

The Rufford Foundation Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Zerihun Asrat, Kutie
Project title	Assessing tree species diversity and forest cover change dynamics and investigation of local people's attitude towards conserving the Wondo Genet catchment.
RSG reference	18484-1
Reporting period	December, 2015 - November, 2016 Final Report
Amount of grant	£5000
Your email address	zerasrat@yahoo.com
Date of this report	November 28, 2016

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To investigate a historic forest cover change over the last four decades by producing land use/land cover map of the area in four different periods.			√	
To assess tree species diversity and determine dominance, abundance and importance value of the tree species of the area's forest.			√	
To assess the forest biomass using appropriate allometric equations, and thereby determine the carbon sequestration potential of the forest			√	Only above ground biomass
To investigation the local people's knowledge on the status of the catchment's forest and its importance; and their attitude towards conservation actions.			√	

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

There was no as such big difficulties, but the unexpected and extended rain and some violence in the area has forced to delay the field data collection.

3. Briefly describe the three most important outcomes of your project.

3.1) Land use/land cover change

The historic forest cover change (land use/land cover LULC change) was studied using satellite images (Landsat) of 1973, 1984, 2000 and 2013. After all the required corrections (geometric, radiometric, etc.) and image enhancement were conducted, the images were classified using hybrid image classification technique. Accordingly, there is a significant change in terms of LULC pattern over the last 4 decades. Figure 1 and 2 below shows that the forest cover and water bodies in the area has declined dramatically while trees outside the forest has increased in the study area. The forest coverage of the area shrunk from 34% in 1973 to 11% in 2013. Similarly, the water body in the area dropped by half from 2% in 1973 to 1% in 2013.

However, on the other hand the cover of trees outside the forest has increased from 16% in 1973 to 50% in 2013. Several factors have been mentioned by the local communities as reasons for the decline of the forest coverage over the past decade. Among the reasons are: settlement in the forest, illegal logging, clearing trees for farm land expansion, firewood collection, charcoal making, etc. It was also clearly seen from the images that the built up areas have increased largely in recent years.

