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PARTICIPATIONIN WETLAND CULTIVATION:  
A BINARY LOGISTIC REGRESSION OF WETLAND  
CULTIVATORS AND NONCULTIVATORS

By

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*Contributed Paper presented at the Joint 3<sup>rd</sup> African Association of Agricultural Economists (AAAE) and 48<sup>th</sup> Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.*

# SOCIO-ECONOMIC FACTORS THAT INFLUENCE HOUSEHOLDS' PARTICIPATION IN WETLAND CULTIVATION:

## A BINARY LOGISTIC REGRESSION OF WETLAND CULTIVATORS AND NON- CULTIVATORS

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### **Abstract**

*Increased droughts in southern Africa have noticed some appreciation of the role that partial wetland cultivation can play to address household food security. This has also witnessed some indication of possible relaxation of wetland cultivation restrictive policies in Zimbabwe. However, the general perceptions of society towards wetland cultivation remain unclear and critically important for policy crafting before blanket recommendations are made. Using a Binary Logistic Regression Model seven predictor independent variables were regressed against a binary dependent variable of wetland cultivation status of households with the implicit goal of estimating socio-economic factors capable of influencing households' participation in wetland cultivation. Results revealed that from the seven predictor variables, six variables had a significant influence, while one variable was not significant. The implied message centres on careful articulation of such a policy given the fact that, the dominant age group (young and educated household heads) had a negative attitude towards wetland cultivation, a crucial factor that may risk its rejection if put under a referendum. Intuitively results conjecture a bleak future for partial wetland cultivation as a possible land use because the expected future generation (current young and educated household heads) currently shares a negative attitude towards partial wetland cultivation.*

### **Keywords:**

Wetland Cultivation; Environmental Policy; Logistic Regression

## **Introduction**

Of late, wetlands have been considered critical food security safety nets in many parts of Sub-Saharan Africa (Millennium Ecosystem Assessment (MEA), 2005). This development has witnessed a huge influx of communities into wetlands as a coping strategy especially in rural areas where uplands are predominately defined in regions of low agricultural potential, dominated by poor soils and low unpredictable rainfall (Ellis-Jones and Mudhara, 1995 and Mutambikwa *et al.*, 2000). In an effort to regularise cultivation activities in wetlands Makombe *et al.* (2001), noted that southern African policy makers were rethinking the potential for “wise use” of wetlands in response to evidence of the economic contributions and benign environmental effects of wetlands. From a policy point of view this would entail devolution of wetland cultivation user rights to communities, a challenge that is likely to face policy makers who have in the past, according to Maconachie *et al.* (2008), preferred single wetland use policies at the expense of multiple-use wetland policies.

Critical to the transfer of wetland cultivation user rights is the relative scarcity of wetlands in relation to potential demand, implying an allocation problem. Understanding socio-economic factors that influence households’ participation in wetland cultivation becomes the first necessary step towards appreciating society’s perceptions in as far as wetland cultivation is concerned. This is necessitated by the fact that wetlands are complex and multifunctional ecosystems of nature whose direct and indirect contribution to humanity is not obvious, an observation noted by Campbell and Luckert (2002), implying that society may view wetland cultivation as a public good or a public bad. Of interest is that, Siribuit *et al.* (2008) acknowledge the fact that lack of knowledge on socio-economic dimensions of agro-biodiversity has constrained the knowledgeable management of valuable resources. This paper therefore seeks to explore socio-economic factors that influence households’ participation in wetland cultivation with the aim of exposing current households’ perceptions towards wetland cultivation before proposing a blanket recommendation on wetland cultivation.

## **Objective**

The objective of this paper is to investigate socio-economic factors that influence households’ participation in wetland cultivation.

