**Combining Focus Group Discussions and Choice Experiments for economic valuation of peatland restoration: a case study in Central Kalimantan, Indonesia**

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**Highlights**

* Farmers support peatland restoration in Kalimantan by planting local tree species.
* Food security concerns limit the proportion of land farmers prefer to restore.
* Combining focus groups and choice experiments enriches valuation results.
* Raising awareness about the ecosystem services may increase local support.

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**ABSTRACT**

This study explores the benefits of combining results of qualitative focus group discussions (FGDs) with a quantitative choice experiment (CE) in a low-income country context. The assessment addresses the compensation needed by local communities in Central Kalimantan to cooperate in peatland restoration programs. The main policy message of the study is that such programs would have to provide arrangements that secure a stable income and food supply, as well as create awareness of the long-term benefits of peatland restoration. The results of this study demonstrate the value of combining qualitative and quantitative methods to improve the reliability and validity of studies assessing the value of ecosystem services. FGDs prove to be paramount to understanding the underlying attitudes and motives towards the proposed scenarios and its institutional context. FGDs provide the possibility to identify the specific terms and conditions on which respondents would accept land-use change scenarios and help to understand preferences regarding the distribution of costs and benefits over time. Yet the individual CE responses offer important quantitative information about the magnitude of welfare changes associated with restoration. Moreover, the privacy of the elicitation process avoids peer-pressure.

**Keywords:** Choice Experiment, Focus Group Discussion, Indonesia, Peatlands, Mixed methods, Valuation

1. **INTRODUCTION**

Monetary valuation studies are increasingly used in environmental decision-making to evaluate the efficiency, in terms of social welfare improvements, of ecosystem management. Valuation results can be used in appraisal tools such as social (or extended) cost benefit analysis, and for the design of policy instruments such as Payments for Environmental (or Ecosystem) Services or other pricing mechanisms (Bouma and Van Beukering 2015).

The use of monetary values in environmental management has been criticized widely, on technical, psychological and philosophical grounds (see e.g. Kallis et al. 2013, Spash 2007), whilst counter arguments are provided in e.g. Gsottbauer et al. (2015). Proponents of monetary valuation methods using Stated Preference (SP) techniques argue that many of the limitations can be improved by appropriate survey design (e.g. Carson 2012, Loomis 2011, Vossler and Watson 2013). Although it could be argued that many published studies do not meet these survey design criteria, monetary valuation, including choice experiments, remains the most prevalent approach to inform environmental management at present. Opponents have argued for more emphasis on non-monetary and analytic-deliberative valuation techniques to overcome some of the limitations of individual SP studies (e.g. Kenter et al. 2016, Völker and Lienhoop 2016).

The number of published choice experiments (CEs) has increased rapidly but includes only a few tests of reliability and validity for which the results are mixed (Rakotonarivo et al. 2016). Qualitative approaches offer a venue for testing reliability and validity (ibid.). Focus group discussions (FGDs) are a participatory method that can be used, in the context of environmental valuation, as a non-monetary valuation method to assess the motivation of people’s value expressions (Christie et al. 2012), and they are typically focused on current, rather than deliberated, opinions. They have a semi-structured format and take place in a group setting. In combination with SP surveys, FGDs are especially useful prior to quantitative SP to identify relevant hypotheses, and to inform, pre-test and improve the survey design (e.g. Hanley et al. 1998, Johnston et al. 2017, Kenter et al. 2016b). FGDs can also provide diagnostic information after SP elicitation about, for example, differences between the researchers’ and respondents’ beliefs about the valuation scenario (Carson 2012, Chilton and Hutchinson 1999), or to validate WTP values and assess the acceptability of SP survey results among respondents (e.g. Brouwer et al. 1999, Clark et al. 2000, Powe et al. 2005, Powe 2007, Spash 2007).

We argue that the above approaches suffer from critical limitations. Firstly, as also noticed for the use of focus groups in combination with contingent valuation (CV) (Chilton and Hutchinson 1999), most studies referenced above have limited their FGD focus on either the study design or on the ex-post evaluation of the survey. They often disregard the reporting of the FGD findings: the recorded outcome of the FGDs remains largely anecdotal and detail on the FGD data and analysis is often missing. Secondly, when the FGDs serve the CE analysis, either prior to or after the CE has been implemented, the range of topics they cover may be different or narrower compared with a situation where the FGD is not used to serve the CE analysis. In practice, FGDs for pre-tests tend to focus on the definition of the good under valuation, the interpretation of the scenario text, the selected attributes and levels and the interpretation of specific questions and visual material. Post-CE FGDs run the risk to emphasise reliability and validity criteria of CEs, including opt-out choices and the monetary amounts, while ignoring other critical decision and contextual factors. Finally, as the discussions in post-CE FGDs usually involve the same respondents, the discussion results may be biased by the framing or narrative of the CEs that the respondents have been exposed to.

The research aim of this paper is to test whether CEs and FGDs result in similar policy recommendations and to evaluate the (dis)advantages of combining these methods. We triangulate the results of the individual discrete CE with FGD results, where the CE and FGDs are implemented simultaneously and involve different samples. The study builds on work by Powe (2007), in which evidence of, and avenues for research on, mixing CV studies and FGDs were explored. We highlight some additional advantages specific to CE and FGD combinations in low-income country settings.

The methods are applied to a case study in Kalimantan, Indonesia, which sought to identify the willingness of local farming communities to participate in a program to plant trees on drained peatland areas, and the level of compensation (if any) demanded. Changes in peatland management were expected bear local costs, in terms of investment in alternative land use practices. However, improved peatland ecosystem management was also expected to generate local ecosystem service benefits from a reduced risk of peat fire and flood events, provisioning ecosystem services, such as timber, non-timber products, fish and other fauna, and cultural services associated with sustainable tree use. The fires lead to damage to property and crops, heavy smoke haze events that cause health risks, such as respiratory diseases, and reduce school attendance.

The design of compensation payment schemes requires understanding the needs of local communities (Engel and Palmer 2008), for which FGDs are well suited, as well as a quantitative assessment of the (non-)monetary costs and benefits that communities may face when programmes to secure environmental services are implemented, which justifies using a CE. The values and perceptions towards intact versus highly degraded natural forests have been studied in non-monetary terms (Abram et al. 2014) and using market prices (Suwarno et al. 2016). This study presents only the third CE conducted among local Indonesian community members after Glenk et al. (2006) and Barkmann et al.(2008) and it is unique in its focus on peatland restoration on smallholder land.