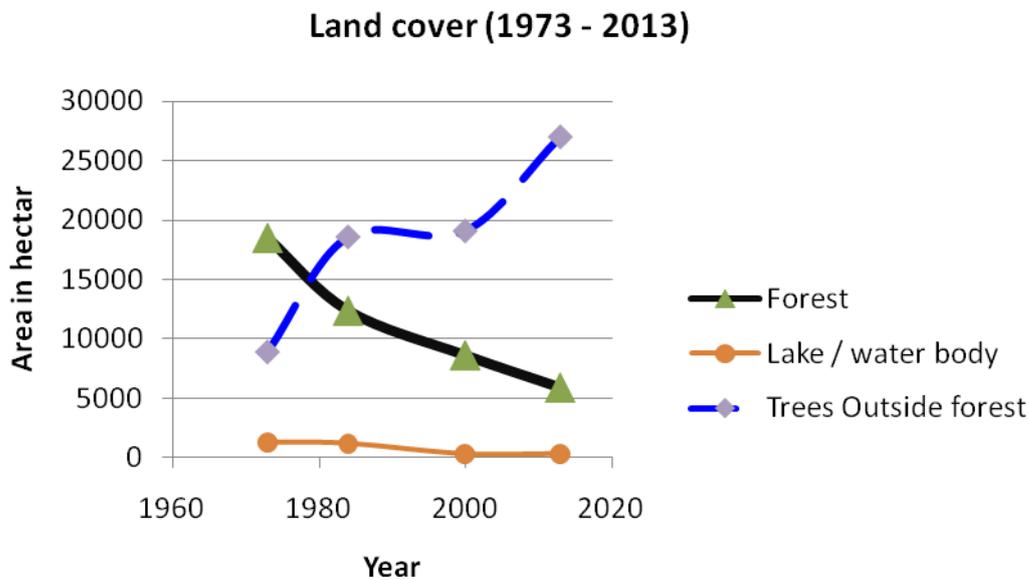
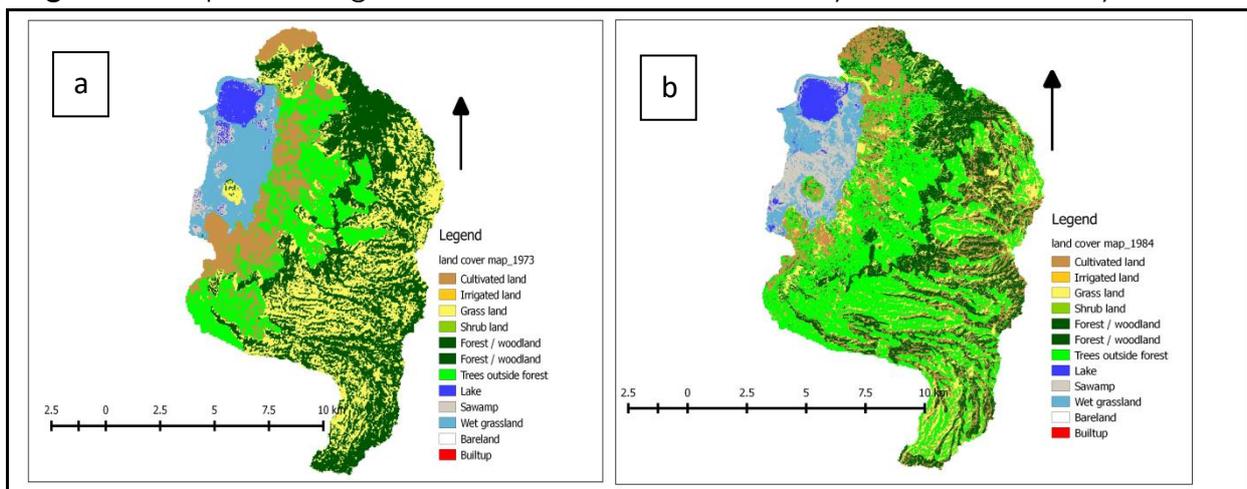


Figure 1: Graph showing trend of forest, TOF a water body cover of the study area.



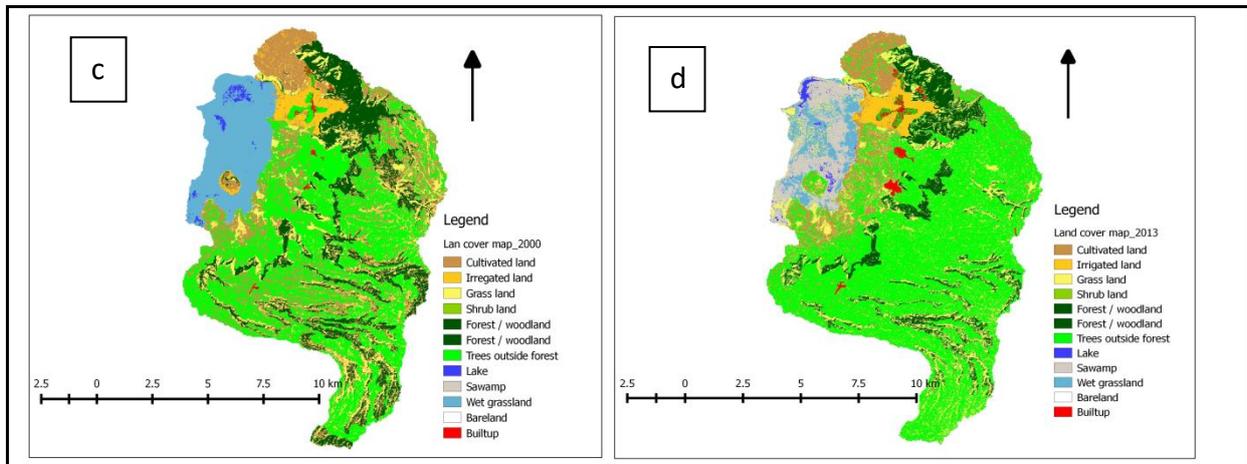


Figure 2: Land use land cover change map of 1973 (a), 1984 (b), 2000 (c) and 2013(d).