## **Related Literature**

Diminutive research has been done in as far as exploring socio-economic factors that influence households' participation in wetland cultivation is concerned. However, a lot of studies have been done on factors that influence households' decision to participate in conservation programmes of natural resources. In this paper, such studies were used as proxy literature capable of giving an insight on how household characteristics are capable of influencing behaviour of society on utilization of natural resources. Siribuit *et al.* (2008), based on a study of socio-economic conditions affecting small farmers' management of wetlands in Thailand noted that, education of household head, amount of livestock and income from wetland products had a positive influence to households' participation in wetland resource management activities. Zidana *et al.* (2007) undertook a case study to establish factors influencing cultivation of the Lilongwe and Linthipe river basins in Malawi. Using logit analysis Zidana *et al.* (2007) concluded that household size, main occupation, education, market availability and land holding size were important parameters in influencing farmers to engage in river bank cultivation. Kapanda *et al.* (2005) evaluated factors affecting adoption of fish farming in wetlands in Malawi and noted that, household head gender had a negative influence, while household head age and livestock ownership had a positive influence on adoption rate by respondents. Muchapondwa (2003), based on a study of assessing the potential of local communities to manage wildlife in Zimbabwe noted that, younger and highly educated household heads were more likely to view local wildlife management as a public bad. Need therefore arises to investigate socio-economic factors that influence households' participation in wetland cultivation at country level to give an insight on society's perceptions in as far as wetland cultivation is concerned.

## **Methodology**

The study was conducted in Mashonaland East Province of Zimbabwe. Primary data was collected using a pretested structured questionnaire. Two hundred and eighty nine respondents were randomly selected from the province to which 145 were wetland cultivators and 144 non wetland cultivators. The binary logistic model was used to investigate households' socio-economic factors that influence participation in wetland cultivation among wetland cultivators and non cultivators to which wetland cultivation status of households was taken as the dependent variable. The dependent variable was dichotomized with a value of 1 if a farmer was a wetland cultivator and 0 if otherwise (non wetland cultivator). Seven

predictor independent variables were regressed against the binary dependent variable of wetland cultivation status of households. Households' participation in wetland cultivation was based on an assumed underlying utility function of attaining household food security from wetland cultivation. According to this theory, households were conjectured to participate more in wetland cultivation if the utility obtained from participation exceeds that of non-participation. The binary logistic regression model as specified in equations, 1 to 5, according to Kidane *et al.* (2005), was used to determine factors affecting households' participation in wetland cultivation.

$$\phi_i = E \left( \gamma_i = \frac{1}{\chi_i} \right) = \frac{1}{1 + \ell^{-\left( \beta_i + \sum_{j=1}^{k=n} \beta_{ij} \chi_{ij} \right)}} \dots\dots\dots (1)$$

$\phi_i$  = is the probability of household (i) being a cultivator

$\gamma_i$  = is the observed wetland cultivation status of the household

$i, \chi_{ij}$  = are the factors determining wetland cultivation status for households

$i$  and  $\beta_j$  = stands for parameters to be estimated.

By denoting  $\beta + \sum_{j=1}^{k=n} \beta_{ij}$  as  $Z$  equation (1) can be written to give the probability of wetland cultivation status of household (i) as:

$$\phi_i = E \left( \gamma_i = \frac{1}{\chi_i} \right) = \frac{1}{1 + \ell^{-Z_i}} \dots\dots\dots (2)$$

From equation (2) the probability of a household being a wetland cultivator is given by  $(1 - \phi_i)$  which gives equation (3) as follows;

$$(1 - \phi_i) = \frac{1}{1 + \ell^{Z_i}} \dots\dots\dots (3)$$

According to Kidane *et al.* (2005) the odds ratio would therefore be, [(i.e.,  $\phi_i / (1 - \phi_i)$ )] as given by equation (4);

$$\left( \frac{\phi_i}{1 - \phi_i} \right) = \frac{1 + \ell^{Z_i}}{1 + \ell^{-Z_i}} = \ell^{Z_i} \dots\dots\dots (4)$$

The natural logarithm of equation (4) gives rise to equation (5);

$$\ln \left( \frac{\phi_i}{1 - \phi_i} \right) = \beta + \sum_{j=1}^{k=n} \beta_{ij} + \varepsilon_i \quad \dots\dots\dots (5)$$

### **Description of variables specified in the model**

This section focuses on a description of the variables specified in the logistic regression model. Using conclusions inferred from other studies and empirical findings from the study area, the *a priori* influence of various household characteristics was estimated.

