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UNDERSTANDING COMMITMENT TO AGROFORESTRY: A CROSS-SECTIONAL STUDY OF A SAMPLE OF NIGERIAN FARMERS

RAZUMEVANJE ZAVEZANOSTI KMETIJSKO-GOZDARSKIM SISTEMOM: PRESEČNA RAZISKAVA VZORCA NIGERIJSKIH KMETOVALCEV

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ABSTRACT

Agroforestry plays a vital role in reconciling food production with forest biodiversity conservation. There is a need for a systematic investigation into the benefits and ecological considerations that underlie the commitment of smallholder farmers to agroforestry systems. This study therefore aims to investigate the relative importance of farmers' attitudes towards forest loss and the perceived benefits of agroforestry in influencing their commitment to agroforestry. The research was conducted among a group of farmers in Oyo State, southwestern Nigeria, using a cross-sectional survey in which structured questionnaires were administered to 400 crop farmers selected through clustered purposive sampling. Respondents' agreement with sets of relevant statements was elicited and used to assess variables. The independent samples t-test and one-way ANOVA were used to examine the significance of the difference in respondents' commitment to agroforestry across sub-groups of gender and age/education, respectively. The Pearson correlation coefficient was used to examine the relationship between variables. The results show that 57.8% of respondents exhibited a 'high' commitment to agroforestry. Gender, age, and education had significant effects on commitment ($p < 0.05$). There was no significant relationship between attitude towards forest loss and commitment to agroforestry ($r = 0.038$, $p > 0.05$), whereas perceived benefits showed a strong positive correlation ($r = 0.426$, $p < 0.05$). Being male, middle-aged, and poorly educated are predisposing factors for a lower commitment to agroforestry among farmers. Furthermore, the ecological benefits or forest restoration potential of agroforestry have a limited influence on the motivation to commit to agroforestry in the study area. The importance of ecologically sustainable agriculture or the restorative potential of agroforestry appears to be poorly recognized by farmers in the study area.

Key words: forest loss, attitude, perception, agroforestry, commitment

IZVLEČEK

Kmetijsko-gozdarski sistemi imajo strateško vlogo pri usklajevanju pridelave hrane z ohranjanjem biotske raznovrstnosti gozdov. Nujno je metodološko transparentno raziskati koristi in ekološke vidike, ki so temelj zavezanosti malih kmetovalcev kmetijsko-gozdarskim sistemom. Ta raziskava je zato poskus analize relativnega pomena percepcije kmetov do izgube gozdov in koristi kmetijsko-gozdarskih sistemov v kontekstu zavezanosti kmetov kmetijsko-gozdarskim sistemom v populaciji kmetovalcev v državi Oyo na jugozahodu Nigerije. Študija je presečna raziskava, v kateri je bilo med poljedelci, izbranimi z namenskim vzorčenjem v skupinah, opravljenih 400 strukturiranih intervjujev. Za analizo spremenljivk je bilo ocenjeno strinjanje anketirancev s sklopi trditev. Za preverjanje značilnosti razlik v zavezanosti anketirancev kmetijsko-gozdarskim oblikam med podskupinami glede na spol in starost/izobrazbo sta bila uporabljena t-test neodvisnih vzorcev in enosmerna ANOVA. Pearsonov korelacijski koeficient je bil uporabljen za preučevanje razmerja med spremenljivkami. Rezultati kažejo, da je 57,8 % anketirancev izrazilo »visoko« zavezanost kmetijsko-gozdarski obliki gospodarjenja. Spol, starost in izobrazba so imeli vpliv na zavezanost ($p < 0,05$). Med odnosom do izgube gozdov in zavezanostjo kmetijsko-gozdarski obliki gospodarjenja ni pomembne povezave ($r = 0,038$, $p > 0,05$), to pa velja za povezavo z zaznanimi koristmi ($r = 0,426$, $p < 0,05$). Biti moški, srednjih let in slabo izobražen, bistveno močneje določa manjšo zavezanost kmetijsko-gozdarski obliki gospodarjenja. Na preučevanem območju skorajda ni ekološko povzročenih vzgibov oziroma motivacije za bodisi kmetijsko-gozdarsko obliko gospodarjenja bodisi obnovo gozdov. Zdi se, da je ekološko ‚pametno' kmetijstvo ali obnovitvena vloga kmetijsko-gozdarske oblike gospodarjenja med kmeti na preučevanem območju slabo uveljavljeno.

Ključne besede: izguba gozdov, odnos, zaznava, kmetijsko-gozdarski sistemi, zavezanost

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1 INTRODUCTION
1 UVOD

The importance of agroforestry cannot be overstated in modern society. Agroforestry is the combination of crop/livestock and tree/shrub production and management (Martinelli et al., 2019). Intensive agricultural production poses the greatest threat to forest biodiversity (The State of the World's Forests, 2020). It is responsible for about 30% of global greenhouse gas emissions and the highest utilization of fresh water (Fraser and Campbell, 2019). The provision of food for human survival is a primary driver of biodiversity loss (Erisman et al., 2016; Chaudhary et al., 2016; Dudley and Alexander, 2017; Lanz et al., 2018). As Chaudhary et al. (2016: 3928) assert, "Anthropogenic land use to produce commodities for human consumption is the major driver of global biodiversity loss". From 2000 to 2010, for instance, 40% of tropical deforestation was attributed to commercial agriculture, and 33% to subsistence agriculture (The State of the World's Forests, 2020). Balancing food production and forest biodiversity conservation is a pressing challenge for humanity, which can range from "land-sparing" to "land-sharing" approaches. The former relies on technologies to promote high-yielding agriculture that spares land for conservation, while agroforestry is a land-sharing approach that combines production and conservation in land use (The State of the World's Forests, 2020).