## CASE STUDY SITE

The study took place in the Southern part of Central Kalimantan in Indonesia, which is one of the areas with the highest degree of peatland degradation in South-East Asia. The study concentrated on the Central Kalimantan Peatland Project (CKPP), formed by a consortium of NGOs, which ran from 2006 to 2008. CKPP worked in a specific area in Central Kalimantan to protect the remaining peat swamp forests and restore the degraded peatlands (<http://ckpp.wetlands.org>). This CKPP area was part of the one million hectare Mega Rice Project area, one of the few regions in the world covered with tropical peatlands. Little of the peat swamp forest remains and the degraded area is nowadays used for agriculture, industrial plantations and settlements, or is left as fallow land.

The Mega Rice Project, initiated by the Indonesian government in 1995, converted an area of more than one million ha of peatland forest into rice fields. The drainage and irrigation canals that were constructed to irrigate the fields have led to systematic drainage of the peatland areas. As a result, the area is continuously suffering from river floods and, in combination with El Niño events, peatland fires (Galudra et al. 2011, Wetland International 2007). Peatland fires are a large re-occurring problem in Central Kalimantan with high costs at regional and global levels such as loss of biodiversity, forest ecosystems and the associated ecosystem services, smoke-related (trans-)national health problems, and large emissions of greenhouse gases (Page et al. 2009, Someshwar et al. 2011). Palm oil expansion brings in large short-term revenues but also causes further deforestation: the associated social costs of CO2 emissions and biodiversity loss outweigh the benefits of palm oil (Naidoo et al. 2009, Sumarga and Hein 2016, but see Fisher et al. 2011).

The floods and fires, in combination with unfavourable agricultural conditions of peatland soil, contribute to levels of poverty that are two to four times higher than in the rest of Indonesia (Wetlands International 2007). Agriculture is still the most important source of income for the majority of local communities (Wiken et al. 2004). Compared to other areas of Indonesia, Central Kalimantan is not densely populated. Besides indigenous Dayak communities, there are communities of transmigrants from other islands or other areas of Kalimantan, who were resettled as part of Indonesian transmigration programs or invited to help with the Mega Rice Project (Galudra et al. 2011). Transmigration has resulted in additional pressure on the limited natural resources and conflicts over land rights and uses. The limited governmental support for indigenous communities and traditional land use practices contrasts with the benefits received by transmigrants. This difference has led to social unrest and even violence.

Our study focused on the ban on fire issued in 2007 by the government of Central Kalimantan which entirely forbade the use of fire in agricultural practices to combat peatland fires. This ban had serious negative consequences for farmers in the region, as burning the top layer of peat is the traditional method for clearing land, producing fertilizers and increasing the pH level. Burning is also used to claim ownership of land. To restore the hydrology and ecology of the peat areas, projects have been set up to build dams that block canals (Jaenicke et al. 2011), helping to ‘rewet’ peatland, re-establish vegetation, reduce fire risks, and increase carbon storage.

This study aimed to increase CKPP’s understanding of the feasibility of various farmer-led tree-planting projects. In these projects, local farmers would plant trees on their own plots, as opposed to large-scale government-led projects. Farmer-led restoration projects impose costs on farmers, such as the investment in tree seedlings and fire-free land clearing methods. Therefore, some form of actual compensation may be needed. Benefits of tree-planting and mitigation of peatland fires in terms of health risk reduction, flood risk mitigation and biodiversity conservation are enjoyed by the global community. An argument could be made for a payment mechanism funded by this wider community paid to local farmers as an incentive to change their current land use. However, changing land use has major implications for local livelihoods. The objective of this study was to assess preferences among local community members in Central Kalimantan towards peatland restoration, and to determine their willingness to participate in farmer-led restoration programs.

**3. METHODS**

**3.1 Design of Choice Experiment**

CEs are a SP technique to elicit respondents’ preferences in terms of the costs and benefits they expect to attain from different attributes of hypothetical profiles. CEs are based on random utility theory (Manski 1977) and draw on Lancaster’s attribute-based utility theory (Lancaster 1966). In a CE, respondents are asked to choose their preferred alternative from different hypothetical bundles of goods, which are described in terms of their characteristics (attributes), including a monetary attribute (Hanley et al. 1998). The inclusion of a monetary indicator among the attributes allows for the estimation of the value in monetary terms of each of these attributes, which can for instance represent different aspects of a policy programme.

One of the main reliability problems of environmental valuation SP studies arises when respondents are unfamiliar with ecosystems or the goods and services they provide, or when they are unaware of the environmental problems as discussed in the valuation study. Unfamiliarity with the ecosystem under valuation can result in biases in WTP estimates, primarily information biases resulting from inaccurate or imprecise scenario description in the survey and misspecification biases from the respondent’s side if the presented information is not fully understood (Barkmann et al. 2008, Nunes and Van den Bergh 2001). Local health benefits or the effects of new land use techniques on hydrology and yield are examples of unfamiliar goods and services that may be relevant in this case study.

SP valuation studies in low-income countries are typically characterised by high response rates and low costs per interview (Whittington 1998). This is advantageous for quantitative survey research as large sample sizes can be used. However, SP methods have been criticised for using money-indicators in non-cash economies (see e.g. Köhlin 2001). Moreover, literacy rates in rural areas in low-income countries are typically low, which has been found to result in confusion or misunderstandings when respondents are asked to value complex goods with numerical questions, for example with payment cards in CV studies (Wang and Whittington 2005, Whittington 2002). Furthermore, cultural differences may affect the validity of certain approaches and the results they produce. Whittington (1998) gives an example of a CV study where cross-cultural differences lead to inflation of WTP statements: in Indonesia, Whittington argues, some ‘yes’-answers to a WTP question are a polite way of saying ‘no’ and should be recoded according to the conditions under which respondents would be willing to pay often stated after the ‘yes’-answer. Whilst these issues give no reason to believe that respondents in low-income countries state systematically less (or more) ‘reasoned’ and ‘deliberate’ preferences than others (Mangham et al. 2009), there may be a larger motivation for researchers and practitioners to triangulate the results of the CE with qualitative methods to gain better understanding of the responses obtained.

The CE in this study was designed to assess the Willingness-To-Accept compensation (WTA) for planting trees on agricultural land and limiting the use of fire. The selection of the CE attributes was based on consultations with the CKPP consortium and local sociology and agriculture experts, and three field trips. During the consultations, the objectives of CKPP and the local social, economic and ecological conditions and farming practices were discussed. These consultations resulted in the selection of one monetary and four non-monetary attributes (see Table 1). Other candidate attributes, such as the temporal distribution of benefits and costs, were considered but deemed to complicate the CE too much. The attributes represented different potential restoration strategies considered by the CKPP consortium, for which they wanted information on local perceptions. Three rounds of pre-tests were organised in August 2007 with individual respondents in different types of villages similar to those in the final survey (see Section 3.3) to improve and finalise the survey questions and CE design, including the evaluation of the attributes and their levels. The pre-tests led to the inclusion of a set of attitudinal questions, for example, about the fear of not receiving any compensation. Further pretesting using focus groups or in-depth qualitative interviews was not feasible within the project’s budget.