#### **Household size**

Household size was measured by the number of family members in the household. Household size would be expected to determine the labour force available to cultivate in the dry-lands and wetlands. Zidana *et al.* (2007) revealed that a positive relation between wetland cultivation and household size was possibly caused by lack of access to land leading households with large family sizes to invade wetlands in search of land for cultivation. Based on these findings, a positive correlation was expected. However, in the event that pressure of household size to wetland produce is likely to be higher than the labour benefits likely to be enjoyed by large household sizes, a negative correlation was also possible. Based on the abovementioned possibilities, either a negative or a positive correlation between household size and wetland cultivation was expected as shown in Table 1.

#### **Household head gender**

Men and women engage in different activities at household level as defined by the African historical cultural domain. Household head gender was conjectured to influence type of activities likely to be engaged by female or male headed families in as far as wetland cultivation was concerned. Earlier studies showed that wetland cultivation was apparently a gendered activity in some areas. Chinsinga (2007) noted that wherever wetland cultivation competes for time and attention with seemingly lucrative alternatives, it becomes predominantly a feminine activity. Households headed by females were therefore expected to participate in wetland cultivation more than male headed households, for males would rather

focus on field crops (Chinsinga, 2007), implying a negative correlation as shown in Table 1 denoted as follows; (1 if male: 0 if female) to represent this predictor variable.

### **Household head education**

Wetlands are complex ecosystems whose direct and indirect contribution to humanity is not obvious (Campell and Luckert, 2002). Education in that respect helps people to appreciate more values of wetlands. In essence, as noted by Muchapondwa (2003), education would make it easier for households to comprehend negative externalities and passive user values of natural resources. Ideally, decisions pertaining to wetland utilisation are expected to be influenced by education level of households. Intuitively, a positive correlation was expected for this variable measured by the level of education attendance of the household head as shown in Table 1. The legal conflict behind wetland cultivation presents another scenario where the risk averseness common to educated people would influence educated household heads to distance themselves from wetland cultivation. Similar effects were also earlier on observed by Zidana *et al.* (2007) reporting a negative relationship between river bank cultivation and education as mainly caused by less access to non farm incomes by uneducated households, hence resorting to river bank cultivation. To that effect, either a positive or a negative effect was expected.

### **Household head age**

Wetlands are state-lands in Zimbabwe, their legal ownership remains on Rural District Councils in which such pieces of land are geographically located. Village heads are empowered to monitor management of wetlands through the Zimbabwean Traditional Leaders' Act and the Zimbabwean Communal Lands and Forestry Produce Act. To that end rural communities collectively use wetlands as a public common pool good. Those with fields stretching into wetlands have managed to claim ownership of wetlands in proximity to their fields although not legally supported. Such temporal ownership has grown to levels where at local level communities have agreed to allocate wetlands in relation to household field position. Age as measured by the actual number of years of the household head plays a vital role in terms of land ownership cum wetland utilization in rural areas, where older household heads are expected to have better access to land than younger heads because younger men either have to wait for a land distribution or have to share land with their families. A positive



correlation was therefore expected between age and wetland cultivation similar to conclusions inferred by Kapanda *et al.* (2005).

### **Number of livestock units<sup>1</sup>**

Livestock units as measured by the total number of livestock units per household was conjectured to have an influence in as far as participation in wetland cultivation by households was concerned. More attention was given to large ruminants (cattle, sheep, goats and donkeys) that utilize wetlands as grazing areas. A mixed expectation was conjured where, on the one hand, conversion of wetland into crop lands would reduce grazing area for households with large livestock units, hence this would influence the way such household would consider wetland cultivation. On the other hand, livestock specifically cattle and donkeys are sources of draught power in rural areas crucial for land preparation, a crucial element in land preparation under wetland cultivation and synergies that exists between the two variables (use of livestock manure in crops, vegetable gardens and fish ponds) as observed by Kapanda *et al.* (2005).