Agroforestry is an indigenous agricultural practice in Africa (Gonçalves et al., 2021). Cardinael et al. (2018) and Rosenstock et al. (2019b) identified several categories of agroforestry, including silvopasture, alley cropping, windbreaks, agrisilviculture, parklands, fallows, multistrata, and hedgerows. Agroforestry is ecologically important because it can contribute to the restoration of degraded forest. Africa has experienced the highest rate of forest loss, with 3.94 million hectares of forest area lost from 2010 to 2020 (The State of the World's Forests, 2020). Globally, 4.74 million hectares were lost in the same decade (The State of the World's Forests, 2020). Halting forest loss is essential for conserving forest biodiversity, enhancing human adaptation to the environment and ensuring environmental sustainability (Mori et al., 2017). Unfortunately, the environment has been profoundly transformed by various forms of human-caused, anti-environmental activities. For instance, forest lands are indiscriminately cleared in favour of agricultural production. Croplands now cover one third of the earth's surface (Rosenstock et al., 2019a). Agricultural production increases the amount of greenhouse gases in the atmosphere, increasing the occurrence and intensity of extreme weather events (Climate Change, 2014). The attitude of farmers towards forest loss is, therefore, of particular interest. This attitude is suggestive of the evaluation of the importance of forest as a land-use option, which is ideally a motivator for agroforestry. Forest conservation is a key priority in our time, as losing forests is tantamount to losing lifelines. About 75% of new infectious diseases originate from human-animal interactions, which are often associated with increasing forest loss (Austin, 2021; The Global Forest Goals Report, 2021). Deforestation can also contribute to the development of infectious diseases that raise public health concerns (Brock et al., 2019; Guégan et al., 2020; Ellwanger et al., 2020). Some authors even argue that the current COVID-19 pandemic is linked to forest loss (Brancalion et al., 2020; Austin, 2021; The Global Forest Goals Report, 2021). Furthermore, 25% and 80% of modern medicines in advanced and developing countries, respectively, have a plant-based origin (The Global Forest Goals Report, 2021).

The commitment of resource-poor smallholder farmers to agroforestry offers numerous benefits. Agroforestry enables the diversification of income, improvement of yields, and therefore the mitigation of poverty in developing countries (Pandey, 2007; Quinion et al., 2010; Pratiwi and Suzuki, 2019). More importantly, agroforestry provides ecosystem services such as enhancing air and water quality, mitigating climate change, and promoting biodiversity (Duguma et al., 2019; Chapman et al., 2020). Noordwijk (2020: 1) describes agroforestry as "an interface of specific concerns of 'Agriculture' and 'Forestry' with wider perspectives on rural and peri-urban livelihoods and landscapes as reflected in all 17 Sustainable Development Goals". Farmers' commitment to agroforestry represents a tangible gain in sustainable development. The adoption of agroforestry is a decision-making process that is informed by the interaction of complex factors, including the perceived benefits of agroforestry and the perceived importance attributed to forest as a land-use option. These variables can act as barriers or facilitators to adoption, necessitating a systematic investigation to optimize agroforestry practices. It is argued that farmers' commitment to agroforestry depends on the extent to which they perceive its benefits and their pro-forest conservation attitudes. The motivations for agroforestry span ecological and non-ecological gains and reflect individuals' evaluation of the ecological importance of agroforestry. Understanding these motivations is crucial for understanding the complexity of farmers' decisions to commit to agroforestry. This study therefore aims to examine the relative importance of farm-

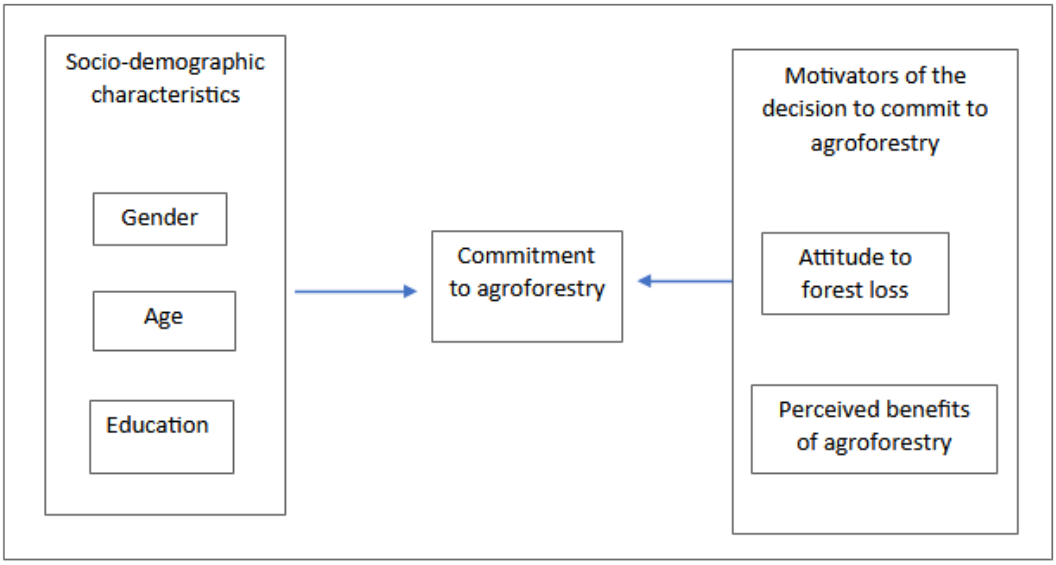

Fig. 1: Conceptual framework of the study

Slika 1: Konceptualni okvir raziskave

ers' attitudes towards forest loss and perceived benefits of agroforestry in shaping their commitment to agroforestry in southwestern Nigeria. The influence of socio-demographic variables on this commitment was also examined. These variables are represented in the conceptual framework in Fig. 1. The research questions addressed in this study are as follows:

- What are the respondents' attitudes towards forest loss and their perceptions of the benefits deriving from agroforestry? What is their level of commitment to agroforestry?
- What is the influence of gender, age, and education on the respondents' commitment to agroforestry?
- What is the correlation between pairs of attitudes to forest loss, perceived benefits of agroforestry, and commitment to agroforestry among respondents in the study area?

