# Adherence to Land use Zones in Implementation of Participatory Village Land use Planning Policy in Ulanga District in Tanzania

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### Authors' contributions

*This work was carried out in collaboration between both authors. Authors MNN and EFN conceptualised the study. MNN did the field work, data analysis and writing of drafts under the guidance of author EFN. Author EFN reviewed and edited the drafts. Both authors read and approved the final manuscript.*

### Article Information

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## ABSTRACT

Proper implementation of land use planning may contribute to solving land use problems, including land use conflicts. Adherence to land plans depends on many factors which vary according to circumstances of a study area. The present study aims to contribute to knowledge needed to enhance adherence to zones in land use planning. Specifically, the study had two objectives, namely: (1) to examine extent of adherence to village land use plans and, (2) to assess factors that influence adherence to the village land use plans. Data were collected through household survey of 120 respondents from two villages, key informants, focus group discussions, field observation, review of guidelines for land use planning, village land use plans (VLUPs), district land use framework, books and journal articles. GPS points to examine adherence to VLUPs were analyzed using Kappa statistic. Factors influencing adherence to VLUPs were analysed using binary logistical regression and pair-wise ranking. There was moderate adherence with kappa coefficient of 0.47 and

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0.49 for Iragua and Kichangani villages. Larger families with higher incomes were more likely not to adhere to land use plans. Immigrants were also more likely not to adhere to plans than residents. Corruption of village leaders, lack of follow up by village leaders on implementation, lack of awareness on land use plans and underestimated population growth were the key prioritised factors that resulted in non-adherence of land use plans. The study recommends a review of the zoning standards to enhance sufficiency of allocated zones; privatization of grazing land; establishment of communal grazing management plans; and involvement of communities in developing complete plans. The study also recommends close monitoring; reviewing of VLUPs; enforcement of good governance; establishing incentive schemes; offering continuous education and developing participatory implementation framework.

## 1. INTRODUCTION

The government of Tanzania instituted participatory village land use planning policy through the Village Land Act No. 5 of 1999 and Land Use Planning Act No. 6 of 2007 [1]. A village land use plan is an outcome of a participatory and systematic assessment of physical, ecological and socioeconomic condition that reflect on current and future needs of the community [1,2]. Village Land Use Plans (VLUPs) were adopted across sectors with the expectation that they would help in solving land use problems including land use conflicts [3–5]. The expectations were to facilitate allocation of land according to land use needs, overcoming land use conflicts, and creating a basis for issuing long-term leases to villagers among others [3]. However, in Ulanga District the VLUPs were not adhered to and thus land use conflicts persisted [6].

Adherence to any plan is a measure of the degree to which outcomes or impacts conform to planned objectives [5,7–9]. These outcomes are as a result of physical spatial alterations of planned use attributed by anthropogenic and natural factors over time [10]. Examination of adherence to land use plans can be done at different levels from national, district through village, using different tools depending on intended objectives.

Most studies done to physically examine adherence to land use plans have been based on cities and urban areas while limited studies have been done at village level and rural areas [4,5,7,9,11]. Adherence to VLUPs may be influenced by factors operating on more than one spatial and temporal level [10]. These factors may be internal, external, political, institutional, demographic, social-economic or ecological in nature [10,12,13]. Existing and changing circumstances such as population growth, climate change and variability, poverty, creation of new social and political alignments may be accompanied by changes in land use practices [9,14]. The present study aimed to contribute to knowledge needed to enhance adherence to zones in land use planning. Specifically, the study had two objectives, namely: (1) to examine the extent of adherence to village land use plans and, (2) to assess factors that influence adherence to the village land use plans.

## 2. METHODOLOGY

### 2.1 Description of Study Area

Ulanga District is located to the South West of Morogoro Municipality (35.4°- 38.0°E; 8.0°-10.0°S). It is the largest district in Morogoro region, with total area of 10,688.89 km², It comprised 21 wards' and 59 villages [15,16]. About 75% of the total area was covered by Selous Game Reserve, Kilombero Game Controlled Area, Wildlife Management Area and forest reserves [15,16].