3.2) Tree species diversity and forest structure assessment

About 50 systematically distributed sample plots of concentric circle were observed and a total of 26 woody species were recorded in the natural forests of Wondo Genet as tree, seedling and sapling stages.

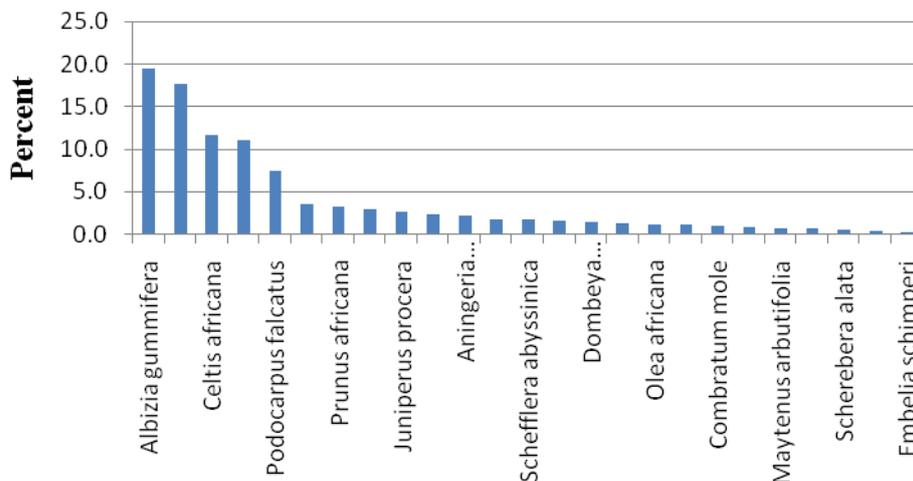


Figure 3: Tree species recorded and their percentage (relative density)

The first four tree species accounted for about 60% of the total number (figure 3). These tree species are *Albizia gummifera* (19.4%), *Millettia ferruginea* (17.62%), *Celtis africana* (11.65%) and *Croton macrostachyus* (11.03%). The calculated Shannon index (H') for each observation ranges from zero where there is no tree at all to a maximum of 1.82, while the average and median of H' are 1.07 and 1.17 respectively. Trees having DBH greater or equal to 10cm were recorded for DBH and height in each plot. Accordingly, the DBH and height distribution of the trees are shown in figure 4 a and b below. The maximum DBH measured was 85 cm while the

average was 33.58 cm. As shown in the figure most the trees are clustered around and below the mean implying that it has a typical curve of inversed j-shape. The average height of the trees was found to be 18.9 m, while the range is from 10 to 46 m. It can be seen that the number of dominant and co-dominant trees is very much limited, while most of the trees are found at the intermediate and lower canopy level indicating that the vertical structure of the forest is confined to the lower storey.