2 MATERIALS AND METHODS
2 MATERIALI IN METODE

2.1 Study areas / research design
2.1 Območja raziskave / zasnova raziskave

The Oyo West and the Oyo East Local Government Areas (LGAs) of Oyo State, southwestern Nigeria constituted the study areas (see Fig. 2). Nigeria is a vast West-African country in sub-Saharan Africa, covering an expansive area of 923,773 km^2, which is about 14% of the total land area of West Africa. Nigeria's population currently exceeds 200 million and is projected to surpass 300 million by 2050 (Ogbonnaya et al., 2019). The southwestern region is one of Nigeria's six geopolitical zones and the ancestral homeland of the Yorùbá people. Oyo state is one of the six states that make up the southwestern region. There are 33 geopolitical units known as Local Government Areas (LGAs) in Oyo state. Ibadan is the capital city of the state and comprises 11 LGAs: five urban and six peri-urban LGAs. The remaining 22 LGAs exhibit predominately rural characteristics, although certain areas display features of semi-urban areas (Gbadegesin and Olorunfemi, 2012). Oyo West and Oyo East LGAs are representative of the remaining 22 LGAs. The total land area of Oyo West and Oyo East is 526 km^2 and 144 km^2, respectively. Their coordinates are 7°56'29.65"N 3°49'18.48"E and 7°52'43.61"N 4°01'16.75"E, respectively. There are 10 and 9 political wards in the Oyo West and Oyo East LGAs, respectively. According to the latest Nigerian census of 2006, the population of Oyo West and Oyo East LGAs was 136,236 and 123,846, respectively (National Population Commission, s.a.). Farming is the dominant occupation of the residents of the study area. The research employed a cross-sectional survey design, targeting crop farmers in the study area, providing a snapshot of the prevailing conditions at a specific point in time.

2.2 Sampling procedure
2.2 Vzorčenje

The Oyo West and Oyo East Local Government Areas (LGAs) of Oyo State, southwestern Nigeria, were purposely selected in the initial phase of sampling. The population of Oyo West and Oyo East (136,236 + 123,846 = 260,082) was projected to estimate the 2021 population of the study area using the following equation:

$$P = P_0 \times e^{rt}$$

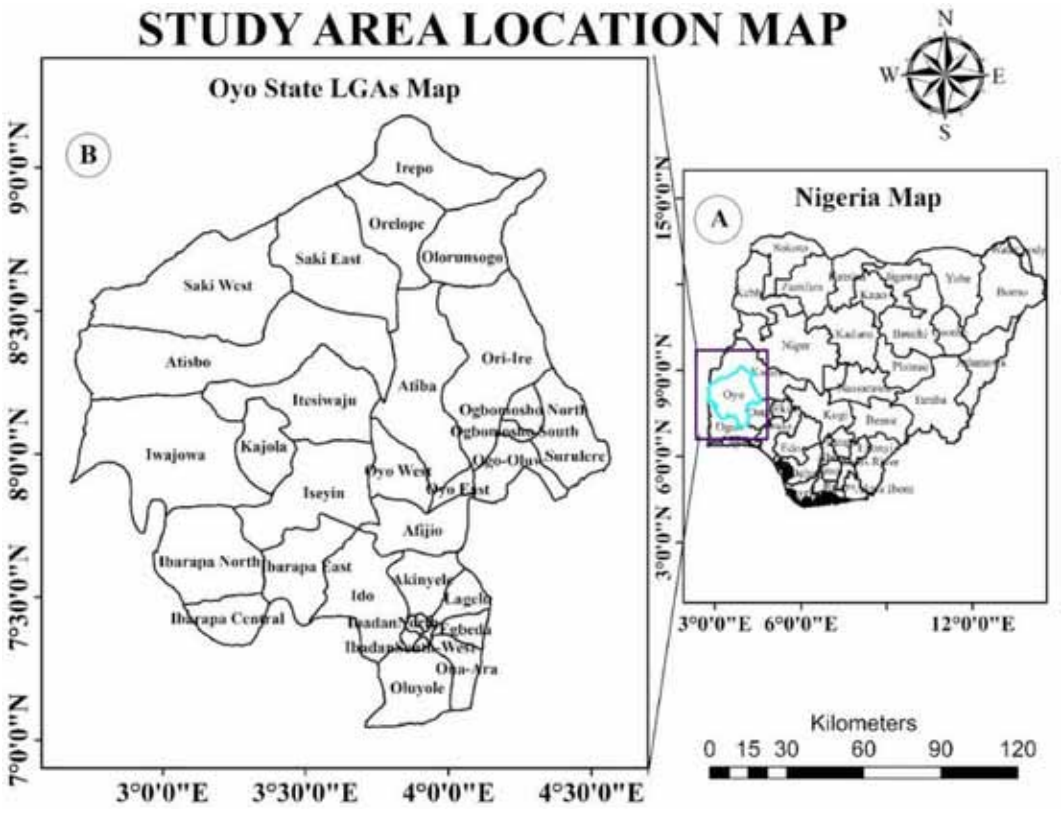

Fig. 2: Map showing the study areas

Slika 2: Karta območij raziskav

Where P is the final population, P_0 is the initial population, e is the exponential function, r is the growth rate, and t is the time interval (15 years). The projected 2021 population was 384,136. This figure was considered the total population (N) since farming is the principal occupation in the study area, and there was no available population-level statistics regarding people's occupation in the study area. N was used to calculate the required sample size using a modified version of the Cochran formula as follows:

$$n = \frac{Npqz^2}{e^2(N-1)+pqz^2}$$

Where n is the required sample size, N is the population = 384,136, p is the assumed proportion of the population exhibiting the sentiment of interest (50% = 0.5), q is 1–p, z is obtained from the 95% confidence level the on z table (1.96), and e is the precision level (i.e., the margin of error) set at 5% or 0.05. The required sample size was initially determined to be 384, but this was increased to 400. Four wards were randomly selected from each of the chosen LGAs. In Oyo West, Iseke, Isokun, Ajokidero, and Fasola/Soku were selected. In Oyo East, Alaodi/Modeke, Oke Apo, Ajagba, and Apaara were randomly selected. Villages and communities within these wards were identified, and two villages/communities were selected from each ward. Hence, in Oyo West, Obanoko, Oloya, Apogidan, Ogunda, Soku, Ejemu, Orowole, and Fasola were selected. In Oyo East, Jakan, Ogbagba, Imeleke, Obede, Ago-ana, Onsa, Gudugbu-orile, and Abu were selected. Data collection took place in the 16 villages/communities. The help of farmer associations was sought in the random selection of respondents. Lists of members were obtained and used as sampling frames. The systematic random sampling principle informed the sampling intervals (k) for selecting respondents. In a few instances where prospective respondents were unavailable, they were replaced with willing but unselected respondents. In each of the 16 communities, 25 copies of the questionnaire for the study were administered.

