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Theme: Biomass Measurement

Section 6 Carbon Baseline pre-project tree adjustment factor	
A. Requirement:	If the potential change in pre-project tree biomass is less than 5% of the expected increase in tree biomass expected to result from the project intervention, estimated using an appropriate tree or stand growth models, the carbon stock aboveground and belowground biomass of pre-project trees can be set at zero in the baseline scenario. Otherwise, measurements from sample plots must be used to define an appropriate adjustment factor with Equation 1 to Equation 3 and Table 3.

$$EETB_{y,s} = \frac{\sum_{i=1}^{n} \left(\frac{(ETB_{y,s} - ETB_{y,s=0})}{(TB_{y,s} - ETB_{y,s=0})} \cdot 100 \right)_i}{n}$$

Equation 1

Where:

$EETB_{y,s}$	= Estimated percentage change in tree biomass in year *y* that is attributed to pre-project trees, for plots in stratum *s*
$ETB_{y,s}$	= Existing tree biomass in sample plot in stratum *s, y* years after the start of the project intervention (t CO_2eq)
$ETB_{y,s=0}$	= Existing tree biomass in sample plot in stratum *s* at the start of the project intervention (t CO_2eq)
$TB_{y,s}$	= Tree biomass in sample plot in stratum *s, y* years after the start of the project intervention in the sample plot (t CO_2eq).
n	= Number of sample plots in stratum *s*

$$U_{EETB_{y,s}} = \frac{1.645 \cdot \sigma}{\sqrt{n}} \cdot \frac{1}{EETB_{y,s}}$$

Equation 2

Where:

$U_{EETB_{y,s}}$	= Percentage uncertainty of $EETB_{y,s}$ at a 90% confidence level
σ	= Standard deviation of $\left(\frac{(ETB_{y,s} - ETB_{y=0,s})}{(TB_{y,s} - ETB_{y=0,s})} \cdot 100 \right)_i$ for all sample plots within stratum *s*
n	= Number of sample plots in stratum *s*

$$AdjU_{EETB_{y,s}} = 0.25 \cdot (U_{EETB_{y,s}} - 0.5)$$

Equation 3

Where:

$AdjU_{EETB_{y,s}}$ = Adjustment for the uncertainty of $EETB_{y,s}$

Estimated change in existing tree biomass in stratum *s* after adjustment for uncertainty ($EETB_{y,s} + AdjU_{EETBy,s}$)	Adjustment factor for baseli for plots in stratum *s* ($AdjB_s$
$(EETB_{y,s} + AdjU_{EETB_{y,s}}) \leq 10\%$	0%
$10\% < (EETB_{y,s} + AdjU_{EETB_{y,s}}) \leq 25\%$	10%
$25\% < (EETB_{y,s} + AdjU_{EETB_{y,s}}) \leq 50\%$	25%
$50\% < (EETB_{y,s} + AdjU_{EETB_{y,s}}) \leq 75\%$	50%
$75\% < (EETB_{y,s} + AdjU_{EETB_{y,s}}) \leq 90\%$	70%
$(EETB_{y,s} + AdjU_{EETB_{y,s}}) > 90\%$	100%

B. Guidance Notes for Validators

Check the pre-project tree adjustment factor via the adjustment factor information provided prior by Acorn. Can this be justified/confirmed on a project level with what the validator sees during the fields visits?

C. Findings (describe)

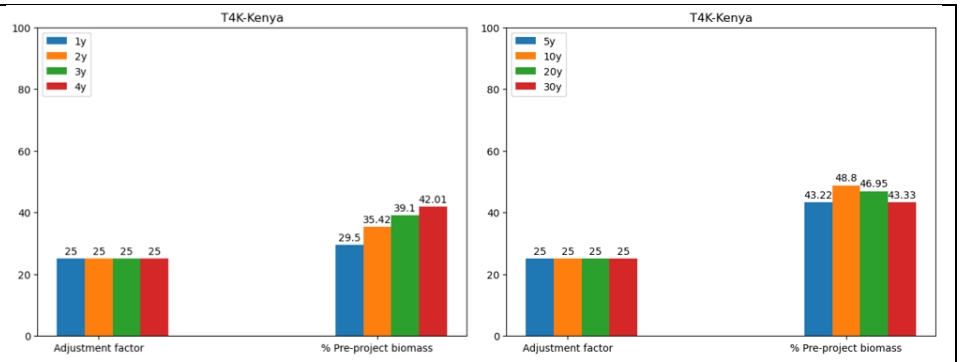
In this project case, as remote sensing is used for the monitoring of tree biomass, carbon baseline cannot be set as zero. Therefore, Acorn has estimated carbon baseline adjustment factor based on the Methodology (25%, as indicated in Part M.2 of the ADD).

