The first rapid forest inventory and assessment of resource use in Dashtijum Nature Reserve, Tajikistan: a mixed methods approach

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SUPPLEMENTARY TABLE 1 The 10 native fruit and nut species occurring in Dashtijum Nature Reserve[1], with their IUCN Red List categories (IUCN, 2020).

Common Name	Scientific Name	Status
Wild Almond	*Amygdalus bucharica* Korsh.	Vulnerable
Wild Apricot	*Armeniaca vulgaris* Lam.	Endangered
Hawthorn	*Crataegus pontica* K. Koch	Least Concern
Persian Walnut	*Juglans regia* L.	Near Threatened
Wild Apple	*Malus sieversii* M. Roem.	Vulnerable
Mulberry	*Morus alba* L.	Not Evaluated
Pistachio	*Pistacia vera* L.	Near Threatened
Sogdian plum	*Prunus sogdiana* Vass.	Not Evaluated
Bukharan Pear	*Pyrus korshinskyi* Litw.	Critically Endangered
Tajik Pear	*Pyrus tadshikistanica* Zapr.	Critically Endangered

[1] U. Gulamadshoev, pers. comm.

Reference

IUCN (2020) *The IUCN Red List of Threatened Species. Version 2020-1*. iucnredlist.org [accessed 20 March 2020].

SUPPLEMENTARY MATERIAL 1 Semi-structured interview to gather data on the frequency, intensity and spatial pattern of resource use within Dashtijium Nature Reserve.

I am doing interviews to get an idea of the community's current and historical use of the fruit and nut forests and the patterns of grazing. It is for my personal research contributing towards my university degree. I will not record any personal information, it will not be shared with anyone and will be stored securely on my computer. Please may we ask you a series of questions? It will take around an hour.

Questionnaire Number: Date:

Age of respondent: Gender:

Length of time living in the area (years): Location of home:

1. When, in season, to what extent do you collect fruit and nuts of the following species?

Prompt: Others may include: cherry plum

	May			June				July				August				September				October				November				
Apple																												
Pear																												
Walnut																												
Apricot																												
Sour Cherry																												
Almond																												
Hawthorn																												
Pistachio																												
Mulberry																												
Wild Grape																												

2. How important economically is the collection of fruit and nuts of the following species?

	Very Important	Important	Moderately Important	Slightly Important	Not Important
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					

3. What kind of cultural uses are there for the fruit and nut tree species and how important are these?

4. In season, how often do you collect fuelwood of the following species?

Prompt: Bushol, fark, kayin, shulash

	Every day	4 x / week	2 x / week	Once a week	Other
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					
Fark					
Shulash					

5. What is the typical size of stems that you harvest for fuelwood?

< 5 cm 5-10 cm 10-20 cm 20-50 cm >50 cm

Prompt: 5cm = 16 C, 10cm = 31cm C, 20cm D= 63cm C, 50cm D = 157cm C

6. How important economically is the collection of fuelwood of the following species?

	Very Important	Important	Moderately Important	Slightly Important	Not Important
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					
Fark					
Shulash					

7. How often do you collect timber of the following species?

Prompt: Mulberry

	Every day	4 x / week	Twice a week	Once a week	Other
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					
Juniper					
Popular					

8. What is the typical size of stems that you harvest for timber?

< 5 cm 5-10 cm 10-20 cm 20-50 cm >50 cm

9. How important economically is the collection of timber of the following species?

	Very Important	Important	Moderately Important	Slightly Important	Not Important
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					
Juniper					
Popular					

10. How often do you collect hay per week during the hay collecting season?

May				June			

11. How important economically is the collection of hay?

Very Important Important Moderately Important Slightly Important Not Important

12. What modes of transport do you use to collect fruit and nuts, fuelwood and timber?

_____

_____

_____

_____

13. How long do you usually have to travel and with what mode of transport in order to arrive at the place where you collect the fruits or nuts of these species?

	Duration	Horse, donkey, foot, tractor
Apple		
Pear		
Walnut		
Apricot		
Sour Cherry		
Almond		
Hawthorn		

14. How long do you usually have to travel and with what mode of transport do you most commonly use in order to arrive at the place where you collect fuelwood of these species?