2.3 Means of data collection – variables and measures

2.3 Zbiranje podatkov – spremenljivke in meritve

The questionnaire was used to collect data and was administered to respondents via a structured interview. A version of the questionnaire in the Yorùbá language was developed to facilitate communication with respondents who did not speak English. The response rate was 100% when data collection took place in August/September 2021. *Attitude towards forest loss* was operationally defined as a respondent's assessment of the favourability or unfavorability of reduction in forest cover. It was measured with an author-developed

list of 6 statements linked to a Likert scale with possible responses "strongly agree" (4), "agree" (3), "disagree" (2), and "strongly disagree" (1), resulting in a possible total score for all statements ranging from 6 to 24. A higher score indicated a more pro-forest conservation attitude towards forest loss. The scale was found to be reliable with a Cronbach's alpha score of 0.901. *The perceived benefit of agroforestry* is a respondent's evaluation of the advantages of engaging in agroforestry. It was assessed with an author-developed list of 13 statements, and response categories included "strongly agree" (4), "agree" (3), "disagree" (2), and "strongly disagree" (1). The total score could range from 13 to 52, with a higher score indicating a more advantageous perception of the benefits of agroforestry. Cronbach's alpha was 0.735. *Commitment to agroforestry* is the extent to which farmers are dedicated to the practice of agroforestry. This commitment was measured using an author-developed list of 8 statements. Response categories also included "strongly agree" (4), "agree" (3), "disagree" (2), and "strongly disagree" (1). Respondents could score from 8 to 32, with a higher score indicating a stronger commitment to agroforestry. Cronbach's alpha was 0.884. See Table 2 for all author-developed statements.

2.4 Data analysis
2.4 Analiza podatkov

The distributions of the socio-demographic characteristics of the respondents were assessed by means of descriptive statistics (absolute and relative frequencies). The summary of items in the scales of attitude towards forest loss, perceived benefits of agroforestry, and commitment to agroforestry were examined by calculating means and standard deviations. Univariate analyses of variables were conducted by using the mean of data to categorize respondents into two groups. Those who scored below the mean were considered to have a weak attitude, weak perception, and low commitment. Conversely, those who scored at or above the mean were considered to have a strong attitude, strong perceived benefit, and high commitment. The Kolmogorov Smirnov test was used to assess the normality of distributions of variables, and the results indicated that the distributions were normal ($p > 0.05$). The independent samples *t*-test and one-way ANOVA were used to examine the significance of the difference in respondents' commitment to agroforestry across sub-groups of gender and age/education, respectively. Levene's test was used for examining the homogeneity of variance across sub-groups of gender, age, and education. A post-hoc multiple comparison test (Tukey HSD) was used to identify homogenous means. A linearity test was conducted, and its output determined whether Eta and eta^2 or R and R^2 were used to examine effect size. The Pearson correlation coefficient was used to examine the relationship between pairs of attitudes towards forest loss, perceived benefits of agroforestry, and commitment to agroforestry. The Statistical Package for Social Sciences (version 24) (SPSS) was used for data analyses.

3 RESULTS
3 REZULTATI

3.1 Socio-demographic characteristics of respondents
3.1 Socio-demografske lastnosti anketirancev

Male and female respondents constituted 77% and 23% of the sample, respectively. The age distribution of respondents closely resembles a normal distribution. The highest proportion of respondents (34.5%) fell within the age range of 36 to 45 years, indicating that farmers in the study area are predominately middle-aged individuals. The mean age of respondents was 43.1, ranging from 16 to 80 years. The distribution of the highest educational qualification shows that about one in every three (33.8%) respondents had no formal education. Furthermore, respondents who completed primary (27.0%) and secondary school (23.8%) comprised the second and third highest proportions, respectively. Higher education is rather uncommon among the respondents: those who had post-secondary education (8.5%), a first degree (4%), or a postgraduate degree (3%) were rather marginally represented in the sample. There is a limitation of formal educational achievement among respondents in the study area. The distribution of the socio-demographic characteristics of respondents is shown in Table 1.

3.2 Analyses of items
3.2 Analiza trditev

Table 2 presents the means and additional statistics for the items in the assessment scales. Respondents expressed strong agreement with the six items on the scale of attitude towards forest loss, with mean scores ranging from 3.65 to 3.79. These means generally signify a high level of negative (pro-forest conservation) attitude towards forest loss. On the perceived benefits scale, items affirming that agroforestry "alleviates climate change" (mean = 3.81) and "enhances rural dwellers' quality of life" (mean = 3.77) received the highest level of agreement. Respondents also showed significant agreement with the positions that agroforestry "enables income diversification" (mean =

Table 1: Socio-demographic characteristics of respondents (N = 400)

Preglednica 1: Socio-demografske lastnosti anketirancev (N=400)

Socio-demographic characteristics	Sub-groups	Frequency	Percentage
Gender	Male	308	77.0
	Female	92	23.0
Age*	16-25	34	8.5
	26-35	81	20.2
	36-45	138	34.5
	46-55	87	21.7
	56-65	41	10.3
	66-above	19	4.8
Education	No formal education	135	33.7
	Primary education	108	27.0
	Secondary education	95	23.8
	Post-secondary education	34	8.5
	Bachelor's degree	16	4.0
	Postgraduate education	12	3.0

*The mean ±SD of age was 43.13 ± 12.95, minimum = 16, maximum = 80.

3.67), "increases total farm income" (mean = 3.66), and "protects the environment" (mean = 3.62), all of which were comparably high. The means of the scores for the premise that agroforestry "increases soil quality" and "enhances the diversity of agricultural products" (3.46) were also similar and relatively high. Respondents' assessment of agroforestry's ability to "provide recreational opportunities" (mean = 3.30), "enhance the scenic beauty of the environment" (mean = 3.31), and "maximize the use of agricultural lands" (mean = 3.33) was also quite high and very similar. However, their evaluation of agroforestry's potential to "increase resilience against pests" (mean = 2.48), "reduce the overall use of chemicals" (mean = 2.20), and "reduce farm odours" (mean = 2.19) was less favourable. These means serve as proxy indicators of the areas in which farmers have the least confidence in agroforestry. When assessing the commitment to agroforestry scale, respondents' evaluations of the eight items were very similar, with mean scores ranging from 3.41 to 3.58. These means strongly suggest a high level of dedication to agroforestry among farmers in the study area.