The first attribute reflected conversion of current agricultural land including fallows to a tree-based farming system (‘tree-planting’), expressed as the extent of the land use change that farmers commit to. Tree-planting would impose short-term costs on farmers as trees require time to grow whilst less land can be used for crops that generate more immediate returns, which was acknowledged in the CE scenario text. In the longer term, direct benefits of the trees, such as sustainably harvested timber, local rubber, fruits and other non-timber forest products were expected, along with indirect benefits such as health and safety improvements. The expected sign of this attribute parameter (i.e. its effect on choice probabilities) hence depended on respondents’ time preferences and expected net benefits from tree-planting. The response to this attribute was therefore expected to vary across respondents and be related to a mix of factors, including current revenues, expected costs of reforestation (labour), expected revenues of local trees and timing of those revenues, access to markets, and size of land.

The second attribute, loosening the restriction on the use of fire of the fire policy, was expected to have a positive impact on the probability that respondents would choose a tree-planting scenario.

The third attribute was included to assess to what extent respondents would be willing to contribute to the project by helping a certain number of days in community activities. These activities would impose costs on farmers in terms of reduced working days. However, a successful project would also contribute to welfare, such as improvement in the health care and safety situation and other ecological services from peatlands, and may help build social capital. Therefore, a higher number of community services days involved an individual trade-off between short-term costs and long-term benefits as well as individual and social costs and benefits; the effect of this attribute on choice probabilities was hence expected to range from positive to negative.

Table CE Attributes and levels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute | Levels |  |  |  |
| **Tree-planting on current agricultural or waste land** |  |  |  |  |
| 25% forest, 75% crop land | 50% forest, 50% crop land | 75% forest, 25% crop land | 100% forest land |
| **Ban on fire** |   |  |  |  |
| No fire allowed | Controlled fire allowed |  |  |
| **Community activities provided by farmers** | comserv01 | comserv02 | comserv03 |  |
| 0 days per planting season | 2 days per planting season | 4 days per planting season |  |
| **Micro-credit/grant****(Rupiah/ha)** | subsidy0 | subsidy1 | subsidy2 | subsidy3 |
| Rupiah 0 | Rupiah 10.000.000 | Rupiah 15.000.000 | Rupiah 20.000.000 |
| **Extra extension services provided to farmers** |  | ext 3 days | ext 6 days |  |
|  | 0 days | 3 days per planting season | 6 days per planting season |  |

The fourth attribute represented a monetary benefit which was presented in the form of a conditional credit scheme. Farmers were offered a one-off upfront micro-credit of a certain amount per hectare, which they would only have to pay back if they failed to maintain the newly planted trees on their land within five years. The attribute was expressed a per-hectare amount, because the costs and benefits of reforestation depended on the total size of the area planted with trees, which varied along with the first attribute across respondents. The scenario text explained that the money would go directly to the farmer without the involvement of middle-men. The condition on the payment was used in the survey to ensure that farmers would consider the risk of not meeting the loan requirements. In the pre-tests, farmers stated that this risk would limit the maximum amount they would want to get. We aimed to mitigate the risk of strategic overstatement of compensation needs, which is sometimes found in other WTA surveys (Brown and Gregory 1999). The highest level of the monetary attribute was set at 20 million Indonesian Rupiah per hectare (1,538 Euro/ha in 2007 prices)[[1]](#footnote-1), approximately equivalent to mean smallholder agriculture revenues per hectare over five years (Law et al. 2015). We expected that the higher was the conditional credit, the higher would be the probability that a respondent chose to plant trees on his land and thus chose one of the options.

The fifth and final attribute for extension services was included to assess the demand for provision of technical assistance with tree-planting activities to farmers. Some of the sampled villages already received assistance by extension officers, who advise on agricultural techniques, which formed the basis of the attribute levels. Extension services were expected to provide some benefits to respondents; this attribute was expected to have a small positive effect on choice probabilities.

In the survey, pictograms and pictures were used to explain the meaning and the variation in the different levels of the attributes and to support interpretation of the choice cards (see e.g., Rasid and Haider 2003). In the final CE, respondents were asked to evaluate four choice cards. Each card consisted of two alternative scenarios based on the five attributes, and an opt-out choice reflecting the current situation. Respondents were asked to choose their preferred alternative from each card separately, without the opportunity to review choices. A fractional factorial experimental design with eight blocks was used to generate the choice cards; each block contained four choice cards which were presented in a fixed order. In total, 32 different choice cards were used in the CE. The choice cards were checked for dominant options. The blocks were assigned randomly to respondents whilst balancing the number of times that each block was used.

The CE was embedded in a household survey, which consisted of 54 questions, divided into five sections: current farming practices, involvement in current support and development programmes, the respondent’s experience and opinion on the fire ban and development plans, the CE, and the respondents’ socio-demographic and economic characteristics. Questions about causes, benefits, costs and attitudes towards deforestation and peatland rehabilitation were included. Almost all questions were closed-ended or had a statement-format with a Likert-scale, in which respondents were asked to what extent they agreed with the statement.

**3.2 Design of Focus Group Discussions**

A series of FGDs was conducted at the same time as the CE. FGDs fall under the umbrella of techniques that emphasize data collection among groups of individuals and are often used in participatory rural appraisal studies (e.g. Dao et al. 2015, Ramirez-Gomez et al. 2015). A facilitator, who introduces the topics and enhances discussions, usually leads the discussions and stimulates interaction between participants, which may benefit socially marginalised groups (Gibbs 1997, Kidd and Parshall 2000). The FGD approach used in this project can be classified as exploratory, seeking to identify and explain thoughts, feelings and behaviour (Fern 2001).

The interaction between participants in FGDs allows for more flexibility in the assessments of values, beliefs and perceptions of situations than household surveys and the CE scenario. People may have more freedom to express doubts and conditions of accepting certain proposals. However, commonly mentioned limitations of group interaction include conformance, coercion, and conflict avoidance, resulting in non-participation of less articulate, confident or powerful people (Kidd and Parshall 2000). Practically, it can be difficult to ensure representativeness of the FGD sample, and indeed, this may not be the objective of FGDs. Finally, confidential or politically sensitive issues, including individual income, ability and willingness to pay may be better assessed in individual interviews (Powe 2007, Ch.4).

The main purpose of our FGDs was to explore the conceptualizations, attitudes, perceptions, values and priorities of peatland restoration and tree-planting (Powe et al. 2005). The FGDs focused on direct uses and interaction with peatland resources as well as intrinsic, non-monetary values. The FGDs were also used to give insight in the thought-processes that preceded choices and the adequacy of the valuation exercise, to provide validity checks of CE exercise.