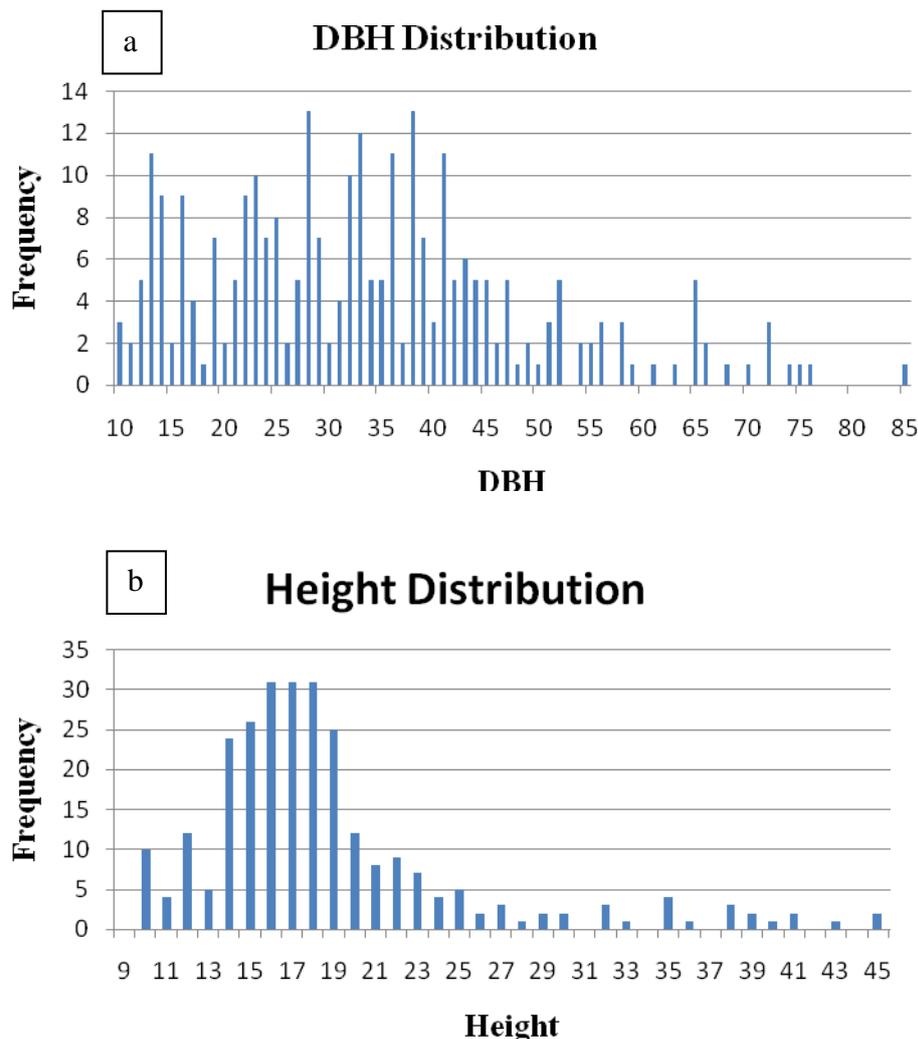


Figure 4: DBH (a) and height (b) distribution of trees.

Relative frequency (RF), relative basal area (RBA) and relative density (RD) of each tree species were determined. In addition importance value (IV) of each species was also calculated and shown in the table1 below. The top three species which have high IV and RD are *Albizia gummifera*, *Millietia ferruginea* and *Celtis africana*. From RF point of view the top three species are *Albizia gummifera*, *Croton*

macrostachyus and *Millietia ferruginea*. From RBA point of view the top three species are *Podocarpus falcatus*, *Albizia gummifera* and *Celtis africana*.

Table 1: Relative frequency, relative density, relative basal area and importance value of the observed tree species.

Species	RF	RD	RBA	IV
<i>Albizia gummifera</i>	13.37	20.36	15.95	49.69
<i>Millietia ferruginea</i>	10.47	15.64	11.63	37.73
<i>Celtis africana</i>	9.88	11.64	13.69	35.21
<i>Croton macrostachyus</i>	13.37	11.27	9.30	33.95
<i>Podocarpus falcatus</i>	8.72	6.91	16.55	32.18
<i>Aningeria adolfifrederici</i>	3.49	2.55	6.76	12.80
<i>Syzygium guineense</i>	3.49	4.73	4.50	12.71
<i>Prunus africana</i>	4.07	3.64	3.84	11.54
<i>Cordia africana</i>	4.65	2.55	2.72	9.91
<i>Juniperus procera</i>	4.65	2.55	2.29	9.48
<i>Schefflera abyssinica</i>	1.74	1.82	5.44	9.00
<i>Phonex reclinata</i>	2.91	2.18	1.55	6.64
<i>Olea africana</i>	2.33	1.45	1.26	5.04
<i>Barsama abyssinica</i>	2.33	1.82	0.39	4.54
<i>Acacia abyssinica</i>	2.33	1.45	0.64	4.42
<i>Polyscias fulva</i>	1.16	1.82	1.40	4.38
<i>Combratum mole</i>	1.74	1.45	0.41	3.61
<i>Apodyetes dimidiata</i>	1.74	1.09	0.32	3.16
<i>Dombeya schimperiana</i>	1.74	1.09	0.23	3.06
<i>Mytenus arbifolia</i>	1.16	0.73	0.24	2.13
<i>Ekebergia capensis</i>	1.16	0.73	0.13	2.02
<i>Manikara butugi</i>	0.58	0.73	0.20	1.51
<i>Spathodea nilotica</i>	0.58	0.36	0.39	1.33
<i>Steganotaenia araliacea</i>	0.58	0.36	0.05	1.00
<i>Embelia schimperi</i>	0.58	0.36	0.05	0.99
<i>Morus alba</i>	0.58	0.36	0.05	0.99
<i>Schrbera alata</i>	0.58	0.36	0.05	0.99