3.3 Analyses of the attitude towards forest loss, perceived benefits of agroforestry, and commitment to agroforestry

3.3 Analiza odnosa do izgube gozda, koristi kmetijsko-gozdarskih sistemov in zavezanosti kmetijsko-gozdarskim praksam

The mean ±SD for attitude towards forest loss is 22.2±2.2 (min = 18, max = 24). This mean score is close to the maximum score, indicating that respondents, on average, obtained high scores on the attitude scale. As depicted in Fig. 3a, 69% (276) of respondents strongly agreed with the negative aspects of forest loss, demonstrating a "strong" pro-forest conservation attitude. Notably, 124 respondents (31%) held a "weak" attitude, which represents a noticeable deviation from the prevailing pro-forest conservation attitude towards forest loss in the study area. The mean ±SD for the perceived benefits of agroforestry is 42.3±4.0 (min = 33, max = 52), reflecting a relatively high mean score. Fig. 3 also illustrates that 227 (56.8%) respondents had a "strong" perception of the benefits of agroforestry, while 173 (43.3%) had a "weak" perception. Hence, about 6 of every 10 respondents in the study area held robust perceptions of the benefits of agroforestry. The mean ±SD of commitment to agroforestry is 27.8±3.3 (min = 21, max = 32). This level of commitment is also quite high, with 231 (57.8%) respondents exhibiting a "high" commitment to agroforestry. Meanwhile, 169 (42.3%) demonstrated "low" commitment. Commitment to agroforestry is palpable in the study area, with nearly 6 of every 10 respondents displaying a high level of commitment.

3.4 Effects of gender, age, and education on commitment to agroforestry

3.4 Vpliv spola, starosti in izobrazbe na zavezanost kmetijsko-gozdarskim praksam

The summary of results from the bivariate analyses of socio-demographic characteristics and commitment to agroforestry is presented in Table 3. Men displayed a stronger commitment (mean = 28.1) compared to their female counterparts (mean = 27.1). This difference in

Table 2: Descriptive statistics of respondents' level of agreement with statements on forest loss, benefits of agroforestry, commitment to agroforestry, and reliability indicators

Preglednica 2: Opisna statistika ravni strinjanja anketirancev s trditvami o krčitvah gozda, koristih kmetijsko-gozdarskih sistemov, zavezanosti kmetijsko-gozdarskim praksam, ter ocen zanesljivosti statistik

Attitude Towards Forest Loss	Mean ±SD	Min	Max	Cronbach's alpha
Human progress is hampered when forests are lost	3.70±0.46	3	4	0.901
Losing forests is catastrophic for the human race	3.65±0.48	3	4	
Losing forests endangers human health	3.70±0.46	3	4	
Future generations will suffer if we continue to lose our forests	3.69±0.46	3	4	
Losing forests is one of the worst things that can happen to our environment	3.71±0.45	3	4	
A society that loses its forests loses its treasure	3.79±0.43	1	4	
Perceived Benefits of Agroforestry (*The planting of trees along with crops*)				
Increases soil quality	3.46±0.50	3	4	0.735
Enhances diversity of agricultural products	3.46±0.50	3	4	
Increases resilience against pests	2.48±0.98	1	4	
Alleviates climate change	3.81±0.40	2	4	
Protects the environment	3.62±0.51	1	4	
Reduces farm odours	2.19±0.91	1	4	
Reduces the overall use of chemicals	2.20±0.95	1	4	
Enhances the scenic beauty of the environment	3.31±0.53	2	4	
Maximizes the use of agricultural lands	3.33±0.63	2	4	
Provides recreational opportunities	3.30±0.55	2	4	
Enhances rural dwellers' quality of life	3.77±0.42	3	4	
Increases total farm income	3.66±0.47	3	4	
Enables income diversification	3.67±0.74	3	4	
Commitment to Agroforestry				
I would be very happy to spend the rest of my farming career planting trees along with crops	3.58±0.62	2	4	0.884
I enjoy discussing the planting of trees along with crops with people who are not even farmers	3.45±0.51	2	4	
I feel as if the problems that are usually encountered in the planting of trees along with crops are my own	3.44±0.66	2	4	
I wish many more farmers would plant trees along with crops	3.41±0.50	3	4	
Planting trees along with crops has a great deal of personal meaning for me	3.47±0.59	2	4	
I could take a loan to ensure the success of planting trees along with crops	3.47±0.51	2	4	
It is important for farmers to prioritize the planting of trees along with crops	3.49±0.51	2	4	
I take a lot of pride in the planting of trees along with crops	3.54±0.50	3	4	

mean scores was significant ($p < 0.05$), and there was homogeneity of variance between gender sub-groups ($p > 0.05$). Eta was 0.126, and eta^2 was 0.016. Hence, gender explains only 1.6% of the variance in commitment to agroforestry.

The degree of commitment to agroforestry initially appeared to increase with age, but there are limitations to this trend: commitment was lowest among respondents aged between 16 and 25 (mean = 25.9), while it was very high and comparable among those aged between 26 and 35 (mean = 28.0), 46 and 55 (mean = 28.3), and 56 and 65 (mean = 28.5). The ANOVA revealed that means across sub-groups of age were significantly different ($p < 0.05$). Levene's test confirmed the validity of this significant difference by indicating homogeneity of variance across age sub-groups ($p > 0.05$). The result of the posthoc multiple comparison test shows that the 16-25 y. sub-group is significantly different from the 26-35 y. sub-group ($p = 0.001$), the 36-45 y. sub-group ($p = 0.002$), the 46-55 y. sub-group ($p = 0.000$), the 56-65 y. sub-group ($p = 0.001$), but not the 66-above y. subgroup ($p = 0.274$). This implies that the manifestation of commitment to agroforestry across age sub-groups resembles an inverted U distribution that is low at the extremes of age sub-groups and high for the age sub-groups in between. The effect of age on commitment deviated from linearity ($F = 3.454$, $p = 0.009$). Eta is 0.208, while eta^2 is 0.043. Hence, 4.3% of the variance in commitment is explained by age.