The FGDs were loosely structured around six topics: three standard peatland restoration activities, namely blocking canals, land use change, and the use and ban on fire, and three CKP development project aspects: training, compensation, and trust in the provision of compensation and training. The discussions sought to understand current practices of land use, and attitudes towards farmer-led peatland restoration, including participation in existing tree-planting projects and community activities. The moderators made sure to cover each topic in every FGD, but allowed for some freedom in the order of questions (Redmond and Curtis 2009). A list of 76 questions divided over the six topics was developed to remind the moderators of the required information. Explicit attention, also in the formulation of the questions, was paid to the conditions of the proposed land-use schemes, such as various forms of in-kind compensation and institutional arrangements. These types of questions, especially when formulated as conditions (what would you do if CKPP undertook action A), often stimulated the discussion and revealed priorities.

The set of questions was checked for clarity and language with two translators originally from the study area. During the FGDs, non-judgmental reflective listening methods, i.e. clarifying, paraphrasing and summarising, were essential to understand responses (Fern 2001). This was crucial to avoid information loss and misunderstanding related to translation, encourage more timid, non-dominant participants to talk, especially in larger groups, and understand whether information provided by one respondent was representative for the entire group or village. For more personal responses, non-reflective listening (i.e. non-judgmental, with minimal response) was used, respecting local culture.

**3.3 Sampling strategy and implementation**

The final data were collected in October-November. The FGDs and CEs were implemented simultaneously. To compare the results of the methods, the FGD and CE samples did not overlap but involved different individuals, and results of one method were not shared with participants of the other method. The collaborators from the University of Palangkaraya organised the logistics of the data collection, including transport, translators, interviewers, permissions and contacts with village representatives and experts. Prior to data collection and following Kalimantan customs, the village headmen were informed of the purpose and nature of the study, and then assisted in inviting the FGD participants; CE respondents were selected by the interviewers.

In total, 398 respondents from 20 villages (approximately 20 respondents per village) in the Central Kalimantan peatland area participated in the household survey including the CE. The interviewers were from Kalimantan and spoke local languages. They were experienced in conducting surveys, contributed to the development and pre-testing of the questionnaire, and received specialised training on implementation of the CE. It took on average 45 minutes to complete the interview. Because of the heterogeneity of the communities living in the study area, differences in perceptions and attitudes were expected to exist at various levels, so that three criteria were used for village and respondent selection: (1) origin of population, i.e. Dayak or transmigrant households, (2) CKPP-involvement, and (3) depth of the peat layer. The CE sampling procedure was split equally between Dayaks and transmigrant households, between deep peat and shallow peat locations, and between villages that were and were not participating in the CKPP. A further on-site selection was made to only include respondents who used peatland, either for agriculture or left fallow, or used peatland for agriculture before the ban on fire was introduced.

Thirteen of the 20 villages and one additional village were selected for the FGDs. The 14 FGD villages represented all eight combinations of the same three selection criteria (i.e. ethnicity, CKPP-involvement, peat depth). The FGDs lasted on average one to two hours and involved five to fifteen respondents. Smaller groups are more likely to focus on individual issues, whilst participants in larger groups are more likely to focus on shared issues and experience they have in common (Fern 2001). Therefore, the variation in group size in our study increased the probability that both individual and general issues were discussed.

Two moderators were responsible for managing the FGD process together with two local translators. Following local customs, the discussions usually took place in the house of the village head, and people were seated in a circle on the floor or on chairs. At the start of each discussion, after an introduction of the research team and aims, it proved to be important to stress the independency and confidentiality of the study to avoid worries and manage expectations of the research project.

**4. RESULTS**

**4.1 Household survey results**

Agriculture and agroforestry were the main sources of food and income for the majority of communities in the area. The main crops were rubber and rice. The household survey results showed that most farmers held small plots of around 4.24 hectares, ranging from 0.25 to 20ha, for permanent cultivation, although many farmers left a proportion of their land unproductive (i.e. 37% on average). The mean annual income was 7.8 million Rupiah (~600 Euro), ranging from 0.2 to 50.2 million Rupiah (see Table 2). Only 41% of the sample considered their income sufficient to sustain their family. The remaining 59% of the sample did not have a number of fundamental goods and services, of which food was mentioned most often. Around 52% had received subsidies from the government since 1995. Only 42% of Dayak respondents received extension services, compared to a significantly larger number of the transmigrants (81%, Kruskal-Wallis test, H=58.227, p<0.001). Similarly, transmigrants had significantly better access to financial subsidies (66% versus 41%, H=23.546, p<0.001), which may be explained by the availability of a targeted transmigrant subsidy.

Table Descriptive statistics of household survey sample population and subsamples by CKPP involvement

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Full sample** | **CKPP involved** | **Not CKPP-involved** |
|  | **Mean (st.dev)** | **Mean (st.dev)** | **Mean (st.dev)** |
| Age (in years) | 44.8 (9.4) | 43.8 (10.1) | 45.0 (9.1) |
| Household size (in members) | 5.0 (1.6) | 4.9 (1.5) | 5.0 (1.7) |
| Born in Central Kalimantan (%) | 59.8%(49.0%) | 70.4%\*(45.9%) | 55.4%\*(49.8%) |
| Income (in million Rupiah) | 7.8 (7.3) | 8.0 (6.5) | 7.6 (7.1) |
| Land size (in ha) | 4.2 (3.0) | 5.0\*(3.8) | 3.9\*(2.6) |
| Used extension services | 39.8%(49.0%)  | 40.2%(49.3%) | 41.9%(49.4%) |
| CKPP involvement | 26.1%(44.0%) | 100%(0%) | 0%(0%) |
| Use of fire to clear our farmland* Yes
* Yes, I used to until it was banned
 | * 28%
* 55%
 | \** 44%
* 45%
 | \** 23%
* 57%
 |
| Attitude towards fire ban* % positive
* % neutral
 | * 62%
* 15%
 | * 62%
* 12%
 | * 61%
* 16%
 |
| Willing to switch to planting trees:* Partly
* Fully
 | * 64%
* 33%
 | * 56%
* 41%
 | * 66%
* 31%
 |
| Number of respondents | 398 | 98 | 277 |

*Note: these results are based on household surveys collected in Central Kalimantan in Oct-Nov 2007. The asterisks (\*) indicate variables for which the non-parametric Kruskal-Wallis test indicates that the sub-samples of respondents split by CKPP-involvement are significantly different at the 5% level.*

Responses to the attitudinal questions revealed that 58% of the Dayaks-respondents and 66% of the transmigrant households were positive about the fire ban. Support for blocking canals to avoid further drainage differed between these groups: 40% of the Dayaks supported this policy whilst 24% were against, compared to 28% of the transmigrant respondents who were in favour and 42% against (H=6.094, p=0.014). Whilst we do not know what caused these differences with certainty, we expect that a combination of differences in the cultural relationship with forests and legal land tenure rights resulted in different attitudes towards, and inclusion in, forest management and financial subsidy programs of the central government.