### **Distance to wetland area**

Wetland cultivation was also expected to be influenced by the distance between households' fields in relation to wetland location as measured by the actual kilometres between the two variables. Based on that, the more distant the fields are from the wetlands, the drier are uplands implying the moisture content of the soil is only limited to summer seasons when there are natural rains (Peters, 2004). It therefore follows that upland farmers are more likely to face high chances of crop failure than their counterparts with fields stretching into wetlands. As a coping strategy up-land farmers are more likely to venture into wetland cultivation to complement upland yields. Contrary to this scenario households with fields far from wetlands would find it more difficult to access wetlands due to pressure from households with fields near wetlands in relation to scarcity of wetlands in rural areas. Naturally, either a positive or a negative correlation was expected.

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<sup>1</sup> 1 Livestock Unit = 500kg live mass

## **Availability and enforcement of wetland cultivation restrictive measures**

Laws supported by statutory instruments, provides the legal basis for controlling activities, through setting the *modus of operandi*, standards and penalty levels. In Zimbabwe, the Environmental Management Act provides the legal basis for management of wetlands. At local level chiefs, head-man and village heads use different wetland restrictive strategies to control wetland cultivation. By default, all wetland areas in Zimbabwe are restricted in as far as cultivation is concerned based on the national legal framework. What differs therefore is enforcement depending on areas. With that background, categorization of areas based on low, medium and high enforcement levels was used as a standard measure to assess the influence of availability and enforcement of wetland restrictive measures to participation in wetland cultivation with the implicit goal of evaluating the effectiveness of available policies. Under normal circumstances availability and enforcement of laws that restrict wetland cultivation within an area or within a country is expected to be associated with a decline in engagement of such activities (wetland cultivation) as citizens respond to set rules. Regardless of availability and enforcement of these measures, Mutambikwa *et al.* (2000) noted that widespread wetland cultivation was an indication of a conflict between society and policy makers. To that end, either a positive or a negative effect was expected. Table 1, summarises variables specified in the binary logistic model with wetland cultivation as the dependent variable and their expected signs.

**Table 1: Description of variables specified in the model**

<i>Acronym</i>	<i>Description</i>	<i>Type of Measure</i>	<i>Expected Sign</i>
<b>Dependant Variable</b>			
<b>PART</b>	<b>Whether a household participates in wetland cultivation</b>	<b>Dichotomous Response (1 if yes: 0 if no)</b>	
<b>Explanatory Variables</b>		<b>Dummy (1 if yes: 0 if no)</b>	
1)HHSZE	Household Size	Number of family members in a household	- / +
2)HHHSX	Household Head Sex	1 = male; 2 = female	-
3)HHHED	Household Head Education	1 = educated; 2 not educated	- / +
4)HHHAG	Household Head Age	Actual number of years	+
5)AMTLU	Amount of Livestock Units	Number of livestock units per household	- / +
6)DISTWA	Distance to Wetland Area	Kilometres from end of fields to wetland banks	- / +
7)AEWCRM*	Availability and Enforcement of Restrictive Measures	Dummy (1 if yes: 0 if no)	+

\*(AEWCRM) = Availability and Enforcement of Wetland Cultivation Restrictive Measures

## Results and Discussion

With regards to model fit, the Lemeshow Goodness-of-Fit test statistic was 1.000, implying that the model's estimates fit the data at an acceptable level. Since  $R^2$  can not be exactly computed for Logistic Regression (Norusis, 2004), a pseudo  $R^2$  was therefore computed. *Nagelkerke*  $R^2$  was computed in this study as a proxy estimate to  $R^2$  in OLS regression which according to Norusis (2004), measures proportion of the variation in the response that is explained by the model. In this study, *Nagelkerke*  $R^2$  of 0.98 was obtained indicating that more of the variation was explained by the model with an overall prediction percentage of 98.3 as shown in Table 2.