The adjustment factor for baseline removal (AdjB) has been calculated using growth models and not using measured data. This adjustment factor has been estimated by comparing project year 0 and year 30. The Estimated percentage change in tree biomass in year "y" that is attributed to pre-project trees (EETBy) plus the Adjustment for the uncertainty of EETBy,s ($AdjU_{EETBy,s}$) was calculated between 25% and 50%. However, based on the observations in the field visit and on the forestry expertise of the audit team, there is enough information to confirm that this value should be close 100% or at least higher than 50%. In more than 90% of the 28 visited plots, project trees have not been planted or have been planted recently (seedlings smaller than 0.5 m). The current biomass changes in these first project years are mainly due to the growth of pre-existing trees. The use of an average adjustment factor for 30 years is not considered a conservative approach for the first years of the project, when, because of the sigmoid growth of the biomass, the growth is slower.

D. Conformance

Yes	No	N/A
X		

E. Corrective Actions (describe)	**CAR 01/24** The adjustment factor for baseline removal (AdjB) shall be done following the methodology, for the verification year "y". For example, if the biomass stock change and CRUs are calculated in project year 3, the baseline pre-project tree adjustment factor shall be calculated for this same year and all the parameters of equations 1, 2 and 3 (see above) shall be also for project year 3. If this CAR leads to a change in the adjustment factor, Acorn should update accordingly Part M of the ADD and the CRUs calculations.
F. Acorn's Response (if applicable)	To calculate pre-project tree adjustment, Acorn follows the prescribed methodology, chapter 6 on Carbon baseline. On page 11, Acorn methodology v1.1 it is stated *"… measurements from sample plots must be used to define an appropriate adjustment factor with Equation 1 to Equation 3 and Table 3. The sample plot data used must allow for distinction between pre-project trees and trees planted as part of the intervention."*. Sample plots, or also referred to as ground truth plots, are not the same as land ownership plots. Therefore, these are not monitored by the biomass model, they are used to build the model. The data collected from sample plots is an inventory and field measurements, collected at the start of the project. It is done for a statistically significant number of plots, selected within the strata of the project and targeting to represent the full variability of the project. These plots are measured at the start of the project. Full inventory on the tree species is collected. The adjustment factor is based on the sample plots, as no other field data is collected (for example from farmer plots). During the monitoring period, the biomass model is used to establish total biomass on farmer plots. However, the model is not able to differentiate the contribution of existing trees and the contribution of newly planted trees. In order for Acorn to be able to estimate the % biomass growth from pre-existing trees compared to the total biomass, we use a growth model. The model incorporates projected biomass growth of both existing and expected planted trees from the agroforestry design. This is because different tree species grow differently, therefore it is not possible to assume what % growth will be in the following year based on total biomass measurement. The model has passed model validation. This is also prescribed on p. 11 in the Acorn methodology. See below: *"If the potential change in pre-project tree biomass is less than 5% of the expected increase in tree biomass expected to result from the project intervention, estimated using an appropriate tree or stand growth models,"* The modelling of 30 years is done to address the part of the methodology which states "*expected increase as a result of the project intervention*". In the formula that is expressed as y ("*years after the start of the project intervention*"). To calculate the contribution of the project intervention, an assessment for the full duration of the project has to be taken into account. Nevertheless, we tested the adjustment factor for increment years (see figure below). The adjustment factor for Trees4Kenya remains at 25%.

	 **Audit team final findings (17 May 2024):** It is clear in the methodology that year "y" is the year where parameters are calculated (see section 10.2. and also, as an example, equation 10). It is also clear in the methodology, in section 6 (equations 1, 2 and 3), and in section 10.2. that all parameters in equations 1, 2, and 3 shall be measured and not based on growth models. However, Acorn has described the methodology deviation and has justified the use of growth models in this project case, where in the mid-long term it will not be possible to differentiate planted and pre-existing trees. The use of projections and models is a common practice in the estimation of the baseline GHG removals in Land Use carbon projects. Acorn has also updated the calculation of the adjustment factor for project year "y", year 4 in this case, leading to the same Adjustment factor of 25%. For the next verification period the Adjustment factor will need to be recalculated, considering the new project year "y" and the actual number of planted trees, based on project implementation information. Based on these new findings the audit team has decided to close the CAR.
G. Status (if applicable)	**Closed**
H. Forward Actions (describe, if applicable)	*None*
I. Others	*None*

