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Binary Models for Evaluation of Acceptance of Joint Forest Management Concept in Southern Nigeria

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Summary

Joint forest management (JFM) is a concept of developing partnerships between fringe forest users and the Government who are in custody of the forest estate. The continuous decline in quality and extent of the forest cover in the southern part of Nigeria indicate among other things the inadequacy of the public agencies mandated to solely manage the forest resources. One major underlying cause of this inadequacy is the failure on the part of government in involving local communities in the management of the forest. Willingness to participate or support JFM initiatives on the part of the local communities could depend on a number of factors.

In this study, binary models were developed using the field data collected from eight states in the South-west and South-south parts of Nigeria (Cross river, Delta, Edo, Ekiti, Ogun, Ondo, Osun and Oyo States) to evaluate a number of factors perceived to determine willingness of the local communities to participate or support JFM. The selected states are virtually the major timber producing states in the past and present time. The models predict the probability that a respondent (i.e. a local community dweller) will be willing to support JFM in relation to independent factors which include presence/absence of equitable share between Government and communities, presence/absence of conflicts between communities and holders of permits, awareness of community participation in management, presence of association and access to the forest via community consultation. In each state, one head quarters, two forest reserves, six communities were selected for the field survey. A total of eight headquarters, sixteen forest reserves and forty eight communities were randomly selected for field data collection. Two sets of structured questionnaires were employed for the study.

Willingness to support JFM was best predicted by presence of association in the community and awareness of community participation. Presence of conflicts between community and holders of permit and presence of equitable share of benefits from the forest between government and the communities were found to influence the relationships. Willingness to participate/support JFM appears to be guaranteed where the local communities are organized in associations and awareness of community participation in forest management is high. The specific models developed depend on the locations where the data were collected, and therefore should not be applied to areas outside the range of the data. However, the modelling approach is of general applicability and can be used to predict the willingness of the local communities to support JFM in other areas.

Key words: *Joint Forest Management, Conflicts, Community participation awareness, Presence of association*

Introduction

Joint forest management is a concept of developing partnerships between fringe forest user groups and the Forest Department (FD) on the basis of mutual trust and jointly defined roles and responsibilities with regard to forest protection and development. In JFM, the user (local communities) and the owner (Government) manage the resource and share the cost equally. In Nigeria, JFM is slowly emerging into a form of sustainable forestry, which augments the forestry regime with processes for rapid adaptation to changes in what people needed, wanted, and can do. As an adaptive social process, it is striving to create sufficient future forest production opportunity to satisfy potentially competitive/conflicting interests that would diminish the forest if left unresolved. The challenge with JFM has thus been to develop social processes that recognize, accommodate and respond more effectively to diverse and dynamic perspectives of what the forest is about and should be.

In JFM, community forestry has increasingly focused on the control and management of local forest and tree resources by communities for meeting their livelihood needs. According to Malhotra (1995) and Banerjee (1996), JFM in India has been a well-documented experiment in community-based forest management. Prior to JFM, both farm forestry and community forestry had been promoted in India under social forestry. Farm forestry, in which seedlings were distributed for planting on household controlled land, was successful. Communities in states that have adopted JFM have become "partners with state forestry departments in the protection and regeneration of millions of hectares of state forest land (Campbell et al., 1996). It was reported that 1.5 million ha of forest land, about 2 per cent of India's forest area was being protected by mid-1992 by community institutions (Singh and Khare, 1993). In 1978, community forestry in Nepal was adopted as a new strategy that "initially emphasized people's participation in reforestation of degraded lands" (Hunt et al., 1996). By the late 1980s, community forestry had been transformed to include participatory forest management and rural development. The basis for participatory forest management is handing over control of local forests to forest user groups (FUG), that have locally recognized rights to use a forest. The Forest Act in 1993, supported by the Forest Rules issued in 1995, gave FUGs legal rights to all forest products from their forest (but not rights to sell the land, build houses or cultivate the area) "in return for assuming responsibility for protection of the forests" (Hunt et al., 1996). The FUGs have proven to be a viable approach for regeneration and protection of the forest and providing forest products for the needs of the local people (Hunt et al. 1996, citing Gilmour and Fisher, 1991; Branney and Dev, 1994; Jackson and Ingles, 1995).

The examples of India and Nepal illustrate the important role of policy and regulations in the support of community forestry. Forest policy has shifted the management of degraded forests to the communities. Even with JFM, the ownership remains with the state. In these countries where policy and regulations that support community forestry have been put in place, it appears that forest cover is increasing and /or the forest is less degraded.