Almost all respondents held positive attitudes towards tree-planting and preventing fires and were willing to switch to cultivating local tree species suitable for peat soils. However, while 33% of the survey respondents would be willing to plant local species on their entire farmland area, 64% would only plant trees on part of their plot. Respondents generally believed that peat conservation would help future generations and 87% agreed that the fire ban would improve their family’s health situation. Although only 26% of respondents participated in community services and activities of CKPP, almost all respondents expressed willingness to participate in community services for the implementation of a tree-planting project.

All respondents claimed to be in need of some kind of compensation if the project as proposed in the CE scenario was introduced, and 75% of respondents argued that the new policies would reduce their welfare if no compensation was provided. A multiple-choice question revealed that the most preferred type of compensation was monetary (‘money, grants or subsidies’) (64%), immediately followed by compensation in terms of ‘seedlings, fertilizers and pesticides’, whilst ’extension services’ were least preferred. However, 80% of the respondents were afraid that compensation would not be provided if the plans were implemented.

**4.2 CE results**

The CE results were based on a mixed logit model that accounts for the panel structure of the data and relates the probability that an alternative is chosen to the attribute levels and respondent characteristics (see Table 3). Following Train (2003), our model specification in equation (1) represents the utility function, where U is respondent n’s utility of choosing option $i (i=1, 2, 3)$ in choice situation $ t \left(t=1, 2, 3, 4\right)$, $X\_{int}$ is a vector of presented attribute levels, $β$-terms are parameters to be estimated; $β\_{kn}$ reflects the preference parameters related to the attributes ($k$) in set$ X$, $γ\_{i}X\_{int}s\_{n}$ captures systematic preference heterogeneity for attributes as a function of individual characteristics ($s\_{n}$), and $ε\_{int}$ is a random term to account for random unobserved utility.

|  |  |
| --- | --- |
| $$U\_{int}=β\_{kn}X\_{int}+γ\_{i}X\_{int}s\_{n}+ε\_{int}$$ | (1) |

The analysis of the CE data was performed in R-software. We present the results of the best-fit model (according to the BIC), which includes all attributes and only those additional explanatory variables for which the parameter estimates are significant at the 5% level. All parameter estimates for the attributes are significant, but extension services are only significant at the 10% level. The model contains one random parameter (for the tree-planting attribute); additional random parameters did not improve the model fit (according to the BIC). Two interaction effects between the attributes and respondent characteristics are also significant and explain part of the observed heterogeneity in choices across respondents. No statistically significant effects were found for other socio-demographic and attitudinal variables, including peat-depth and the respondent’s origin, which may be due to the sample size.[[2]](#footnote-2) The presented model with two socio-demographic variables performed better than its attributes-only mixed logit counterpart (LL=-995.5, AIC=2006.9, BIC=2049.9).

The final column of Table 3 presents the WTA, based on the ratio between the non-monetary and micro-credit attribute parameter estimates and their significance, using the Delta Method to estimate the confidence intervals (Hole 2007).

Table 3 Discrete choice model results, random parameter logit model

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Coefficient** | **Robust t-value** | **WTAa mean****(s.e.)** |
| Tree-planting (linear effect, in % of land x 100, random parameter, normal distribution, mean) |  0.088\*\*\* |  9.54 | -1.56\*\*\*(0.27) |
|  Standard deviation of random parameter |  0.037\*\*\* |  10.83 |  |
| Tree-planting (quadratic effect /100) | -0.082\*\*\* | 11.13 | 1.46\*\*\*(0.24) |
| Ban on fire (controlled fire = 1; no fire allowed = -1) |  0.140\*\*\* | 2.88 | -2.49\*\*(1.02) |
| Community activities (in number of days) | -0.073\*\* | 2.30 | 1.30\*\*(0.59) |
| Micro-credit (in million Rupiah) |  0.056\*\*\* | 6.15 |  |
| Extra extension services (in number of days) | -0.053\* | 1.76 | 0.95(0.62) |
| *Interaction effects* |  |  |  |
| Extra extension services x annual household income (in million Rupiah) |  0.009\*\*\* | 3.34 | -0.15\*\*\*(0.05) |
| Tree-planting x CKPP village b |  0.010\*\* | 2.07 | -0.18\*(0.10) |
| Alternative specific constant (opt-out = 1, options A and B = 0) |  -3.760\*\*\* | 5.12 | 66.91\*\*\*(17.88) |
| *Model statistics* |  |  |  |
| Pseudo R2 | 43% | AIC | 1995.3 |
| Log likelihood  | -987.7 | BIC | 2049.1 |
| Number of choices | 1592 |  |  |

 *Notes: Results are based on 500 Halton draws. \* significant at 0.10, \*\*significant at 0.05, \*\*\*significant at 0.01. a WTA: Willingness to Accept, expressed in million Rupiah per hectare. b the CKPP variable is a dummy variable with the value 1 for respondents from villages that fall under the CKPP, and the value 0 otherwise.*

The tree-planting attribute was included as a random parameter with a normal distribution; the significant standard deviation demonstrates heterogeneity in preferences for tree-planting among farmers. Preferences for the tree-planting attribute show significant non-linearity as demonstrated by the significant quadratic effect. Respondents from villages where CKPP was organising activities were more positive towards planting trees on their lands than respondents from other villages. Based on the parameter estimates, this non-linear effect implies that the part-worth utility (of the average respondent) of choosing an alternative increases up to 55% of farmland to be planted with trees where WTA≈ 42 million Rupiah per hectare (and 60% for CKPP villages), but decreases beyond that level yet remains positive at 100%. This suggest that respondents required no compensation for converting part of their land. The available variables could not explain the underlying drivers of the non-linearity, that is, they were not statistically significant.

As expected, respondents preferred options that allowed controlled use of fire over a complete ban on fire, and fewer days to be dedicated to community services. The higher the amount of the micro-credit provided, the more likely respondents would choose that option. For the attribute extension services, respondents did not expect to benefit from extra extension services. The weakly significant direct effect is negative. However, respondents with higher incomes preferred more extension services. Interactions with indicators for experience with extension services or socio-demographic variables were not significant in the model.

The alternative specific constant, which enters the model as a dummy variable with the value 1 for the opt-out and zero otherwise, is negative and significant, which suggests that respondents preferred participating in the tree-planting project over their current land use. However, as discussed below, the value of this parameter should be interpreted with caution.

**4.3 FGD Results**

The key finding of the FGDs is that local farmers were willing to cooperate in land use changes, but only if key conditions were met. Respondents (a) wanted to keep a proportion of their land to cultivate for own consumption and be self-sufficient in rice, (b) needed continuous income during the transition period until trees reach maturity.