	Duration	Horse, donkey, foot, tractor
Apple		
Pear		
Walnut		
Apricot		
Sour Cherry		
Almond		
Hawthorn		
Fark		
Shulash		

15. How long do you usually have to travel and with what mode of transport do you most commonly use in order to arrive at the place where you collect timber of these species?

	Duration	Horse, donkey, foot, tractor
Apple		
Pear		
Walnut		
Apricot		
Sour Cherry		
Almond		
Hawthorn		
Juniper		
Popular		

16. Compared to the situation five years ago, has there been any change in the distance needed to travel to where fruits and nuts are collected?

The travel time has: increased decreased stayed the same

17. Compared to the situation five years ago, has there been any change in the distance needed to travel to where fuelwood is collected?

The travel time has: increased decreased stayed the same

18. Compared to the situation five years ago, has there been any change in the distance needed to travel to where timber is collected?

The travel time has: increased decreased stayed the same

19. How important to the health of the forest ecosystem and its ecological functioning are the following species?

	Very Important	Important	Moderately Important	Slightly Important	Not Important
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					
Juniper					
Popular					

20. Over the last five years, what has been the change in the total amount of fruit and nuts you have collected?

	Increased	Decreased	Stayed the same
Apple			
Pear			
Walnut			
Apricot			
Sour Cherry			
Almond			
Hawthorn			

21. Over the last five years, what has been the change in the total amount of fuelwood that you have collected?

	Increased	Decreased	Stayed the same
Apple			
Pear			
Walnut			
Apricot			
Sour Cherry			
Almond			
Hawthorn			
Fark			
Shulash			

22. Over the last five years, what has been the change in the total amount of timber that you have collected?

	Increased	Decreased	Stayed the same
Apple			
Pear			
Walnut			
Apricot			
Sour Cherry			
Almond			
Hawthorn			
Juniper			
Popular			

23. Does your household own livestock? Yes No

24. Do you graze your animals in the forests?

25. If so, which species of livestock do you let into the forests?

Horse/donkey	
Cattle	
Goat	
Sheep	

26. How far do the livestock go from your territory?

<1 km 1 - 3 km 3 - 5 km >5km Anywhere

27. How has the number of livestock that you own changed over the past five years?

	Increased	Decreased	Stayed the same
Horse/donkey			
Cattle			
Goat			
Sheep			

28. How have the following changed in the forest over the past five years?

	Increased	Decreased	Stayed the same	Don't know
Number of young trees				
Number of large trees				

Availability of fruits and nuts				
Availability of fuelwood				
Availability of timber				
Area available for grazing				
Quality of grazing in forests				
Quality of grazing in pasturelands				

29. Please indicate whether the following products are collected for mostly subsistence use, or for commercial sale.

	Subsistence use	Commercial sale
Apple		
Pear		
Walnut		
Apricot		
Sour Cherry		
Almond		
Hawthorn		
Fuelwood		
Timber		

30. In season, how often do you eat pears and other fruits and nuts?

	Every day	Often	Once a week	Rarely	Other
Apple					
Pear					
Walnut					
Apricot					
Sour Cherry					
Almond					
Hawthorn					

31. What are the main threats to the forest and have these increased, decreased or stayed the same?
Make sure you get inc, dec or stay the same

32. What are the main threats to the pear trees and have these increased, decreased or stayed the same?
Try and extract species specific answers

33. Has the climate changed in the past decades?
Prompt: Has the patterns of rainfall changed? Has it got drier or hotter? Has the frequency of natural disasters changed?

34. Do the pear trees have any pests or diseases?

35. Do the pears have cultural significance within the communities?

36. Who harvests the pears, other fruits and nuts, fuelwood and timber?

37. Is the forest managed in any way?

38. Are the fruit and nut trees naturally occurring in these areas or were they planted by humans?

39. What types of pear tree do you know of?

40. Of the ones you know, what do you use them for?

    Shaking:

    Amrud:

    Tar amrud:

    Nok:

    Noshpoti:

    Kayon:

41. Do you know if the pear trees interbreed?

42. Do you know of any examples of natural pear hybrids?

SUPPLEMENTARY TABLE 2 Biotic, topographic and disturbance variables for each of the 40 survey plots (Fig. 1).