The Southern part of Nigeria was a highly forested region before and immediately after independence in 1960. It was a region of Tropical High Forests (THF). However, from late sixties to date some of these forests have been and are still being destroyed by loggers and farmers. In 1970, the Federal Government of Nigeria was worried about the rate of deforestation when the country suddenly became importer of wood products; therefore, the exportation of timber was banned. In the early 1980s, a parastatal named Forestry Management, Evaluation and Coordinating Unit (FORMECU) was set up under the Ministry of Agriculture and Natural Resources to improve afforestation schemes and management of the same through the process of obtaining and managing funds which could be loans, grants, aids, etc. for the purpose of monitoring, evaluation, project appraisal and overall coordination of state forestry activities where funds obtained are utilized (FORMECU, 1993). In 1982, the Federal Government of Nigeria obtained loans from the multilateral organizations such as World Bank, ODA, UNDP, EEC and

ADB for afforestation projects to be executed by state governments in Ogun and Ondo states, which involved the local communities in plantation establishment but planning, decision making, etc were not based on mutual agreement. The communities were only used for land clearing, pegging, planting, and replanting in the project sites. The only arrangement based on mutual agreement that involved local communities was Taungya plantation, which was a short-term tenure on forestland. Over the years, state forest services in Osun, Oyo, Ekiti, Edo, Delta and Cross River States of Nigeria have been involving the communities in Taungya plantation because of landlessness that exists in these states. The main occupations of communities around and within forest reserves in these states are farming, logging, hunting, non-timber forest product harvesting and gathering. In some of these states, there was once an avenue for benefit sharing between the state forest services and the communities where forest reserves are located. The standard in use in the past was royalty, which was 16.7% percent of the values of logs harvested from the forest reserves. The royalties were paid to the local governments and the villages for the development of their areas. However, these royalties have since been ignored by some states and such neglect has been leading to illegal activities in the forest reserves.

Therefore, considering the level of complete or total dependence of local communities on the forest resources, any management approach that does not involve the local people who live on, by and for the forest is not likely to succeed. This understanding according to Atte (1994) and Cross River State Forestry Project Technical Report (1994) informed Forestry Department of Cross River State's decision in 1991 to involve the local communities/stakeholders in a participatory land use management process that will empower them to have a greater say in the management of the only resource upon which their very existence depends; the forest, the land. The Cross River State having realized the importance of local communities in forest management and preservation of natural forest, initiated the JFM in the 1990s.

The state-led forest management has failed to enhance sustainable forest management in Nigeria. The failure according to IIED/FD (1994) has mainly resulted from non-inclusion of local communities in forest management. IIED/FD (1994) further stated that the local communities constitute a readily available labour force that can be used to protect forest resources easier than the State Forestry Department. CFMU (1995) also acknowledged that communities are vital components and have important role to play in collaborative forest management.

The continuous decline in quality and extent of the forest cover and also the inability to stem the tide of deforestation indicate among other things the admission of failure of the public agencies mandated to manage and protect these resources. The underlying causes of this failure according to Asare (1997) can be attributed to lack of involvement of communities who own and use forest resources. The country has reacted by introducing new policies, which promote and regulate JFM. Some trials with JFM projects have been implemented. However, experiences in Africa and other countries indicate that JFM can be a panacea for the current problems encountered in sustainable management of forests. Indeed, many countries are in the process of reviewing their JFM activities to ascertain their sustainability and real contribution to sustainable forest management. Willingness to participate or support JFM initiatives on the part of the local communities is one major factor that has not been fully evaluated in Nigeria.

In this study, binary logistic models were developed using the field data collected from eight states in the southern part of Nigeria (Cross river, Delta, Edo, Ekiti, Ogun, Ondo, Osun and Oyo States) to evaluate a number of factors perceived to determine willingness of the local communities to support JFM concept. The selected states are virtually the major timber producing states in the past and present time. The models predict the probability that a respondent (i.e. a local community dweller) will be willing to support JFM in relation to independent factors which

include presence/absence of equitable share between Government and communities, presence/absence of conflicts between communities and holders of permits, awareness of community participation in management, presence of association and access to the forest via community consultation.