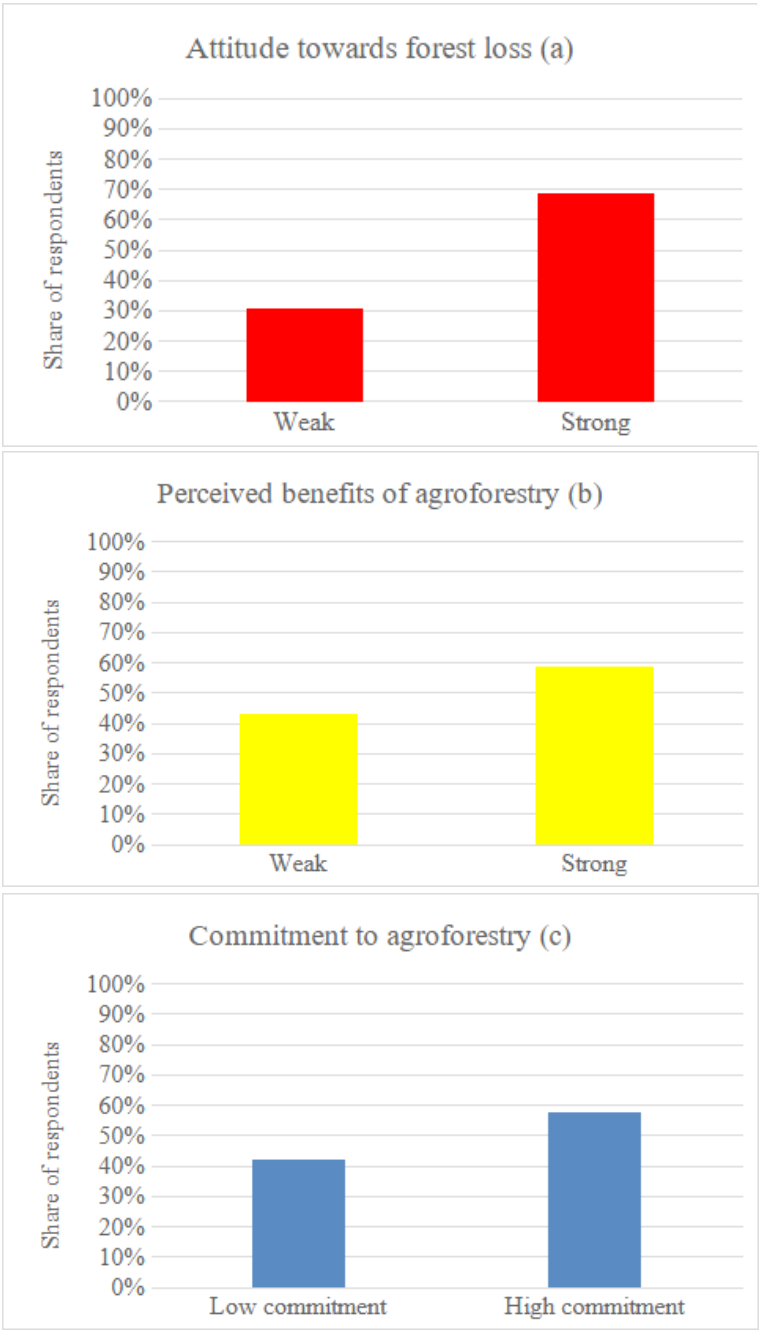

Fig. 3: Dimensions of attitude towards forest loss (a), perceived benefits of agroforestry (b), and commitment to agroforestry (c)

Slika 3: Razpon odnosa do izgube gozda (a), zaznanih koristi kmetijsko-gozdarskih sistemov (b), in zavezanosti kmetijsko-gozdarskim praksam (c)

The extent of commitment to agroforestry among respondents who had no formal education (mean = 28.2), primary education (mean = 28.0), and secondary education (mean = 28.3) is high and very similar. The mean commitment score among respondents who held a bachelor's degree was 26.4. Respondents who held post-secondary education (mean = 25.9) and a postgraduate degree (mean = 25.8) had the lowest commitment. Means across sub-groups of education were significantly different ($p < 0.05$), and homogeneity across sub-groups of education was confirmed ($p > 0.05$). Hence, education has an effect on commitment to agroforestry. The separation of means revealed that the non-formal education sub-group is not significantly different from the primary ($p = 0.648$) and the secondary ($p = 0.839$) sub-groups. However, the non-formal education sub-group is significantly different from the post-secondary ($p = 0.000$), first degree ($p = 0.031$), and postgraduate degree ($p = 0.011$) sub-groups. The effect of education on commitment was linear ($F = 14.084$, $p = 0.000$). R was -0.183 while R^2 was 0.034. These indicate an inverse relationship between education and commitment to agroforestry, and 3.4% of the variance in commitment is explained by education.

Table 3: Effects of gender, age, and education on commitment to agroforestry through testing equality of means and assessment of effect sizes

Preglednica 3: Vpliv spola, starosti in izobrazbe na zavezanost kmetijsko-gozdarskim praksam s testiranjem enakosti srednjih vrednosti in oceno vpliva velikosti učinka

Socio-demographic variables	Sub-groups	Mean±SD	Levene's test for homogeneity of variances		Independent samples *t*-test		ANOVA		Eta	Eta²	R	R²
			Levene's statistic	*p* value	*t* statistic	*p* value	F statistic	*p* value				
Gender	Male	28.1±3.3	0.664	0.416	2.54	0.012	-	-	0.126	0.016		
	Female	27.1±3.1										
Age	16-25	25.9±3.3	1.330	0.249	-	-	3.549	0.004	0.208	0.043		
	26-35	28.0±3.3										
	36-45	27.9±3.3										
	46-55	28.3±3.2										
	56-65	28.5±3.0										
	66- above	26.9±2.6										
Education	Non-formal	28.2±3.3	1.330	0.250	-	-	5.050	0.000	-	-	-0.183	0.034
	Primary	28.0±3.2										
	Secondary	28.3±3.2										
	Post-secondary	25.9±2.7										
	Bachelor's	26.4±3.2										
	Postgraduate	25.8±2.1										

3.5 Relationship between attitude towards forest loss, perceived benefits of agroforestry, and commitment to agroforestry

3.5 Odvisnosti med odnosom do izgube gozda, koristmi kmetijsko-gozdarskih sistemov in zavezanosti kmetijsko-gozdarskim praksam

The result of the bivariate correlation in Table 4 shows that the relationship between attitude towards forest loss and commitment to agroforestry is positive, very weak, and insignificant (r = 0.038, p > 0.05). In contrast, the relationship between the perceived benefits of agroforestry and commitment to agroforestry is positive, quite strong, and significant (r = 0.426, p < 0.05). The stronger the perceived benefits of agroforestry, the stronger the commitment to agroforestry. Incidentally, there is a positive and insignificant relationship between the attitude towards forest loss and the perceived benefits of agroforestry.