Plot	Spp. Richness	Shan. Index	Marg. Index	Total Basal Area (m2)	Alt. (m)	Slope (°)	Canopy Cover	Dist. to Near. Settle. (m)	Fence	Hay	Track	Animal Track	Browse Line	Trampling	Dung Count
1	3	0.79	0.69	2.61	1174	13	Medium	1670	No	Yes	No	No	Absent	None	0
2	1	0.00	0.00	2.51	1188	11	Medium	870	No	No	Yes	Yes	High	High	105
3	3	0.89	0.80	1.40	1171	11	Open	1570	No	No	Yes	No	Absent	None	0
4	5	1.11	1.24	1.34	1292	22	Open	1080	No	No	Yes	Yes	Absent	None	180
5	6	1.20	1.25	20.91	2307	3	Medium	5210	No	No	No	Yes	Absent	None	0
6	6	1.33	1.36	5.23	2045	18	Open	4130	No	No	No	Yes	Low	None	0
7	6	1.61	1.73	4.72	1764	7	Open	480	No	No	No	Yes	High	Medium	294
8	3	0.61	0.48	4.22	1761	5	V Dense	410	No	No	Yes	Yes	Medium	None	406
9	6	1.58	1.62	3.94	1226	31	V Open	1060	No	No	Yes	Yes	Low	Medium	60
10	4	1.12	1.04	1.18	1157	12	V Open	820	No	No	Yes	Yes	Absent	High	420
11	1	0.00	0.00	2.41	1187	22	V Open	380	No	No	Yes	Yes	High	High	30
12	4	0.96	0.88	5.36	1319	5	Medium	1030	No	No	No	No	Absent	None	60
13	2	0.49	0.29	0.95	1279	11	Dense	1310	No	No	No	No	Absent	None	232
14	1	0.00	0.00	1.59	1313	2	V Open	1020	No	No	No	Yes	High	Low	0
15	3	0.99	0.76	0.99	1453	15	V Open	630	No	No	No	Yes	Medium	None	0
16	9	1.25	2.22	7.89	1848	10	Dense	1980	Yes	No	Yes	No	High	None	0
17	7	1.38	1.48	9.38	1778	15	Medium	1310	No	No	Yes	Yes	Medium	High	300
18	3	0.69	0.53	8.91	1723	6	Open	510	No	No	Yes	Yes	High	High	598
19	5	0.96	1.38	3.57	1380	20	V Open	660	No	No	Yes	Yes	High	Medium	118
20	4	0.42	0.71	5.95	1345	5	Dense	840	No	Yes	Yes	Yes	Absent	Medium	0