Materials and methods

Study Area

In Nigeria, the study was conducted in Cross River, Delta, Edo, Ekiti, Ogun, Ondo, Osun and Oyo States (Figure 1) whose local communities are forest dependent. The selected states are virtually the major timber producing states in the past and present time. They are notable for employment of latent labour locked up in the rural areas. In the past when Nigeria was divided into three regions, the eight states belonged to West, Mid-Western and Eastern regions that had virtually similar forest policy. In each state, one head quarters, two forest reserves, six communities were selected for the field survey. A total of eight headquarters, sixteen forest reserves and forty eight communities were used for the exercise (Tables 1 and 2).

Data Collection and Procedures

Field survey, which entails detailed appraisal of the various aspects of the objectives, was carried out through the use of structured questionnaire and opinion/target group discussions for primary data. Secondary data were also collected from documented facts. The respondents were made up of forest officers of various categories, agricultural officers, sawmillers, timber contractors, farmers and people living within and around the forests. The content of primary data comprised open-and closed-ended questions. The method used by Diaw et al. (2002) was used to administer the structured questionnaire. Thus, 10 per cent sampling intensity were used to randomly select the number of respondents in communities with population less than 500.

Questionnaire Design and Administration

Two sets of structured questionnaires were employed for the study. A total of 800 questionnaires (Tables 3 and 4) were administered in the Eight Headquarters of Forestry Services and Forty eight communities used for the project. The first set of questionnaire was designed to obtain information from the forest officers in charge of the forest reserves. Questions were based on demographic features of the respondents, forest reserves and year they were constituted, original sizes, policy and regulation, condition of forest reserves, involvement of community participation in forest management, economic attributes on availability and condition of forest goods and services, benefit sharing formulas, benefit sharing mechanism, problems in sharing, conflicts in joint forest management, situation of forestry, factors impacting forestry sector, forestry situation in the future, forest investment, achievement in forest regeneration, problems militating against JFM, awareness of community participation in forest management, incentives needed for impacting forest management, attributes expected in the forest management, external interventions, etc.

The second set of questionnaire was also designed to obtain information from other stakeholders like farmers, sawmillers, contractors, traders, drivers, civil servants, students, village chiefs, settlers and migrants. Questions were based on demographic features of respondents, period of stay in the settlement, annual income, benefit derivable from the forest, involvement of community in forest management, forest activity, beneficiaries of forest to community, who should protect forest, equitable share of forest proceeds, unauthorized harvesting, specific roles of community to achieve sustainable forest management, conflicts, problems militating against forestry, awareness of community participation in forest management, etc.

Table 1: Sampling States in Nigeria

S/N	States	Forestry Headquarters	Local Government
1	Cross River	Calabar	Calabar Municipality
2	Delta	Asaba	Oshimili South
3	Edo	Benin-City	Oredo
4	Ekiti	Ado-Ekiti	Ado
5	Ogun	Abeokuta	Abeokuta South
6	Ondo	Akure	Akure
7	Osun	Osogbo	Osogbo
8	Oyo	Ibadan	Ibadan North