From the seven predictor variables fitted in the logistic regression model, six variables had a significant (household head age, household head education, distance to wetland area, amount of livestock units, household size and availability and enforcement of wetland cultivation restrictive measures) impact on influencing households' participation in wetland cultivation, while one variable (household head sex) was not significant, implying that gender had no impact on influencing household's participation in wetland cultivation as earlier on noted by Zidana *et al.* (2007) although not supported by Kapanda *et al.* (2005) who confirmed a significant influence by gender.

Of the six significant predictor variables three had positive signs (household head age, distance to wetland area and availability and enforcement of wetland cultivation restrictive measures) implying an increase in either of these variables would be associated with an increase in households' participation level in wetland cultivation and the other three (household head education, amount of livestock units and household size) had negative signs meaning an increase in either of these variables would be associated with a decrease in participation level as shown in Table 2.

The positive significant coefficient of household head age indicates its positive influence on participation in wetland cultivation which was as expected. Per every unit increase in household head age, a 0.211 increase in the log odds of participation in wetland cultivation by households holding all other independent variables constant was confirmed as shown in Table 2. Similar findings were obtained by Kapanda *et al.* (2005) who noted a significant positive relationship between age of household and the probability of adoption of fish

farming in wetlands. The most likely explanation of the confirmed association is based on the fact that, in rural areas older household heads are expected to have better access to land/wetland than younger household heads because younger men either have to wait for a land distribution or have to share land with their families. A significant *p-value* (0.010) in the model confirms this relationship. On most occasions younger households were either reported to have moved to urban areas in search for work given that they comprised the economically active age group, or had migrated to resettlement areas in response to the Land Reform Program since 1980.

The coefficient of household head education was significant but negatively related implying that the more educated the household head would be, the less likely that household would participate in wetland cultivation. Per every unit increase in household head's education, a 3.556 decrease in the log odds of participation in wetland cultivation by households holding all other independent variables constant was confirmed as shown in Table 2. Zidana *et al.* (2007) noted a similar negative relationship between river bank cultivation and education level of households as mainly attributed by the fact that less educated households had less access to non farming incomes hence resorted to river bank cultivation. Educated households enjoy multiple better options to trade their labour as compared to their uneducated counterparts. In essence it would be logical to find uneducated household heads engaging in wetland cultivation for they are limited in terms of their labour trade options. Educated households were on most occasions reported to be working in urban areas.

On another dimension wetland cultivation is an illegal operation according to the Zimbabwean Environmental Management Act of 2002; elements of risk aversion could also explain a *p-value* of (0.037) with a negative coefficient. Educated households logically would be expected to be more risk averse and sceptical to engage in illegal activities compared to uneducated households. Muchapondwa (2003) observed a similar behaviour as manifested by educated household heads on conservation of wildlife at local level attributing such behaviour to access of information and ability of educated households to comprehend more seriously negative and positive externalities associated with such schemes.

**Table 2: Estimated parameters of factors that influence households` participation in wetland cultivation**

Predictor Variables:		$\beta$ :	S.E:	Wald Statistics:	Significance:
Constant	$\beta_0$	-16.361	7.558	4.685	.030
a) Household Head Age	$\beta_1$	.211	.082	6.556	.010*
b) Household Head Education	$\beta_2$	-3.556	1.701	4.369	.037*
c) Distance to Wetland Area	$\beta_3$	7.940	3.144	6.377	.012*
d) Amount of Livestock Units	$\beta_4$	-1.084	.415	6.832	.009**
e) Household Size	$\beta_5$	-1.617	.681	5.634	.018*
f) Household Head Sex	$\beta_6$	-4.378	2.356	3.453	0.63
g) Availability & Enforcement of Restrictive Measures	$\beta_7$	4.577	2.178	4.416	.036*
1)	Chi-Square (df = 7)=		382.371		
2)	(- 2) Log Likelihood =		18.264		
3)	Accuracy of prediction; Overall (%) =		98.3		
4)	Nagelkerke R <sup>2</sup> =		0.98		
<b>Note:</b> ** and * indicate significance at 0.01 and 0.05 probability level respectively					