Farmers were generally willing to cooperate in land-use change developments that could be beneficial financially or otherwise. Willingness to participate was dependent on type and size of land owned. Farmers with deeper peat expressed more positive attitudes towards change because of the low productivity of their land. Farmers with small plots preferred to maximise crop production rather than tree-planting, to satisfy their household needs, whilst farmers with larger plots often planted multiple crops and trees. At least a quarter of the villages had access to nearby peatland forest, where the participants would collect local timber and NTFP species, usually without any restriction. Therefore, investing in planting local species on farmland did not generate much support among the FGD respondents in first instance.

Willingness to change land use was dependent on two requirements: the changes had to be beneficial to the farmers, mostly conceptualised as profitable, and secondly, stable and continuous food and income supply had to be guaranteed. Participants carefully evaluated the short and long-term impacts on income. In five villages, self-sufficiency in rice, the staple crop, was considered very important and irreplaceable. When only half the land would have to be planted with trees, or when other crops could be grown in between young trees until those reached maturity, farmers were willing to enter an agreement. Most participants would agree to plant trees on unused land, but a minority of participants claimed that fallow land would be taken into production in the future. Farmers expressed concerns about their crop yields on wet and acidic peatland when canals would be blocked, the limited availability of markets and profitability of native tree products, the high initial costs of tree-planting until tree maturity.

Drainage canals and fire were perceived as essential for cultivation; farming without them was perceived to be hardly possible. The FGDs revealed that transmigrant communities made more use of canals than Dayak communities. Dayak traditional farming methods are not based on canals, yet their response to building dams was as negative as transmigrants’ reactions: the initial understanding was that dams would increase flood risk. However, farmers were indifferent between existing and alternative methods of drainage and fertilization. Respondents were willing to accept building of dams in canals, but only if those could be opened to avoid flooding and would allow farmers to regulate their water table. Dams could raise the water table and reduce the risk of peat fires in the dry season.

The perception of peatland fire frequency varied across villages, but in all villages respondents were aware of the negative impacts of fire, with health issues regarded as the biggest threat. Awareness of the relationship between dry peat and fires was limited. Despite the ban on fire, two thirds of the villages still used fire on their land, mainly for clearing and generating ashes to improve soil fertility. Except for one village, all transmigrant communities continued the use of fire, compared to three out of seven Dayak villages. Three of the four non-burning Dayak communities stopped using fire after the ban on fire out of fear of penalties, and the fourth had stopped using fire long before the ban. Farmers explained that they continued using fire, with controlled techniques, because they had no other means to feed their families and cultivate their land. Villages that had stopped fire use claimed to have experienced considerable income losses, up to 75%. In two villages, former farmers tried to provide in their livelihood through fishing. However, villages still using fire were willing to accept a ban on fire, as long as training in alternative fire-free methods, tools and fertiliser would be offered.

The majority of the participants would accept loan-grant schemes, but their willingness was dependent on knowledge, compensation for the perceived costs of a change in land use, and trust. Compensation was especially needed to overcome the period until trees were fully grown. Money was not the only form of compensation needed, but most respondents wanted at least a part in cash. Fertilisers, lime (to increase pH levels), pesticides and tools were preferred as substitutes for the use of fire. When discussing the loan-credit scheme as offered in the CE, participants considered the financial compensation period of 5 years too short and suggested to prolong the period to 10-15 years to match the period it takes for trees to mature and the limited income they would generate in the meantime. Participants were interested in training opportunities, such as firefighting workshops that would help them to protect crops and homes. However, in contrast to what NGOs seem to promote as best practice, training on environmental issues or responding to environmental changes were not mentioned as being essential or desirable.

The main source of scepticism about the loan-credit scheme or other financial compensation mechanisms among FGD participants was fear of corruption. Paying compensation directly to farmers was considered essential. Participants explained that in their experience, middlemen (including village heads) tend to take up to half of the money from allowances and agricultural subsidies or other activities. The participants did not express that a lack of trust among different community members or towards the loan provider was a problem. The FGD results did not demonstrate differences in attitudes, motives and perceptions between communities of different ethnic background in this respect. The FGD introduction mentioned that the study was to be implemented on behalf of CKPP, who would also act as the loan provider, which may have biased these results despite our efforts to create a safe discussion environment.

When asked questions about the threats to the peatland forests, the causes of environmental problems, the ecosystem services peatlands provide, and the connection between human activities and the state of natural resources, the FGD participants’ answers suggested some familiarity with these topics. No in-depth understanding was present of the importance of rewetting peatlands for flood risk reduction, the potential benefits of solutions such as dams, the link between peatland fire and drainage, and wider ecosystem services such as health benefits. This knowledge gap amongst participants initially limited their support for various peatland restoration activities. However, whenever information about these environmental issues was provided during the FGDs, major changes in attitudes followed, and support increased. This mirrors the results of Alvarez-Farizo and Hanley (2006), which also showed changes in preferences when respondents can interact. Although the impact of such changes in attitudes and the permanence of such changes is beyond the scope of this paper, this finding suggests that discussions and other forms of deliberation influence the understanding of ecosystem services and their sustainable management, and can thereby increase public support for such interventions.

**5. DISCUSSION**

**5.1 Do the CE and FGDs lead to similar policy recommendations?**

The main aim of this study was to assess whether CE and FGDs would result in similar policy recommendations, in this case for the design of a farmer-led tree-planting project with an externally funded compensation mechanism. We found some considerable differences between the two methods.

First, hardly any respondent in the CE chose the opt-out, and the negative estimate for the alternative specific constant suggests that respondents would take up the options even if no compensation was offered. In addition, a third of respondents stated to be willing to plant all their fallow and agricultural land with trees. However, in the FGDs respondents’ willingness to participate in farmer-led tree-planting projects changed from negative to positive only after more information on the benefits of healthy peatland forests and the option to only plant trees on part of their plots were provided. The FGD participants also expressed fear that they would be unable to fulfil the requirements of the scheme, because it is difficult to grow anything on peatlands. It may be that the tendency to choose an option rather than the opt-out in the CE was due to the same cultural politeness of saying “yes” as found by Whittington (1998), or general yeah-saying regardless of true willingness to accept (Alberini et al. 1997).

Second, and related to the first point, the outcomes of the CE may present an underestimate of the requested level of compensation. The assumption underlying the CE is that respondents make a trade-off between the one-off payment and the costs during the transition period when farmers switch from agriculture to tree-based farming. The estimated part-worth utility for tree-planting also suggests that, up to a threshold, respondents would renounce compensation. This result was not supported by results of the auxiliary survey questions or the FGDs. Although many farmers left part of their land unproductive, this may be a buffer or part of the swidden agriculture cycle (Cramb 2017) or indicate that some form of incentive to plant trees may be necessary. The FGD participants clearly considered transition costs and the impacts on income over time, and expressed the need to extend the compensation period as trees may need longer to grow. The FGDs thereby provided more information about the preferred design and timing of the compensation scheme than the CE. At the same time, the FGDs, where the financial compensation featured less prominently, may have invoked more strategic group behaviour and therefore raised the demand for compensation compared to the CE.