Source: Field Survey, 2004/2005

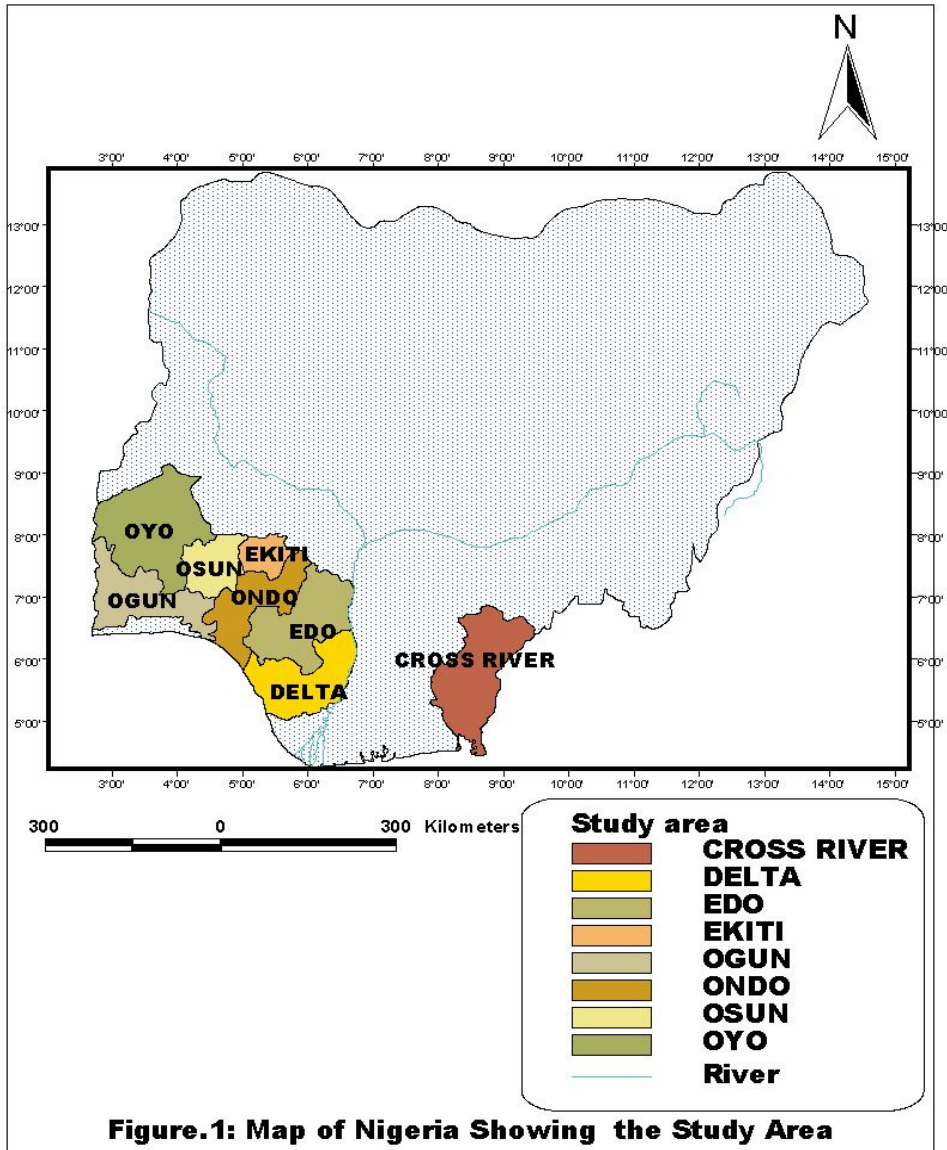


Table 2: Sampling Forest Reserves and Communities in the Eight States

States	Forest Reserves	Communities	Local Government
1. Cross River	1. Agoi Forest Reserve	i. Agoi-Ekpo ii. Akarukpat iii. Agoi-Ibami	Yakurr
	2. Agoi & Ukpom Forest Reserve	i. Akpet I ii. Akpet Central iii. Ahama Oja Ona	Biase
2. Delta	1. Iyiocha Stream Forest Reserve	i. Aiwan Mile 5 ii. Anigeri iii. Ugbolu proper	Oshimili North
	2. Attach 1 & II Forest Reserve	i. Forest Camp (GRA) ii. Ollor iii. Ogwashi-Uku	Aniocha South
3. Edo	1. Ozalla-Ora-Uleha Forest Reserve	i. Uhonmova-Ora ii. Ozalla iii. Atoruru	Owan West
	2. Ehor Forest Reserve 15/1	i. Ugha ii. Obagu iii. Otofune	Uhunmwode
4. Ekiti	1. Ise Forest Reserve	i. Aba Onisu ii. Aba Panu iii. Salaja Camp	Ise Ekiti
	2. Eda II Forest Reserve	i. Ago Igbira Orisa ii. Ago Elekoju iii. Ago Elekeberu	Ilejemeje
5. Ogun	1. Olokemeji Forest Reserve	i. Abule Oniyanrin ii. Ogunsile Camp iii. Alape	Odeda
	2. Ilaro Forest Reserve	i. Igbogun ii. Jaja iii. Ipake	Ifo Yewa Ilaro
6. Ondo	1. Akure Forest Reserve	i. Aponmu ii. Kolawole iii. Obada Oke Owena	Akure Ondo East -Ditto-
	2. Akure Ofosu Forest Reserve	i. Ajagbusi ii. Ala Olufosan iii. Ago Dada	Akure South
7. Osun	1. Ago-Owu Forest Reserve	i. Araromi Owu ii. Mokore I & II iii. Ajegunle	Ayedade
	2. Ikeji-Ipetu Forest Reserve	i. Arewa Majaro ii. Fajuke iii. Alonge	Atakumosa Atakumosa East -Ditto-
8. Oyo	1. Olokoo/Olla Forest Reserve	i. Abemi/Atoba ii. Odanban iii. Ile tuntun	Ogbomoso South Surulere -Ditto-
	2. Oso Forest Reserve	i. Agbetu ii. Gbagba Adejumo iii. Adedapo	Iddo Odeda -Ditto-
TOTAL	16 Forest Reserves	48 Communities	