Section 7.1 Sample plots for ground truth data collection	
A. Requirement:	*Data from sample plots are used to calibrate models for estimating tree biomass from satellite imagery. Sample plots used for model calibration must meet the following requirements:* 1. *Aboveground and belowground biomass of trees >2m in height or with a DBH of more than 2.5 cm must be measured.* 2. *Sample plots must be within the same ecoregion and with land use similar to that of the plots to which the model will be applied.* 3. *The location of sample plots must be selected at random from sites that meet the applicability conditions* 4. *Tree biomass within sample plots can be measured using:* • *The fixed area plot methodology described in Annex 1 of the Methodological tool: Estimation of carbon stocks and change in carbon*

	stocks of trees and shrubs in A/R CDM project activities (AR-TOOL14, v.4.2) • *The Acorn Standard Operating Procedures for Tree Inventory Plot Establishment and Measurement (Annex 3).* • *Airborne or terrestrial LiDAR survey that meets the minimum requirements set out in Annex 4.*
B. Guidance Notes for Validators	During field visit(s) collect ground truth data Do the plots meet the above requirements and does it appear that the trees have been appropriately measured?

C. Findings (describe)	During the site visit the following findings were identified regarding ground truth data collection:
	
	Field measurements: during the GTD collection, the verification team visited, together with Acorn staff (Acorn team), several field teams (project team) doing the GTD collection. During the visit, it was possible to interview some of the field workers of the project team, to measure some plots with them and to re-measure some plots with the Acorn team. The following findings were identified:
	
	• Plot delineation: in the visit during the GTD collection no errors in the delineation of the plot were identified.
	• Field data collection: in the interview with the project team staff collecting the data, three main findings were identified:
	  ○ Discrepancies/unclarity in the grouping of trees. Not all trees are measured. When trees of the same species have similar height they are grouped and then the number of trees of the group is recorded with the average height and DBH. The way the groups are done (e.g. every 1 m heigh difference) is not standardized and not included in the SOP. This affects the GTD final results.
	  ○ Errors in tree height measurement: it was identified that tree height was not measured correctly. Although it was confirmed that field teams are trained and that there is a document (Acorn – AKVO ground truth data collection) containing the methodology for GTD collection, it was identified that in some cases height is not measured following the appropriate method included in the SOP.
	  ○ Errors in the identification/reporting of existing trees. During the visit some plots were re-measured together with Acorn team and it was confirmed that some tree/groups were not measured. In some cases, one species was not measured/reported, and in others some individuals of a certain species were not measured/reported. In the next section (Data comparison) there is more information regarding this finding.
	
	Verification team remeasurement: during the on-site visit, the verification team measured 4 GTD subplots. Measurements have been compared with the result of the GTD collection that was done by the project team during the visit. The following findings were identified:
	
	• Species identification: in 2 of the 3 plots that were compared (the 4th one was not compared as it was not measured by the project) the verification

	team identified tree species that were not measured by the project team (Macadamia in one case and Tomato tree in the other). • Number of trees: in 2 of the 3 plots there were discrepancies in the total number of measured trees per subplot. The difference (not considering Coffee) was 60% and 18% (more trees were measured by the verification team compared to the data collected by the project). • Total biomass: in the only remeasured plots with the same number of trees and species the total AGB using the Chave equation was calculated. The discrepancy between verifier calculations and project calculations is significant. Verifier results are 2.6 times lower than project results.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	**CAR 02/24** Quality assurance and quality control procedures shall be implemented in the field monitoring of GTD to prevent and/or minimize the above described findings. Following chapter 4.3.4. of IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry 2003: Monitoring requires provisions for quality assurance (QA) and quality control (QC) to be implemented via a QA/QC plan. The plan should become part of project documentation and cover procedures for: collecting reliable field measurements; verifying methods used to collect field data; verifying data entry and analysis techniques; and data maintenance and archiving.		
F. Acorn's Response (if applicable)	Acorn has created an updated SOP document, which can be published online (if desired). The data collected following the protocol can be made available to the verifier/validator if required. The SOP documents has been provided to the audit team. Section 3. Quality assurance and control, has been adapted from the IPCC Good Practice Guidance for LULUC and Forestry. Acorn has implemented an additional step incorporating high resolution imagery and Lidar data. **Audit team final findings (17 May 2024):** It was confirmed by the audit team that a new QC/QA protocol has been designed and included in the SOP document. Acorn is continously improving the ground truth data collection and the remote sensing model to increase the accuracy of calculations. The implementation of this new protocol will be confirmed in the next verification. Based on these new findings the audit team has decided to close the CAR.		
G. Status (if applicable)	**Closed**		
H. Forward Actions (describe, if applicable)	*None*		
I. Others	*None*		