The more distant wetlands are located in respect to fields of households, the more households would want to participate in wetland cultivation because the probability of getting a meaningful yield from uplands decreases with distance from wetlands, *ceteris paribus*. Results therefore indicate that per every unit increase in distance of wetland area from the fields, a 7.940 increase in the log odds of participation in wetland cultivation by households was expected holding all other independent variables constant. The observed positive effect of distance to wetland area on the probability that a household would view wetland cultivation as vital and essential is therefore reasonable. Households with fields near wetlands enjoy spill-over moisture (Peters, 2004) and nutrient effects of wetlands making them realise at least a harvest even under drought conditions. Wetland cultivation to such a category of households would be a secondary issue especially given the illegality associated with wetland cultivation. On the contrary, their distance counterparts face sandy soils and dry conditions in their fields making it difficult for them to realise meaningful yields to support their families. Coping strategies (wetland cultivation) associated with risk taking (illegal wetland cultivation) characterise this group; hence a significant *p-value* of (0.012) with a positive coefficient was obtained as shown in Table 2.

Households with higher numbers of livestock units would be expected to be sceptical of wetland cultivation for they weigh grazing benefits to their livestock versus benefits they might get from illegal wetland cultivation. In this paper, a negative effect of the number of livestock units in relation to wetland cultivation was realised where per every unit increase in livestock units, a 1.804 decrease in the log odds of participation in wetland cultivation by households, holding all other independent variables constant was confirmed as shown in Table 2. Wetland remains the only all year round green areas crucial for livestock survival in rural areas. With persistent droughts ravaging southern Africa dry-land crop production in semi arid areas has been substituted by cattle ranching given that farmers can get milk, meat and cash out of livestock sales. Comparing livestock production and crop production, more effort, risk and inputs are associated with crop production especially under rural setting in arid areas than livestock production. With that background it would therefore be logical to expect households with higher livestock units to distance themselves from wetland cultivation as confirmed by a significant *p-value* of (0.009) with a negative coefficient. Contrary to this conclusion, Kapanda *et al.* (2005) noted a positive relationship between number of livestock and adoption of fish farming in wetlands as explained by synergies that

exist between the two variables (use of livestock manure in crops, vegetable gardens and fish ponds).

Household size was significant but negatively related to participation in wetland cultivation. Per every unit increase in household size, a 1.167 decrease in the log odds of participation in wetland cultivation by households, holding all other independent variables constant, was confirmed as shown in Table 2. Ideally, scarcity of wetlands and their tricky ownership entails “one household - one piece of wetland area”, principle making it difficult to take advantage of the normally expected multiple-ownership generic to public goods by large household sizes. Pressure on outputs from wetlands by higher household sized families may far outweigh the labour benefits of large family members making smaller household sized families comparatively better and more willing to participate in wetland cultivation. It would be logical therefore to expect larger household sizes to trade their labour elsewhere, for much of the required labour under wetland cultivation is normally during establishment of the area and once established labour will only be required for watering. Conflicting conclusions were inferred by Zidana *et al.* (2007) who noted a positive relationship implicating this to lack of access to land by large households as a possible reason for the positive correlation. Large families would therefore be expected to invade wetlands in search of land for cultivation.

A significant and positive effect of availability and enforcement of wetland cultivation restrictive measures signals a communication message from society to policy makers. Mutambikwa *et al.* (2000) confirms this relationship where they report a wide invasion of wetlands amid restrictive policies. Per every unit increase in availability and enforcement of restrictive measures a 4.577 increase in the log odds of participation in wetland cultivation by households, holding all other independent variables constant, was confirmed. The message from society points to errors of commission and omission that could have dominated crafting of available restrictive policies. In other words, society is pointing a finger at the potential of wetlands to address their immediate needs hoping to get an accommodative response from policy makers. It would be shocking to note such a sinister observation where a country introduces a new environmental policy and establishes an agency to enforce statutes to restrict wetland cultivation then in practice wetland cultivation increases, as confirmed by Bullock, (1995), Ellis-Jones and Mudhara (1995), Mutambikwa *et al.* (2000) and Muzenda (2001) who acknowledge that contrary to policy objectives rural communities have been cultivating wetlands to an increasing degree. A significant *p-value* of (0.036) with a positive



coefficient confirms this relationship implying the strength and direction of the signal of the message from society.