4 DISCUSSION

4 RAZPRAVA

The generally high means observed in the item analysis of attitudes signify a pro-forest conservation attitude towards forest loss among the respondents. This is in line with the findings reported by Meijer et al. (2015: 59), who asserted that their respondents, a group of farmers in Malawi, "generally have negative attitudes towards cutting down trees from the forest". Meijer et al. (2015) further reported that their respondents generally believed that people in their communities disapproved of tree cutting. The indirectly relevant report of Ansong and Røskaft (2011) also showed that forestry stakeholders in Ghana generally held positive attitudes towards forest management. The current attitude towards forest loss indicates that pro-forest conservation is popular among respondents in the study area. This is likely related to the cultural importance of forests to the people of the study area. Ibrahim (2021: 497) asserted that "the forest is a classical locale of traditional culture among many peoples, including the Yorùbá of southwestern Nigeria". The generally strong perceived benefit of agroforestry in the current study is similar to the findings reported by Ruheza et al. (2012). They reported that 87% of their respondents in the Uluguru Mountains, Tanzania, believed that agroforestry has various benefits. Elbakidze et al. (2021) similarly reported that 81% of their respondents selected agroforestry landscapes as their favourite environments because of their belief that agroforestry enhances the quality of life. Awazi and Avana-Tientcheu (2020) also reported that 100%, 98%, 86%, and 76% of their respondents, a group of farmers in Cameroon, believed that agroforestry was beneficial with regard to food, fuelwood, building materials, and shade, respectively. Krčmárová et al. (2021) also reported that 79%, 75%, 58%, and 36% of a group of Czech farmers anticipated that agroforestry enhances environmental beauty, reduces erosion, improves the

Table 4: Relationship between (pairs of) attitude towards forest loss, perceived benefits of agroforestry, and commitment to agroforestry

Preglednica 4: Odvisnosti med (pari) odnosov do izgube gozda, zaznanimi koristmi kmetijsko-gozdarskih sistemov in zavezanostjo kmetijsko-gozdarskim praksam

		Attitude towards forest loss	Perceived benefits of agroforestry	Commitment to agroforestry
Attitude towards forest loss	*R*	1	0.033	0.038
	p value	-	0.505	0.450
Perceived benefits of agroforestry	*R*	0.033	1	0.426*
	p value	0.505	-	0.000
Commitment to agroforestry	*R*	0.038	0.426*	1
	p value	0.450	0.000	-

*Significant correlation

microclimate, and helps diversify income, respectively. The current study and these findings generally support the idea that farmers perceive agroforestry as beneficial, which can be leveraged in interventions to promote its adoption. Item analysis also strongly indicates a high level of dedication to agroforestry among farmers in the study area. While studies addressing farmers' commitment to agroforestry appear to be scarce, related findings support the high level of commitment reported in the current study. Meijer et al. (2015) reported that a group of Malawian farmers generally maintained a positive attitude towards tree planting. Islam et al. (2021) also reported that 76.25% and 68.7% of their respondents, a group of farmers in the Coastal Belt of Sundarbans, Bangladesh, affirmed that they liked agroforestry and held a favourable attitude towards it, respectively. However, Olagunju et al. (2020) reported that only 41% of their respondents, a group of farmers in Kaduna state, northern Nigeria, held favourable attitudes towards agroforestry. Borremans et al. (2016) also reported that only 55% of the farmers they studied in Flanders, the northern region of Belgium, were familiar with agroforestry. Borremans et al. (2016) further reported that the attitude of respondents towards agroforestry was poor (mean = 2.95, minimum = 1, maximum = 7). The current findings support the notion that farmers are generally dedicated to agroforestry, which is encouraging for the widespread adoption of agroforestry in the study area.

Gender has a significant effect on commitment to agroforestry, with men showing stronger commitment compared to women. This discrepancy may reflect socio-cultural structures that typically favour men over women in decision-making related to agroforestry. For example, a study on gender and power dynamics in farming households conducted by Kalanzi et al. (2020) in the eastern highlands of Uganda indicates that men typically wield more power in agroforestry-related decision-making compared with their female counterparts. The strong manifestation of commitment to agroforestry among middle-aged respondents suggests that middle-aged farmers are significantly more predisposed to engage in agroforestry. Middle-aged farmers appear to be a valuable resource for agroforestry expansion in the study area. Commitment to agroforestry is significantly high among farmers with no or poor education, while it is significantly lower among farmers with post-secondary education or higher. This is somewhat counter-intuitive since education typically predisposes individuals too hold and exhibit responsible positions. Further research is needed to better understand this relationship between education and commitment.

The lack of correlation between attitude towards forest loss and the extent of a farmer's commitment to agroforestry is contrary to expectations. While related findings are seemingly limited, indirectly relevant findings support this result. Borremans et al. (2016) reported that the farmers they studied in Flanders were quite confident about the positive effects of agroforestry, but believed that adopting and maintaining agroforestry would be difficult. Another indirectly relevant finding suggests that the expectation that attitude towards forest loss would be significant for commitment to agroforestry might not hold. Rahman et al. (2017) questioned whether the adoption of agroforestry reduces pressure on forests by comparing the livelihood activities of swidden agriculture practitioners and agroforestry practitioners. Swidden agriculture, also known as slash-and-burn farming or shifting cultivation, is associated with high rates of deforestation and forest degradation and is therefore unsustainable. Rahman et al. (2017) reported that among the farmers they studied in west Java, Indonesia, those practicing swidden agriculture and agroforestry cleared 0.29 hectares and 0.09 hectares of forest area, respectively,

in the five years before their study. The former group also collected 33 kg of firewood from the forest, while the latter collected only 5.65 kg in the month before the study. The findings of Rahman et al. (2017) suggest that practicing agroforestry resulted in a reduced extent of forest-degrading behaviour. Overall, the current findings suggest that the relationship between forest conservation/forest loss and agroforestry is not well-understood in the study area. However, they also indicate that the stronger the perceived benefits of agroforestry, the stronger the commitment to agroforestry. A related report supports this finding, as Meijer et al. (2015) reported that the attitude of a cohort of Malawian farmers towards agroforestry was generally positive and that this attitude significantly influenced tree planting.