Section 7.2 Estimating change in tree biomass

A. Requirement:

If tree biomass is estimated using satellite imagery, change in tree biomass must be calculated using Equation 5. This approach estimates the change in carbon stock in trees as the difference between two successive and independent carbon stock estimates.

$$\Delta TB_{y,s} = \left(AGB_y - AGB_{y-1}\right) \cdot (1 + R) \cdot CF \cdot \frac{44}{12} \cdot (1 - AdjU)$$

Equation 5

Where:

$\Delta TB_{y,s}$ = Change in carbon stock in aboveground and belowground tree biomass in stratum *s,* in year *y* (t CO_2eq) after uncertainty discount

AGB_y = Aboveground tree biomass per plot in year y (metric tons of dry matter)

AGB_{y-1} = Aboveground tree biomass per plot in year y-1 (metric tons of dry matter)

R = Root-shoot ratio to calculate the belowground biomass factor

CF = Carbon fraction of tree biomass

$\frac{44}{12}$ = Conversion from carbon to carbon dioxide

$AdjU$ = Adjustment factor for uncertainty

B. Guidance Notes for Validators

At desk review check whether above equation has properly been executed and result in real and measurable results.

C. Findings (describe)

Based on the review of the provided Excel files with project GHG calculations (Verification Data Package_Trees for Kenya) it can be confirmed that the calculation of the Change in carbon stock in aboveground and belowground tree biomass was performed following The Acorn Methodology V1.1. and its Equation 5. Regarding the use of the Adjustment factor for uncertainty see CAR 03/24.

D. Conformance

Yes		No		N/A	
	X				

E. Corrective Actions (describe)

None

F. Acorn's Response (if applicable)

(To be filled out by the Project Coordinator)

G. Status (if applicable)

N/A

H. Forward Actions (describe, if applicable)

None

I. Others

None

Section 7.3 Uncertainty adjustment factor

A. Requirement:

The uncertainty value per project is calculated by Equation 7,

$$U = \frac{CI_{\sigma}}{AGB_{\Delta x}}$$

Equation 7

Where:

U	= Project uncertainty for positive change of AGB within a measuring period
CI_{σ}	= Half-width of a 90% confidence interval
$AGB_{\Delta x}$	= The mean positive change in aboveground biomass for n number of plots

$$CI_{\sigma} = 1.645 \frac{\sigma}{\sqrt{n}}$$

Equation 8

Where:

σ	= Standard deviation of positive change in AGB within a measuring period.
CI_{σ}	= Half-width of a 90% confidence interval
n	= refers to number of plots

And if applicable equation 9, for U values greater than 50%.

$$U_{adjF} = 0.25 * (U-0.5)$$

Equation 9

Where:

U_{adjF}	= Adjustment factor for uncertainty (percentage)
U	= Project uncertainty for positive change of AGB within a measuring period

B. Guidance Notes for Validators

Check the uncertainty adjustment factor via the adjustment factor information provided prior by Acorn. Can this be justified/confirmed on a project level?

C. Findings (describe)

In the review of the documentation provided by Acorn it was confirmed that the Uncertainty adjustment factor was calculated following the methodology and using equations 8 and 9. However, as discussed with Acorn and Plan Vivo, the current methods for the calculation of uncertainty and uncertainty adjustment factor do not accurately represent the uncertainty of the remote sensing model and the uncertainty propagation in the calculation of stock