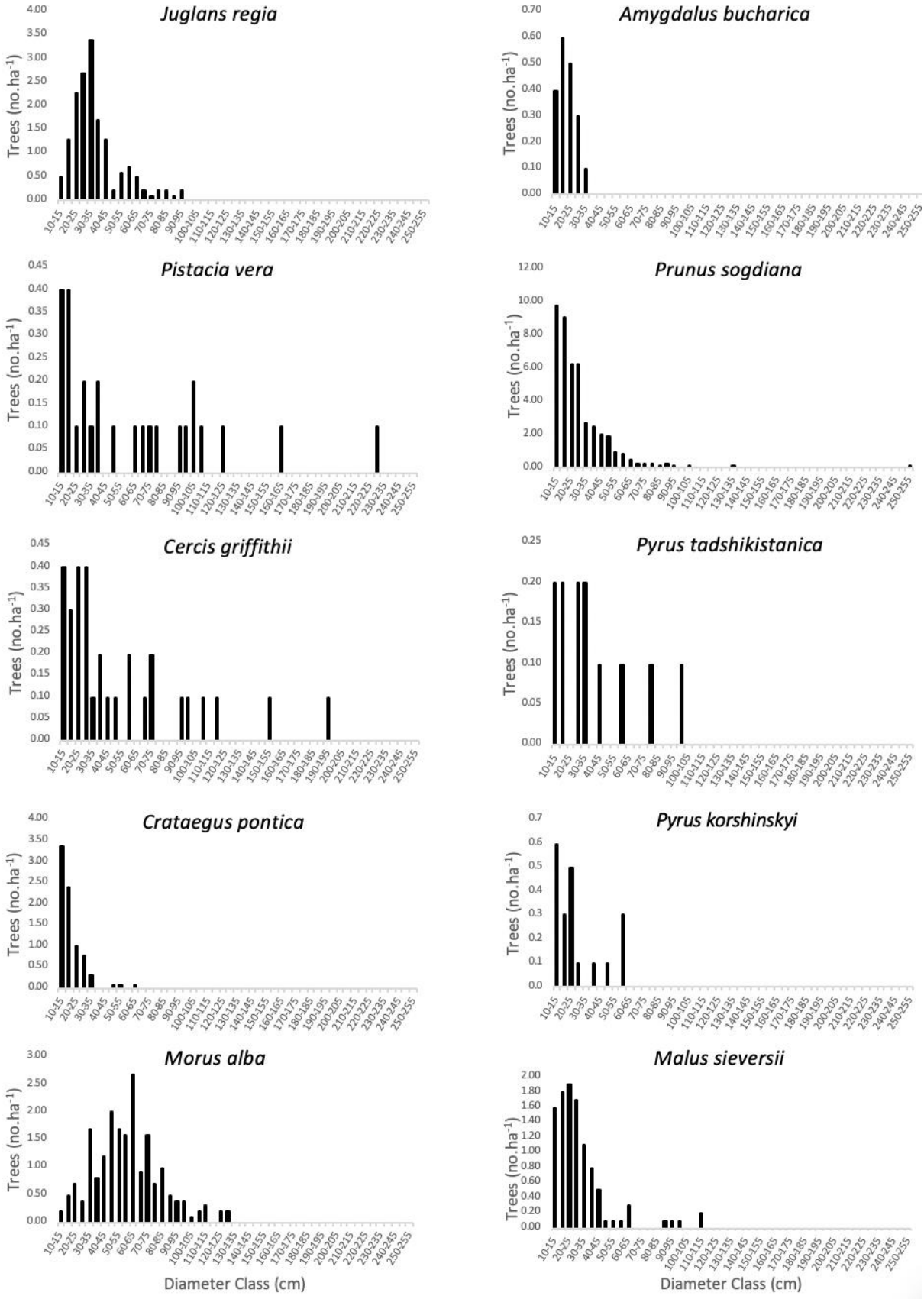
21	7	1.66	2.08	2.02	1488	5	Medium	530	No	Yes	Yes	Yes	Medium	None	118
22	9	1.89	2.29	10.18	1752	6	Medium	1800	No	No	No	Yes	Absent	Low	0
23	8	1.64	1.65	10.11	1630	9	Dense	420	No	No	Yes	Yes	Medium	Low	0
24	5	1.36	1.20	9.22	1564	8	Medium	170	No	No	Yes	Yes	High	High	60
25	11	1.87	2.61	1.51	1535	13	Dense	470	No	No	Yes	Yes	Medium	Low	0
26	1	0.00	0.00	1.22	1449	15	Medium	440	No	Yes	Yes	Yes	Medium	None	0
27	3	0.51	0.80	1.65	1329	17	Open	630	No	Yes	Yes	No	Low	None	0
28	6	1.47	1.42	3.49	1355	6	Open	1930	No	Yes	Yes	Yes	Absent	Medium	0
29	10	1.69	2.35	8.14	1014	5	Medium	990	No	Yes	Yes	Yes	Absent	Medium	0
30	9	1.02	1.84	6.20	1345	18	Dense	460	No	No	No	Yes	High	High	360
31	5	1.26	0.99	1.19	1368	6	Dense	370	No	No	Yes	Yes	Medium	Medium	240
32	6	1.30	1.62	1.32	1313	8	V Open	1060	Yes	Yes	No	No	Absent	None	0
33	6	1.31	1.41	2.62	1389	20	V Open	1040	Yes	Yes	No	No	Absent	None	0
34	5	0.96	1.07	6.94	1524	5	Medium	320	No	No	Yes	Yes	High	High	478
35	10	1.68	2.34	10.46	1588	7	Medium	260	Yes	Yes	No	No	Absent	None	0
36	6	1.57	1.40	3.68	1289	21	Open	1290	No	Yes	Yes	No	Absent	None	0
37	5	1.37	1.26	1.16	1397	11	Dense	1300	No	Yes	Yes	No	Absent	Low	60
38	2	0.24	0.37	14.30	1177	25	Medium	1270	No	No	Yes	Yes	Low	High	540
39	12	2.14	2.80	4.90	1293	19	Medium	3730	No	No	Yes	Yes	Absent	None	60
40	7	1.21	2.77	12.48	1293	6	V Open	2430	No	No	No	No	High	High	1080