Third, where the FGD results suggest that the willingness to cooperate was conditional on being self-sufficient in food and having a diverse set of income generating activities, the results of the CE seem to suggest that the perceived risk of dependency on tree income alone can be overcome by increasing financial compensation. However, the non-linear effect found for the proportion of land dedicated to tree-planting may be interpreted as an expression of the need for food self-sufficiency.

Fourth, the estimated part-worth utilities and parameter of the credit attribute might be influenced by a fear of corruption. Assuming that respondents chose options with a higher compensation level so that not only their costs but also the risk of not receiving (all) compensation would be covered, the resulting CS estimates may be an overestimate of the required compensation in absence of corruption. Fear of corruption came strongly to the fore in the FGDs, but we did not have information to estimate the potential risk premium reflected in the values of the CE. In terms of policy recommendations, the FGDs provided clearer information about the governance issues that would affect the uptake of a farmer-led tree- planting project in practice.

Despite these differences, the FGDs provide some validation of the results on the attributes in the CE, such as the limited relevance of extension services days, the heterogeneity explained by peatland management awareness through CKPP, and the preference to convert to tree-based farming on only half of one’s plot. The findings of this case study suggest that the CE results provide relevant information for ecosystem valuation and public preferences. The FGD participants were interested in farmer-led tree-planting schemes, as long as those would be designed according to local preferences and the conditions expressed by farmers.

There were also study aspects that were more reliably picked up by the quantitative CE, for example preference heterogeneity, such as the effect of household income. The private setting of the CE interview also enabled individuals to state preferences free from group influence and peer pressure. Finally, only the CE results provided quantitative information and a cautionary interpretation of the results give an order-of-magnitude estimate of the necessary compensation levels.

**5.2. What are the advantages of combining CEs and FGDs?**

Powe (2007, Ch. 5) expressed four key advantages of FGDs combined with SP valuation studies:

1. Presentation of the hypothetical market and scenario;
2. Description of the payment vehicle and transaction mechanism;
3. Understanding strategies and motivations for WTP;
4. Assessing the acceptability of the approach.

Here, (1) and (2) mainly refer to FGDs that inform the design of subsequently held SP surveys, making sure that respondents and researchers share a common conceptualization of the good under valuation. In our study, FGD respondents initially perceived investing in planting local species on farmland as unnecessary, since those species can be freely collected. Providing information on ecological services greatly enhanced support for farmer-led tree- planting in the FGDs. It could be argued thatin the CE the significant effect of involved in CKPP reflects a similar information effect, but it may also be that these respondents opted to convert more land because they had larger plots (see Table 2).

We argue that a particular advantage of FGDs is that they allow for exploration of time preferences with more flexibility than CEs. In studies on environmental restoration funded by private payments, the provision of marginal benefits will often take time, whilst payments start immediately. Researchers may assume that respondents are able to make trade-offs in time adequately and infer private discount rates from stated WTP. However, studies on the rate of time preference highlight that individual time preferences depend on a mix of factors, not only wealth but also risk attitudes, ethical and socio-cultural stance (Holden et al. 1998, Ehmke and Shogren 2009, Oleson et al. 2015). It may be easier for respondents to express their considerations of the distribution of benefits or costs over time in a FGD in a verbal, qualitative manner, rather than through making a rational choice in a CE by discounting the costs and benefits. This is equally important in WTA studies, especially where the proposed scenarios affect a non-trivial proportion of the main source of food and income of respondents. In our study, the long-term outcome may be more beneficial and farmers may be genuinely interested, yet they need to overcome the period until trees are ready to be harvested. Therefore, the switching costs which fall in the immediate future may require front-loading compensation payments, especially in low-income countries where people have limited financial buffers to overcome net short-term costs.

The FGDs also revealed more about farmer preferences towards the transaction mechanism, especially their lack of trust that money and extension services would be provided due to corruption. This puts the CE result that respondents would accept monetary compensation into perspective, although it did not lead to a complete rejection of the monetary compensation options.

Powe (2007) relates the 3rd point mainly to the interpretation of WTP statements for (public) environmental goods: CV surveys intend to assess maximum WTP, but respondents may instead express a ‘fair-share’ WTP, or provide protest bids or strategic answers (see also Powe et al. 2005). This point could be expanded: there may be potential to explore with FGDs to what extent alternatives to utility maximisation behaviour, such as satisficing, or risk averse behaviour apply, especially when dealing with unfamiliar and risky options. In our study, participants in the CE, who were highly dependent on ecosystem services from agricultural land and forests, may have shown choice behaviour that aimed to satisfy needs through low risk options rather than maximise their utility. The FGDs shed no further light on a possible cultural bias towards yes-saying in the CE (or the absence of protest-responses), but certainly highlight reservations towards adoption.

We argue that the usefulness of FGDs to inform CEs also lies in the specification of the regression model and the interpretation of attribute effects. As described in the previous section, the FGD results helped to explain the statistical results of the CE analysis, and in particular, the quadratic effect for the tree-planting attribute. Whilst such non-linearity in preferences violates standard monotonicity assumptions, the FGDs explain this behaviour that is akin to risk aversion.

In addition, preference heterogeneity is often modelled through random parameters without explaining the determinant of heterogeneity. Statistical identification of such determinants may be difficult when heterogeneity is driven by a complex set of factors. Factor analysis or hybrid choice models (Bolduc et al. 2005) and latent class models may help, and so can the inclusion of other variables through interaction effects, although the inclusion of additional questions creates additional theoretical and statistical concerns (Johnston et al. 2017). FGDs offer a flexible, separate source of explanations, in which causality rather than correlation can be explored. In our study, for example, the unexplained heterogeneity in the proportion of crop and fallow land converted to tree-based farming found in the CE was related in the FGDs to peat layer depth, size of the plots, and plot revenue.

Furthermore, we argue that the FGDs proved to be beneficial beyond supporting the interpretation of the CE results. FGDs offered the possibility to express conditions regarding acceptance of the proposed land use scenarios. There is a limit to the number of policy components that can be included as attributes in the CE or in the hypothetical market description, and researchers may have to choose between valuing multiple ecosystem services separately, or evaluating different options for the institutional setting. In general, accounting for the many potentially relevant contextual effects in which trade-offs are embedded through attributes in the CE is impossible, because it would make the design too complicated. Using FGDs in combination with CE may reveal relevant, sometimes unexpected conditions for cooperation. In our study, compared to the CE, the FGDs allowed further discussion of more complex aspects of the proposed policies, interdependent issues of peatland management and services, and financial compensation. For example, farmers were willing to accept a ban on fire, as long as substitute methods of land-clearing and fertilization were offered; and farmers required a minimum level of income and food security as well as support for cultivating and marketing local species to accept the scheme. The FGD results showed that the specific conditions under which the farmer-led restoration options were provided affected the uptake.