	changes. Uncertainty is calculated comparing model results in two points in time.		
D. Conformance	Yes [X]	No [ ]	N/A [ ]
E. Corrective Actions (describe)	**CAR 03/24** PENDING ACORN AND PLAN VIVO DECISION ON METHODOLOGY UPDATES.		
F. Acorn's Response (if applicable)	**Acorn´s 1st response** Acorn has followed the latest Acorn methodology v1.1 to generate the CRU's for the project of Trees4Kenya. PlanVivo and their Technical Advisory Committee have advised Acorn to revert back to the previous version of the Acorn methodology v1.0. According to the team, V1.0 incorporates the error propagation. On 11th of April, PlanVivo sent the following statement to Acorn. *"Plan Vivo has not identified any non-compliance of Methodology V1.0 with the Methodology Requirements, so this methodology is still available for use. If ACORN is aware of errors that need to be corrected they should inform Plan Vivo so these can be reviewed. "* Therefore we have recalculated the uncertainty adjustment and have added a tab to the Verification Package Excel sheet in the shared folder (Verification Data Package_Trees for Kenya.xlsx). The adjustment factor is 5%. The full calculation can be replicated from the data in the Verification package. **Audit team final findings 17th May 2024:** Considering the currently available information, and based on the data included the Excel file "Verification Data Package" of the project, the average biomass change (in absolute values) is 10.73 % of the biomass stock at the first point in time (all in per hectare values). This has been calculated by dividing the average, in absolute values, of the difference between AGBy/ha and AGBy-1/ha, by the average of AGBy-1/ha. Following the used methodology (V1.0), the calculated error of the model used for the prediction of biomass stocks can be 30% (maximum value, see section 7.1.5). This means that the allowed maximum error (30%) of the model used for the estimation of the biomass stocks is 2.63 times bigger (280%) than the percentage of the biomass change (10.73%). Considering these calculations, the verification team understands that the actual uncertainty in the estimation of the biomass changes, and therefore of the CRUs (carbon removal units), is not being addressed by Acorn in the Excel file "Verification Data Package". The calculations of the Uncertainty for AGB change (Uy), performed in the Excel file "Verification Data Package", are done calculating the uncertainty of the AGB estimated per year (uy and uy-1) considering each the set of AGB data as a sample. Therefore, it estimates the uy for each set using the standard deviation, the Confidence interval and the average of each set of		

	values. With this approach, the model uncertainty is not being considered in Uy calculation. The audit team has been informed that Acorn and Plan Vivo have had discussions regarding the methodology, the uncertainty calculation and the adjustment factor. The conclusion has been to use the old Acorn Methodology V.1.0. which, the audit team understands, does not provide an accurate uncertainty, considering the model uncertainty (based on the comparison of estimated values vs. measured), the error propagation and the model bias. The methodology matters need to be resolved by Plan Vivo, and the audit team needs to verify the new methodology approach. Once the final adjustment factor is calculated and verified, CRUs shall be recalculated. Acorn and Plan Vivo shall clarify how they will proceed with the already sold CRUs that have not been verified, with the over issuance of CRUs. **Acorn's 2nd response 18th June 2024:** Following a request for Corrective Action, Acorn has recalculated uncertainty, to comply with Acorn methodology 1.0. The estimated adjustment factor is 5%. The calculations can be replicated from the data in the updated verification data package with a median for all plots. On further request for Corrective Action 03/24. Acorn recalculated the uncertainty for the project including the model residuals as input to Equation 7 (from methodology v1.0). Acorn Methodology does not prescribe how to perform this calculation. Therefore, two methods were proposed, both including the calculation of residuals. <u>Method 1: Project level median</u> The method implies that the adjustment factor is applied on project level. For this purpose, the U values derived from Equation 7 per plot from the set of plots subjected to verification, are aggregated using the median as a statistical approach (in case of non-normal distribution) and average (in case of normal distribution). The median/average U value is then matched against the table containing the adjustment factor to determine the project-based adjustment factor applied then equally to all plots. <u>Method 2: Plot level</u> The method implies that the adjustment factor is applied on plot level. For this purpose, the biomass delta values for all plots are used as input to Equation 7. The U value for each plot is calculated and then matched against the table containing the adjustment factor. The adjustment factor is deducted from the delta value for each plot. The formula is applied on the median for all plots measured by the models (Method 1). The estimated uncertainty adjustment is now 15%.