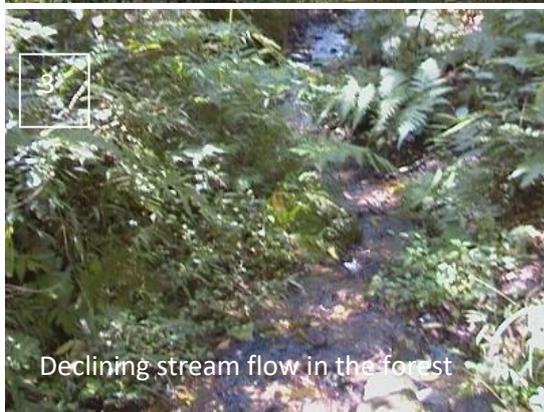
3.3) Tree/forest biomass accumulated and carbon sequestered

The above ground biomass (AGB) of the trees was calculated using the allometric equation proposed by Chave et al., (2014) and then the below ground biomass (BGB) was estimated as 24% of AGB (Carns M. et al., 1997); the corresponding carbon sequestered was estimated using the suggested conversion factor of 0.5; and also the equivalent carbon dioxide was determined by multiplying the obtained

carbon with 3.66 conversion rate. As indicated in table 2, the average biomass, carbon and CO₂e were 75.55, 37.77 and 138.26 ton/ha respectively. The biomass distribution in the forest showed significant variation as it ranges from 10.46 to 328.11 ton/ha between the observations. The carbon of this forest is comparable to those reported for the global above ground carbon stock in tropical dry forest while much less than in tropical wet forests that ranges between 13.5 to 122.85 ton/ ha and 95 to 527.85 t on/ha, respectively Murphy P. G. and Lugo A. E., (1986).

Table 2: Tree biomass, carbon, and carbon dioxide equivalent stored in the forest.

	Total tree Biomass (ton/ha)	Total Carbon (ton/ha)	Total CO ₂ e (ton/ha)
Mean	75.55	37.77	138.26
Standard Deviation	73.97	36.99	135.37
Standard Error	10.46	5.23	19.14
Minimum	10.46	5.23	19.14
Maximum	328.11	164.05	600.43
CI (95%)	20.50	10.25	37.52
Median	46.96	23.48	85.94





3.4) Local people's knowledge and attitude

Assessment of the level of local people's awareness and their attitude on conserving forests of the Wondo Genet catchment was conducted through interview using semi-structured questionnaire. About 40 households were interviewed. The questions were set in such a way to identify their levels of knowledge and attitude. Among the questions and responses were:

Do you have any knowledge about the concept of watershed/catchment management?