Table 3: Questionnaires administration and Responses from the Forestry Officials

States	Number of Questionnaires administered to Forestry Officers (N)	Number of Questionnaires responded to by Forestry Officers (n)
Cross River	10	8
Delta	10	9
Edo	10	10
Ekiti	10	9
Ogun	10	8
Ondo	10	10
Osun	10	9
Oyo	10	8
Total	80 (100%)	71 (88.75%)

Source: Field Survey, 2004/2005

N= Total Number of Questionnaires administered

n = Number of Questionnaires Responded to

Table 4: Questionnaires administration and Responses from the Stakeholders in the Forty Eight Communities

States	Number of Questionnaires administered to Stakeholders (N)	Number of Questionnaires responded to by Stakeholders (n)
Cross River	90	82
Delta	90	82
Edo	90	79
Ekiti	90	77
Ogun	90	80
Ondo	90	78
Osun	90	79
Oyo	90	75
Total	720 (100%)	632 (87.78%)

Source: Field Survey, 2004/2005

N= Total Number of Questionnaires administered

n = Number of Questionnaires Responded to

The Binary Models

Binary models are very useful in situations where the dependent or response variable is binary in nature. This implies that they can have only two possible values. The models therefore describe the relationship between one or more continuous independent variable(s) to the binary dependent variable. The two most common binary models are the logit and probit. The logit model is particularly preferred because of the unique information it provides. A distinct information provided by logit is the odds ratio. It is defined as the ratio of the odds of an event occurring in one group to the odds of it occurring in another group (Deeks, 1996; Bland and Altman, 2000). Logit also provides information on the consequences of one variable on the other. Hence it will clearly indicate the variable(s) that mostly support or determine the acceptance of JFM concept. The logit of a response p between 0 and 1 is given as:

$$\text{Logit}(p) = \log(p/1 - p) = \log(p) - \log(1-p)$$

The simplest form of logit model is expressed as:

$$\text{Logit}(\pi) = a + b x_i \dots\dots\dots (1)$$

Where,

x_i = vector of predictor or independent variables

π = probability of a respondent willing to support JFM concept

a and b = regression parameters

In binary choice models, the two possible results are assigned values of 1 or 0. In this study, respondent willing to accept JFM concept is assigned a value of 1 and respondent not willing a value of 0. The parameter estimation for this study was done using the Quasi-Newton method under logistic regression (logit) option of STATITICA version 5 software.

Models to be tested were obtained by fitting all the independent variables together and backward elimination was done to obtain the best subset model. Emphasis was placed on (1) keeping the model as simple as possible and (2) selecting combinations of independent variables which make practical sense.

Results and Discussions

In this study, binary logistic regression analysis was used to investigate the effects of certain factors on willingness to accept JFM concept by the respondents. The factors investigated were; presence of forest benefit (FB), forest contribution to annual income (FCI), community involvement in forest management (CIFM), presence of forest association (PA), existence of equitable share of benefit between government and community (ES), permission into the forest via community consultation (PVC), existence of conflicts between community and holders of permit (C), awareness of community participation initiatives (CPA) and the location of respondent (State). Preliminary investigation involved fitting all these factors together and then backward elimination was done to obtain the best subset model. The resulting models were evaluated using the chi-square goodness-of-fit statistic (Ostle, 1963; Bruhn et al. 1991), the final loss on accuracy computed using maximum likelihood estimation method and odds ratio (e.g. Deeks, 1996; Davies et al. 1998). The models obtained for this study are presented as follows;

$$\text{WTAJFM} = 1.216 - 0.172\text{FB} + 0.975\text{FCI} + 31.872\text{CIFM} + 1.681\text{PA} - 8.2\text{ES} - 5.723\text{PVC} + 1.356\text{C} + 1.367\text{CPA} - 0.433\text{State}$$

..... 2
Final loss = 112.510; Chi square(df, 9) =255.09,

p=0.000

Odds ratio (unit change): Constant (3.374); FB (0.842); FCI (2.650); CIFM(-); PA (5.372); ES (0.0003); PVC (0.003), C(3.881); CPA (3.925); State (0.648).