SUPPLEMENTARY TABLE 3 The Importance Value Indices (IVIs) of all species within Dashtijum Nature Reserve.

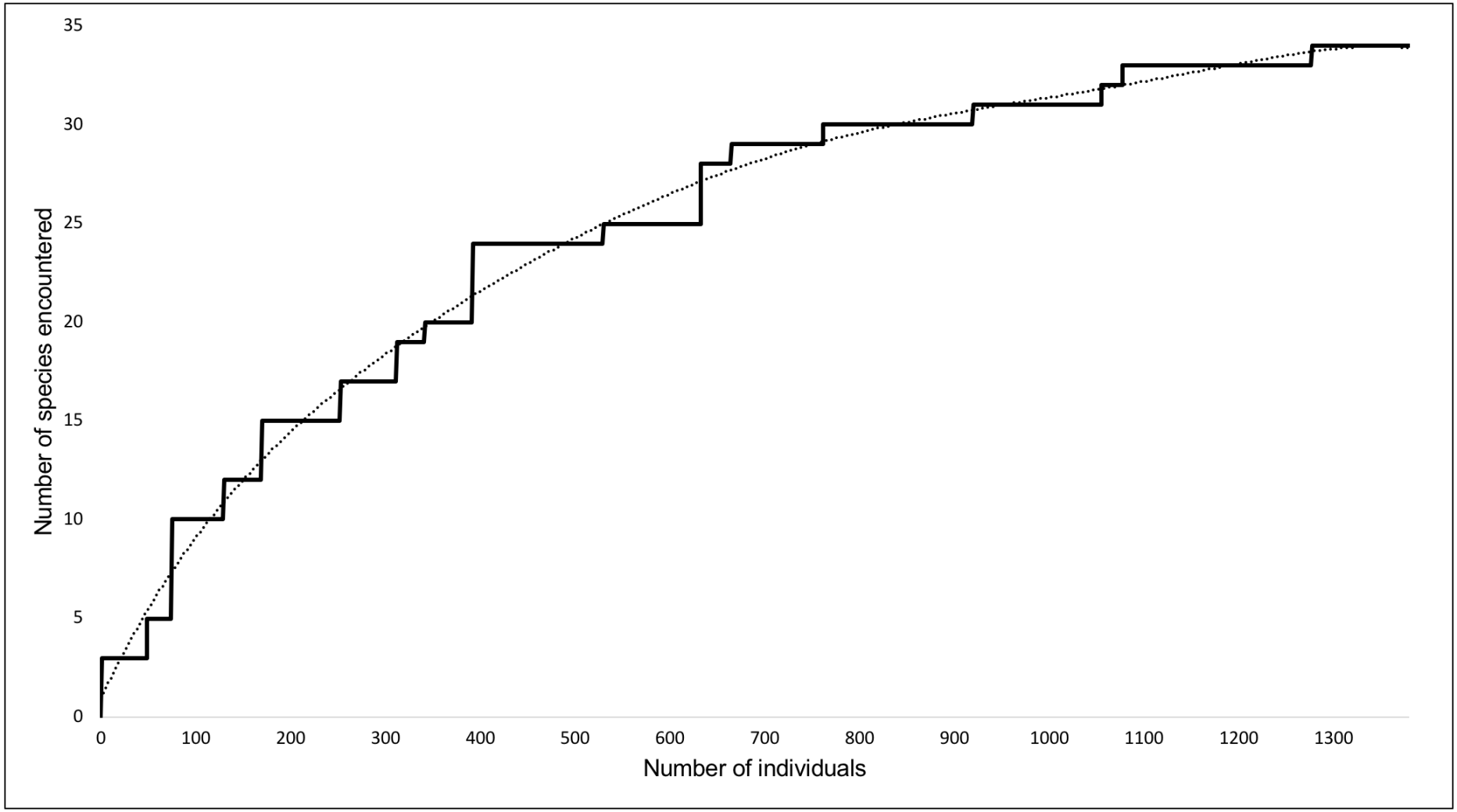
Species	Family	Relative Frequency (%)	Relative Density (%)	Relative Dominance (%)	IVI (%)
Pistacia vera	Anacardiaceae	1.9	2.0	7.7	3.9
Celtis caucasica	Cannabaceae	2.8	2.4	2.7	2.6
Lonicera nummulariifolia	Caprifoliaceae	4.7	3.7	6.8	5.1
Juniperus seravshanica	Cupressaceae	0.9	0.1	0.0	0.4
Elaeagnus angustifolia	Elaeagnaceae	2.4	0.4	0.2	1.0
Calophaca grandiflora	Fabaceae	1.4	0.6	0.2	0.7
Juglans regia	Juglandaceae	9.3	11.7	9.3	10.1
Cercis griffithii	Leguminosae	0.9	2.2	5.3	2.8
Punica granatum	Lythraceae	0.9	2.0	0.6	1.2
Morus alba	Moraceae	6.5	14.6	29.9	17.0
Ziziphus jujuba	Rhamnaceae	0.9	1.9	0.3	1.0
Amygdalus bucharica	Rosaceae	1.9	1.4	0.3	1.2
Armeniaca vulgaris	Rosaceae	2.8	0.6	0.9	1.4
Cerasus avium	Rosaceae	1.4	0.3	0.1	0.6
Cerasus vulgaris	Rosaceae	2.8	1.7	0.3	1.6
Cersus tomentosa	Rosaceae	0.5	0.1	0.0	0.2
Cottoneaster nummularius	Rosaceae	1.4	0.6	1.7	1.2
Crataegus pontica	Rosaceae	9.3	5.9	1.3	5.5
Crataegus turkestanica	Rosaceae	1.4	0.6	0.2	0.7
Cydonia oblonga	Rosaceae	1.9	0.4	2.1	1.5
Exochorda alberta	Rosaceae	1.9	0.4	0.3	0.8
Malus sieversii	Rosaceae	9.3	7.6	4.9	7.3
Padellus mahaleb	Rosaceae	1.4	0.8	1.7	1.3
Prunus sogdiana	Rosaceae	15.0	31.6	18.3	21.6
Pyrus korshinskyi	Rosaceae	2.3	1.4	0.7	1.5