Messages from results presented in this section are four pronged: Firstly, there is a strong signal from society to reconsider the way in which wetland cultivation is treated in Zimbabwe. Current status quo characterised by rampant invasion of wetlands have serious environmental implications in future. No meaningful adherence is given to limits in as far as wetland cultivation with respect to wetland ecology is concerned. Worse still, appropriate wetland cultivation methods are rarely practiced for they are either missing from a research perspective or they are not user friendly from a farmer`s point of view.

Secondly, where devolution of wetland cultivation user rights is to be considered as a possible option, targeting of specific groups within a society will not be an easy task because mixed perceptions dominate the current society making it difficult to rely on specific community groups that would rally behind such a policy. This would have been created by a cocktail of policies that have been introduced, repealed and amended from time to time. Putting such a policy on a referendum where the vote of the majority rules, may risk its rejection since the dominant age groups within societies enjoy secondary<sup>2</sup> benefits of wetland cultivation.

Thirdly, characteristics of households with negative attitude towards wetland cultivation such as the young and highly educated cast a bleak future for wetland cultivation as a possible land use option. Ideally, this group is expected to take over current wetland cultivation initiatives in the future. Entrusting this group before eliminating the current perception they hold would compromise the potential of the policy. Targeting this group with informational campaigns remains the only pathway to address the current perception enshrined in the youth and highly educated household heads, because it is easy to convince educated people of the potential benefits attached to wetland cultivation.

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<sup>2</sup> Due to scarcity of wetlands not all rural communities have direct access to their cultivation. Those with direct access to their use are just the minority uneducated older age group. In the wake of introduction of a policy that would regularise their cultivation, the majority, young and educated who does not have direct access may use their voting power to prevent ratification of such a policy.

Fourthly, scarcity of wetlands in relation to available and yet to be available demand from societies as population increases further warrants careful articulation of practical people driven devolution of user rights to society. Conflict and scramble for wetlands is likely to characterise the whole process. Grouping societies into community wetland cultivation groups pursuing schemes may be the panacea rather than individual ownership of wetland plots as is the current position in rural areas. This approach unites societies and makes it easy for extension service facilities. Conferring user rights under this set up is also easy and manageable. From a credit facility point of view, groups are easy to deal with and track for loan repayment.

Conflict of grazing and wetland cultivation as manifested by a negatively significant relationship between amount of livestock units and participation in wetland cultivation emanates from rapid conversion of forests into crop land. Also increasing population and failure to maintain specific livestock numbers accommodated within the carrying capacities of specific communities may be a contributing factor. Mountains and forests have been converted into crop lands which used to be the traditional grazing areas. No meaningful yields are realized from such land classes depriving livestock their sources of grazing. To counter that, wetlands have been targeted as main grazing areas competing with wetland cultivation. Reserving mountains, forests and river banks for livestock may be a sustainable pathway towards unlocking the created competition of land use in wetlands.

### **Conclusions and policy recommendations**

The paper concludes that household size, amount of livestock units and household head education were significant factors capable of negatively influencing participation of households in wetland cultivation. Household age, distance to wetland area and availability and enforcement of wetland cultivation restrictive measures were also significant factors capable of positively influencing participation of households in wetland cultivation. Household head gender was found to be insignificant in as far as its influence on wetland cultivation participation by households was concerned.

Scarcity of wetlands in relation to potential demand from societies therefore warrants careful articulation of devolution of partial wetland cultivation user rights to societies. Schemes that accommodate more people instead of individual ownership are recommended to instil group

ownership hence involving the masses of rural people as partners, to marry conservation with development as well as employing positive rewards in place of bureaucratic regulations as the main instrument of wetland conservation. Targeted educational campaigns are very crucial especially to the young and educated age groups who seem to have a negative attitude towards wetland cultivation. As future custodian owners of tomorrow's natural resources a massive educational campaign to this group is critical to eliminate the current attitude if ever future sustainability of partial wetland cultivation is to be achieved.

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