Note: matrix was ill conditioned and standard errors can not be computed.

$$\text{WTAJFM} = 1.181 - 0.215\text{FB} + 1.026\text{FCI} + 1.760\text{PA} + 19.389\text{ES} + 11.86\text{PVC} + 1.377\text{C} + 1.481\text{CPA} - 0.429\text{State}$$

..... 3

Final loss = 114.065; Chi square(df,8) =251.98, p=0.000

Odds ratio (unit change): Constant (3.257); FB (0.806); FCI (2.791); PA (5.814); ES (263376000); PVC (141488.6), C (3.962); CPA (4.397); State (0.651).

Note: matrix was ill conditioned and standard errors can not be computed.

$$\text{WTAJFM} = 1.43 + 1.971\text{PA} + 1.547\text{C} + 1.788\text{CPA} - 0.451\text{State}$$

..... 4

Final loss = 116.685; Chi square (df,4) =246.75, p=0.000

Standard error: Constant (0.499); PA (0.434); C (0.467); CPA (0.472); State (0.102)

t (df, 627): Constant (2.868); PA (4.545); C (3.309); CPA (3.788); State (-4.248)

p-level: Constant (0.004); PA (0.000); C (0.001); CPA (0.000); State (0.000)

Odds ratio (unit change): Constant (4.18); PA (7.175); C (4.696); CPA (5.98); State (0.637)

$$\text{WTAJFM} = 1.352 + 2.644\text{PA} + 2.106\text{C} - 0.407\text{State}$$

..... 5

Final loss = 124.057; Chi square (df,3) =232.00, p=0.000

Standard error: Constant (0.481); PA (0.416); C (0.452); State (0.096)

t (df, 628): Constant (2.813); PA (6.362); C (4.662); State (-4.249)

p-level: Constant (0.005); PA (0.000); C (0.000); State (0.000)

Odds ratio (unit change): Constant (3.866); PA (14.075); C (8.218); State (0.665)

Where,

WTAJFM = Willingness to accept JFM concept (willing =1; not willing = 0)

FB = Presence of forest benefit (presence of benefit = 1; absence = 0)

FCI = Forest contribution to annual income (contribution = 1; no contribution =0)

CIFM = Community involvement in forest management (involvement = 1,

non involvement = 0)

PA = Presence of forest association (presence =1; absence = 0)

ES = Existence of equitable share of benefit between government and community (presence of equitable share = 1; absence = 0)

PVC = Permission into the forest via community consultation (community consultation = 1; no consultation with community = 0)

C = Occurrence of conflicts between community and holders of permits (occurrence of conflict = 1; non occurrence of conflict = 0)

CPA = Awareness of community participation initiatives (awareness =1 non awareness = 0).

State = Location of respondent (Cross River state = 1; Ogun state = 2; Ondo state = 3; Ekiti state = 4; Edo state = 5; Delta state = 6; Osun state = 7 and Oyo state = 8).

All the four models presented above gave overall significant fit to the data, judging from the chi square values that are significant at α -level of 0.05. However, models 2 and 3 have ill-conditioned matrix, hence standard errors and significance of the estimated coefficients can not be computed. This indicates that there is no sufficient evidence that the estimated coefficients are not zero. The contributions of the coefficient can not be established. The estimated coefficients in models 4 and 5 have p-values less than 0.05, indicating that there is sufficient evidence that the coefficients are not zero using α -level of 0.05. This implies that the regression parameters in the models are statistically significant. Willingness to support JFM concept was significantly influence by presence of association in the community (PA), awareness of community participation initiatives (CPA), occurrence of conflicts between community and holders of permit and State. Generally for models 4 and 5, the odds ratio values for the coefficients were greater than one except for the state.

The higher values of odds ratio suggest that respondents that indicate presence of forest association (PA=1), occurrence of conflicts (C=1), awareness of community participation initiatives (CPA=1) tend to accept the JFM concept. For the state, the negative coefficient of -0.451 and -0.407; and the odds ratio values of 0.637 and 0.665 in models 4 and 5 respectively respondents location tend to influence the acceptance of JFM concept. For respondents in Cross River state, there is a high tendency of acceptance of JFM. One possible reason for this could be as a result of the existence of the JFM structures in the state. The concept is already in practice in the state. As a result of this, the awareness of the JFM initiative is high; the community are already organized in forest related association. Consequently, there are regular occurrences of conflicts between community and holders of permits.

Conclusion

Willingness to accept JFM concept appears to be guaranteed where the local communities are organized in associations and awareness of community participation in forest management is high. The specific models developed depend on the locations where the data were collected, and therefore should not be applied to areas outside the range of the data. However, the modelling approach is of general applicability and can be used to predict the willingness of the local communities to support JFM in other areas.

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