Pyrus tadshikistanica	Rosaceae	3.7	0.9	0.9	1.8
Rosa canina	Rosaceae	0.9	0.1	0.2	0.4
Populus bachofenii	Salicaceae	1.9	1.3	1.0	1.4
Populus tadshikistanica	Salicaceae	1.4	0.8	0.2	0.8
Salix excelsa	Salicaceae	1.4	0.9	0.2	0.9
Acer turkestanicum	Sapindaceae	2.3	0.5	1.6	1.5
Ulmus androssowii	Ulmaceae	0.5	0.1	0.2	0.3
Vitis vinifera	Vitaceae	1.9	0.4	0.0	0.8
Total		100	100	100	100

SUPPLEMENTARY FIG. 1 Stem diameters of the 10 most utilized tree species, as reported in interviews in the four villages (Fig. 1).



SUPPLEMENTARY FIG. 2 Tree species accumulation curve for the study area, the dotted line represents the rarefaction curve which almost reaches an asymptote.



SUPPLEMENTARY TABLE 4 The results of a simple linear regression using total basal area as the response variable showing a significant relationship with the independent variable distance to nearest settlement.

Independent Variables	Estimate	Standard Error	t-value	p-value
Intercept	5.313	1.529	3.475	0.001
Slope	-0.163	0.099	-1.639	0.111
Distance to Nearest Settlement	0.002	0.001	2.858	0.007

SUPPLEMENTARY FIG. 3 Marginal response curves for the three quantitative predictor variables altitude, distance to nearest settlement and dung count with Shannon index, species richness (N) and total basal area as the response variables.