Yes = 97.5% No = 2.5%

Do you think others also have such knowledge? Yes = 97.5% No = 2.5%

Do you know the role of trees in catchment conservation? Yes = 92% No = 8%

Do you have trees (planted/natural) on your farm land? Yes = 92.5% No = 7.25%

Number of trees (estimated): Min = 6 Max = 300 Average = 79

Number of tree species (estimated): Min = 2 Max = 8 Average = 5

Do you have alternative energy sources other than wood for cooking?
Yes = 18% No = 82%

Do you use improved cooking stoves?
Yes = 12.5% No = 87.5%

What do you think about the overall trees/forest cover of the Wondo Genet sub-catchment over the past 10 years?
Decreasing = 100%

Would you be willing to contribute for the Wondo Genet Watershed Management Program?
Yes = 94% No = 6%

In general from this it might be possible to imagine that the majority of the local people are aware about the catchment and its forests situation that it is being degrading in terms quality and quantity. The vast majority of the respondents have also quite positive attitude regarding the conservation efforts and they are willing to contribute in any form. However, it seems that some of them are constrained by lack of alternative source of energy and improved cooking stoves for preparing food for their household, as a result forced to go to the forest for collecting fire wood and construction woods as well. This is obviously an indication of the possible intervention required.

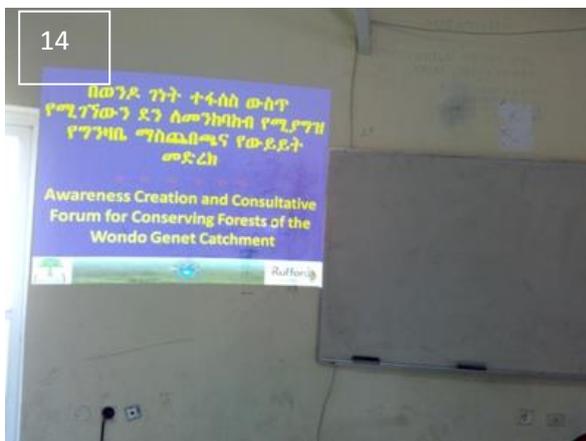


4. Briefly describe the involvement of local communities and how they have benefited from the project (if relevant).

Local people were involved in providing information regarding the existing problems on the forests of the area, that may help to design feasible intervention option to

tackle the problem and which will in turn help to solve their problems and manage the resources sustainably.

They were also involved in awareness creation and consultative workshop that has facilitated free and open discussion among the local people. They have got a chance to learn about the right way of using the water from the catchment for their irrigation cultivation activities. This was an opportunity for them to deal on the issue of water use conflict among the neighbouring villages and reach on consensus. The workshop has brought together various stakeholders (local people, development workers, government officials and professionals) to enable each identify their role and responsibilities in using and conserving the catchment and its forests reasonably and sustainably.





Presentation by Mr Yadeta T.



Coffee/Tea break

5. Are there any plans to continue this work?

Yes, there is a plan to include other dimensions of the issue also and over a relatively wider geographic area.

6. How do you plan to share the results of your work with others?

Part of the results were presented to the public during the workshop. The other results will be organised and compiled for publication on a local as well as international journal. It will also be presented on any available national and international workshops and opportunities.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

As planned, it was carried out over the past 12 months.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Stationary materials for field data collection, analysis and workshop preparation, Photo	611.32	611	-0.32	

Camera, external hard disk, etc.				
Car rent/mileage, fuel and oil	958.56	928.5	-30.06	
Personnel payment for field data collection	1739.33	1540	-199.33	Few field plots were not measured due to inaccessibility.
Workshop organization (subsistence payment, refreshment and related)	1363.7	1593.396	+229.71	The remaining amount from the above items and the contingency were used to cover the cost of the intentionally increased number of workshop participants
Contingency	327.104	327.104	-	
Total	5000.014	5000.00	-	

9. Looking ahead, what do you feel are the important next steps?

It might be good to work on the identified gaps so as to minimise the heavy dependence of the people on the forest for various purposes. It might also be good to extend the consultation and participation farther to the other neighbouring villages and the downstream dwellers so that a common ground will be formed for a better forest and catchment conservation.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Yes. The logo was used on the presentation slides for the workshop and on the printed papers (notes) for the participants including the workshop programme. Participants were also notified about the foundation.

11. Any other comments?

Thank you so much for the support.