	The method that has been followed is: • Calculation of CI on validation plot AGB derived from GT data. • GT data is collected at the time of model calibration. As prescribed by Acorn Methodology v1.0 section 7.1.4.2, a minimum of 20 plots is kept aside for model validation. • CI is calculated using this validation set, and the modeled and measured values. • This method assumes uy and uy-1 are the same as the same version of the model is used in both years. • The residual, which is the difference between predicted and measured AGB of the validation dataset, is used within the half-width of the confidence interval. • The uncertainty estimates that results from Equation 7, therefore, includes both model error and project variance of the GT-derived AGB. **Audit team final conclusion 20th June 2024:** After reviewing the second response of Acorn and the new information provided (updated version of "Remote sensing process description-Trees4Kenya" and "Verification Data Package_Trees for Kenya") the audit team concludes that the uncertainty calculated is now considering both the remote sensing model uncertainty and the error propagation. Although the approach recommended by the TAC of Plan Vivo to calculate the adjustment factor at a plot level has not been followed (as Acorn is using Method 1 described above), the audit team has decided to close this CAR based on the following: Uy (Uncertainty for AGB change estimated) calculated using Method 1 described above is higher, and therefore more conservative, in the new version of the "Verification Data Package_Trees for Kenya" than in the previous one; the Adjustment factor calculated using the above Method 2 is higher, and therefore more conservative, than the calculated in the previous version of the "Verification Data Package_Trees for Kenya" using TAC´s approach. This decision has been made following a conservative approach. The final method to be followed is still under discussion/evaluation by Acorn and Plan Vivo, and under consultation with Remote sensing modelling experts
G. Status (if applicable)	**Closed**
H. Forward Actions (describe, if applicable)	*None*
I. Others	*None*

Section 8 Leakage adjustment factor	
A. Requirement:	The leakage value per project is calculated by Equation 10, $$AdjL = P \cdot A \cdot LF \cdot 100$$ Equation 10

	Where: $AdjL$ = Adjustment factor for leakage (percentage) P = The estimated reduction in productivity that will result from the project intervention, as a percentage of the productivity expected in the baseline scenario. If no change or an increase in productivity is expected, the score should be 0% A = The proportion of the project area used to produce the most important product, or carry out the activity, that contributes to productivity in the baseline scenario, e.g. if half the plot is used to grow a specific crop the score should be 0.5 LF = Leakage factor for the type of land that production will be likely to shift to as a result of the project intervention: cropland or degraded land is '0' and forest land or wetland or organic soils[1] is '1'
B. Guidance Notes for Validators	Check the leakage adjustment factor via the adjustment factor information provided prior by Acorn. Can this be justified/confirmed on a project level with what the validator sees during the field visits?
C. Findings (describe)	As stated in the Validation report, in the findings of Requirements 4.6.1 & 4.6.2: The ADD in Part M. 2. gives an adjustment factor for Leakage of 0%. Leakage is not expected, the project activity is not expected to lead to GHG emissions outside the project boundary. Trees for Kenya and Acorn do not expect potential displacement of pre-project activities due to the project implementation. During the site visit enough evidence was gathered to confirm that, if existing, potential leakage will be negligible. The only potential identified source of significant leakage is the displacement of agricultural or grazing activities. These activities will be displaced only if incompatible with project activities. Agroforestry is expected to increase the productivity of the current crops, or at least not decrease it, therefore, no displacement of agricultural activities is expected. In the case of livestock, most farmers have few animals and are compatible with their current agroforestry activity and are expected to be compatible with the project improved agroforestry.
D. Conformance	Yes [X] No [ ] N/A [ ]
E. Corrective Actions (describe)	*None*

[1] *IPCC GPG LULUCF (iges.or.jp)*

F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*
G. Status (if applicable)	*N/A*
H. Forward Actions (describe, if applicable)	*None*
I. Others	*None*

Section 9 Quantification of carbon benefits

A. Requirement:

Carbon Removal Units (CRUs) are calculated using equation 11.

$$CB_y = PR_y \cdot \frac{1}{1+BP} \cdot \left(1 - AdjB_s\right) \cdot (1 - AdjL)$$

Equation 11

Where:

CB_y = Carbon benefit for a plot in year *y* (t CO_2eq)

PR_y = Carbon removal for a plot in year *y* (t CO_2eq)

BP = Buffer pool percentage

$AdjB_s$ = Adjustment factor for baseline removal for plots in stratum *s*

$AdjL$ = Adjustment factor for leakage

B. Guidance Notes for Validators	Check number of CRUs calculated be justified/confirmed on a project level with what the validator sees during the fiels visits?
C. Findings (describe)	Based on the review of the provided Excel files with project GHG calculations (Verification Data Package_Trees for Kenya) it can be confirmed that the calculation of CRUs was performed following The Acorn Methodology V1.1. and its Equation 11. Regarding the use of the Adjustment factor for baseline removal see CAR 01/24.

D. Conformance	Yes	X	No		N/A	
E. Corrective Actions (describe)	*None*				
F. Acorn's Response (if applicable)	*(To be filled out by the Project Coordinator)*				
G. Status (if applicable)	*N/A*				
H. Forward Actions (describe, if applicable)	*None*				
I. Others	*None*				