**6. CONCLUSIONS**

This paper presents the results of focus group discussions and a household survey including a choice experiment, simultaneously implemented but using different samples, with the methodological aim to assess if these methods would result in similar policy recommendations. Both methods focused on farmers’ willingness to cooperate in a farmer-led tree-planting project to restore peatlands in Central Kalimantan, and their preferences on the design of a compensation scheme for the net costs associated with tree-planting. The study provides information on the socio-economic value of peatland resources in Central Kalimantan from the perspective of local smallholders. The results lead to several policy and methodological recommendations and demonstrate the usefulness of combining quantitative and qualitative approaches.

Regarding the methodology, the main conclusion of this study is that although the results of the FGDs and CE overlap, providing a triangulation of some of the findings, there are also considerable differences in the policy recommendations that would result from these two methods. We confirm that FGDs are very beneficial to support CE studies, i.e. in the design phase of a survey, or as a debriefing tool with the same subjects after the completion of the CE (Keske et al. 2011). Indeed, recent guidelines (Johnston et al. 2017) specifically recommend qualitative pretesting approaches (i.e. focus groups, cognitive interviews) in combination with quantitative pretesting. As in many applied studies, this was unfortunately not feasible in our study where CE pre-tests with the target population were largely quantitative; arguably, the use of qualitative pre-tests would have improved the CE (or FGDs) design and reduced the differences between the FGD and CE results described in Section 5.1.

That said, we argue that FGDs, when applied as another primary research method for (non-monetary) valuation in a mixed methods approach, provide extremely useful results and policy relevant information. Methodological triangulation efforts through combining qualitative and quantitative methods can provide a more complete understanding of attitudes and motives and recognise the multiple realities that underpin environmental preferences and monetary values of ecosystem services. Additional to the features listed in the literature on the combination of SP studies and FGDs (Powe 2007, Powe et al. 2005), this study finds that FGDs have the advantages of dealing with specific contextual problems, institutions and conditions for accepting a policy scheme, of addressing effects of the distribution of costs and benefits over time, besides aiding the specification of the CE regression model. Some of these advantages have been recognised in other combined or integrated qualitative-quantitative valuation studies (e.g. Kenter et al. 2016b). But especially in studies that want to apply CEs to assess preferences for change in private land use with non-trivial impacts on people’s livelihoods, the complexity of factors that affect adoption choices may be more easily assessed in qualitative FGDs than in fixed CE and survey designs. In addition, respondents’ articulation of the conditional acceptance of policy options may provide policy relevant clues for project design, and warrant careful interpretation of CE results.

We argue that the use of different samples for these methods allows for more robust triangulation than ex-ante or ex-post discussions or deliberation with the same subjects. Indeed, different samples may obscure differences caused by methodologies (Davis and Whittington 1998). Separate samples, however, avoid risks of groupthink and other group interaction effects on subsequent statements of preferences, attitudes or opinions in the CE. It avoids narrowing down the discussions in pre-CE or post-CE FGDs on monetary CE outcomes. Moreover, using independent samples avoids framing effects in post-CE FGDs that may occur when involving the same respondents, whose perceptions may be led by the narrative of the CE survey instrument. Still, post-CE FGDs are certainly useful to provide more context and explanation of monetary valuation studies. Therefore, increasing their uptake would strengthen the policy relevance of SP research.

In studies of complex or uncertain scenarios or policies, participatory and deliberative valuation approaches, where respondents can share information or call upon experts and other information sources before expressing their values, may be beneficial. Participatory multi-criteria approaches (e.g. Garmendia and Gamboa 2012) and deliberative valuation methods provide opportunities to bring divergent viewpoints together and explore these. Proponents of deliberative valuation methods argue that the process of deliberation moves decision making beyond ad hoc choices based on heuristics and incomplete consideration of multiple perspectives as captured with SP or FGD methods, towards value formation that brings results closer to social benefits assessment (Kenter 2016, Fish et al. 2016). However, practical, ethical and theoretical problems of such methods include the aggregation of preferences over the larger population, the legitimacy of introducing a deliberated policy to a population without the same deliberation experience, the choice of a social welfare function, and the assembly of sufficiently large samples for robust statistical analysis of group choices (Bunse et al. 2015, Lienhoop et al. 2015). Further research may test the validity of different group-based valuation approaches, where different groups receive different treatments or discuss different topics.

The results also provide recommendations for future policy design. This study shows that farmers are willing to change from current agricultural practices to tree-based farming. One of the reasons is that many local farmers in Central Kalimantan find it difficult to make a living from the infertile peatlands, which are not very suitable for agriculture. Although farmers support alternative income generating activities through tree cultivation, the market potential for local tree products is limited especially in areas where natural peatland forest is still present. The presence of off-site benefits may provide an argument for longer financial support of tree-planting farmers than the five years offered in our CE study. Ethnicity seemed to have little influence on the attitudes and perceptions of peatland conservation measures or ecosystem knowledge. Local support will require environmental awareness about the potential ecosystem services benefits of conservation measures, including flood risk reduction, health benefits and provisioning services of local peatland tree species. Engagement of local communities in peatland management, as well as adaptation of (compensation) measures to local agricultural practices may further enhance support. Deliberation, through intensive discussions over longer periods, could improve ecosystem service awareness and change attitudes in favour of sustainable peatland forest management. Input of different knowledges, those of local and traditional experts alongside external experts such as peatland ecologists and agronomists, into this deliberation process may help to develop solutions that do not exacerbate the vulnerability of smallholders.

On-farm tree-planting may offer a cost-efficient way of avoiding further carbon emissions to international investors and development agencies, but it requires local support. In Central Kalimantan, support is conditional on secure and stable income and food supply, the availability of substitute techniques for land clearing and fertilisation, and the availability of markets for local tree products. Out of fear of corruption, lack of trust in middlemen, including community leaders, and limited trust in financial compensation schemes, in combination with a desire to be self-sufficient in food, farmers prefer to continue using part of their land for household consumptive production. Compensation in the form of extension services is not valued highly. Research on other forms of non-monetary compensation, such as seeds, farm tools and fertilizer, and on the institutions that would be trusted to provide these may provide information on preferred compensation mechanisms with potential cost-savings.

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1. The paper applies an exchange rate of 1 Euro = 13,000 Indonesian Rupiah [↑](#footnote-ref-1)
2. A mixed logit model with an additional random parameter for the community activities attribute (with a normal distribution) resulted in a better LL and AIC but worse BIC (LL=-985.2, AIC=1992.4, BIC=2051.5). The WTA estimates were not significantly different and the other parameter estimates were similar. We therefore opted for the most parsimonious model. [↑](#footnote-ref-2)