5 CONCLUSIONS
5 ZAKLJUČKI

Gender, age, and education are significant sociodemographic variables influencing farmers' commitment to agroforestry. Women, younger and older individuals, and highly educated farmers tend to exhibit a significantly lower commitment to agroforestry. While attitude towards forest loss does not significantly impact commitment to agroforestry, the perceived benefits of agroforestry are associated with an increased commitment to agroforestry among the farmers in the study area. This study supports the expectation that farmers are more likely to commit to agroforestry depending on the extent to which they recognize the benefits it offers. Therefore, emphasizing these benefits when promoting the widespread adoption of agroforestry is crucial. On the other hand, the expectation that farmers' commitment to agroforestry would align with their pro-forest conservation attitudes to forest loss is not supported by this study. There is a lack of a strong ecological or forest restoration motivation for agroforestry in the study area. Hence, environmental interventions should highlight the importance of agroforestry in restoring lost forests as a motivating factor for its adoption.

6 SUMMARY
6 POVZETEK

Človeštvo se spoprijema s potrebo po iskanju ravnovesja med proizvodnjo hrane in ohranjanjem biotske pestrosti gozdov v prizadevanju, da bi se zagotovila okoljska trajnost. To se lahko giba med pristopom »varovanja površin« do pristopov »delitve zemljišč«, kot dvema skrajnima možnostma. Prvi temelji na tehnologijah za spodbujanje visoko donosnega kmetijstva, da se preostala zemljišča prihranijo v prahi. Nasprotno pa so kmetijsko-gozdarski sistemi pristop k delitvi zemljišč, saj se pri rabi zemljišč predvideva združevanje proizvodnje in varstva. Kmetijsko-gozdarski sistemi zajemajo hkratno pridelavo poljščin oziroma živinoreje ter gojenje dreves/grmovnic. So strateško pomembni pri usklajevanju pridelave hrane z ohranjanjem biotske pestrosti gozdov. Treba je metodično raziskati vidike koristi in ekološke nujnosti, kar je lahko podlaga za ozaveščanje malih kmetov, ki se zavežejo kmetijsko-gozdarskim praksam. Ta raziskava je zato poskus analize relativnega pomena odnosa kmetov do izgube gozdov in do koristi kmetijsko-gozdarskih praks v kontekstu zavezanosti kmetov kmetijsko-gozdarskim sistemom v skupini kmetov v državi Oyo na jugozahodu Nigerije.

Ta študija je presečna raziskava, ki temelji na intervjujih s strukturiranimi vprašalniki med 400 poljedelci, ki so bili izbrani v lokalnih upravnih območjih (LGA) Oyo West in Oyo East v državi Oyo na jugozahodu Nigerije. Stopnje strinjanja z različnimi trditvami so ključen vhodni podatek za analizo. Za testiranje razlik zavezanosti kmetijsko-gozdarskim sistemom med različnimi skupinami anketirancev sta bila uporabljena t-test za neodvisne vzorce in enosmerna ANOVA. Pearsonov korelacijski koeficient je bil uporabljen za preučevanje razmerja med spremenljivkami.

Rezultati kažejo, da je 57,8 % vprašanih pokazalo »visoko« zavezanost kmetijsko-gozdarskim praksam. Moški so bolj zavezani (povprečje = 28,1) v primerjavi z ženskami (povprečje = 27,1). Zavezanost je bila najnižja med anketiranci, starimi od 16 do 25 let (povprečje = 25,9), vendar je bila zelo visoka in primerljiva med tistimi, starimi od 26 do 35 let (povprečje = 28,0), od 46 do 55 let (povprečje = 28,3) in od 56 do 55 let (povprečje = 28,5). Stopnja zavezanosti kmetijsko-gozdarskim praksam med anketiranci brez formalne izobrazbe (povprečje = 28,2), z osnovnošolsko (povprečje = 28,0) in srednješolsko izobrazbo (povprečje = 28,3) je visoka in zelo podobna. Povprečna stopnja zavezanosti med anketiranci, ki so imeli dodiplomsko izobrazbo, je bila 26,4. Anketiranci, ki so imeli višješolsko izobrazbo (povprečje = 25,9) in podiplomsko izobrazbo (povprečje = 25,8), so imeli najnižjo stopnjo zavezanosti. Spol, starost in izobrazba so imeli vpliv na zavezanost ($p < 0,05$). Med odnosom do izgube gozdov in zavezanostjo kmetijsko-gozdarskim praksam ni pomembne povezave ($r = 0,038$, $p > 0,05$), kar pa ne velja za zaznane koristi ($r = 0,426$, $p < 0,05$). To, da so moški, srednjih let in slabo izobraženi, bistveno določa manjšo zavezanost kmetijsko-gozdarskim praksam.

Spol, starost in izobrazba so pomembne socialno-demografske spremenljivke pri zavezanosti kmetov kmetijsko-gozdarskim praksam: ženske, najmlajši in najstarejši ter visoko izobraženi kmetje so bistveno manj zavezani kmetijsko-gozdarskim praksam. Motivacije za kmetijsko-gozdarske sisteme skorajda ni v ekološkem kontekstu ali v smislu obnove gozdov. Zdi se, da je povezava med ohranjanjem / izgubo gozdov in kmetijsko-gozdarskimi sistemi v obravnavanem območju slabo razumljena. Ekološko smotrne kmetijske prakse ali obnovitvena vloga kmetijsko-gozdarskih sistemov med kmeti pa so na preučevanem območju slabo uveljavljene. Na drugi strani zaznane koristi kmetijsko-gozdarskih praks med kmeti pozitivno vplivajo na zavezanost kmetijsko-gozdarskim praksam. Na podlagi zaznanih koristi kmetijsko-gozdarskih praks, lahko predvidevamo zavezanost kmetov tem praksam. Poudarjanje teh koristi pri spodbujanju širšega uresničevanja kmetijsko-gozdarskih sistemov je zato zelo ključno.

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