Ulanga District was selected for this study because there were VLUPs but still there were reports of land use conflicts, which suggests among other issues both inappropriateness of the VLUPs and poor implementation strategies [6]. A total of 42 villages had land use plans by 2016 [16].

### 2.2 Methods

This study employed cross-sectional design whereby data collection was undertaken once. The study contains information which was collected between January and June 2016. Ulanga District was purposively selected due to persistent incidence of land-based conflicts despite initiation of VLUPs. Two villages were
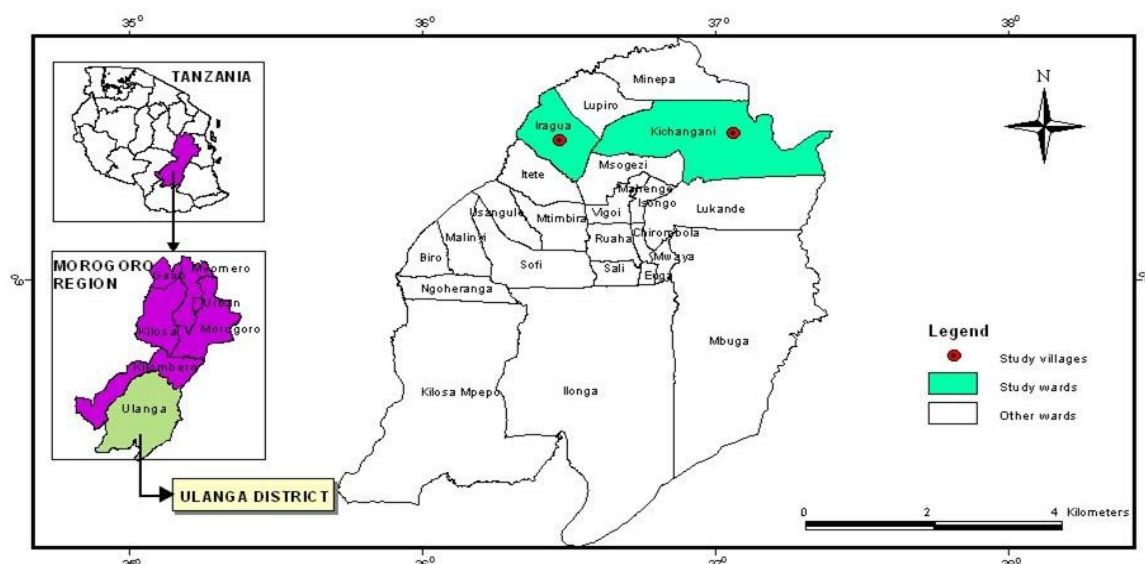
**Fig. 1. Map of Ulanga District showing study villages**

purposively selected from a list of villages with operational VLUP that was obtained from the district land office. The selection of these villages was also based on the major socioeconomic production system (farming and pastoralism) and VLUPs implemented for over three years of time when the community will have adjusted to the changes in planned land use. Other criteria for selection included a village adjacent to a communally managed wildlife conservation area while another not adjacent and accessibility of the villages by the research team.

At the village level, independent groups of female and male farmers as well as female and male pastoralists were drawn randomly from the updated village registers. Each group comprised at least eight individuals since this is a manageable size of group recommended for FGD [17]. Other groups for FGDs included Village Land Use Management Committee (VLUMC) while Participatory Land Use Management team (PLUM) were involved at district level. Key informants were purposively selected from the district and village levels. At village level, the key informants comprised Ward Executive Officer, Village Councillor, Village Executive Officer, Village Chairman and Extension Officer.

At least 120 households (60 from each village) as recommended constituted a representative sample for the study [18]. Farmers, pastoralists, male and female headed households were randomly obtained from updated household register of each village with facilitation from the Village Executive Officer.

VLUP maps were scanned and georeferenced to zone 37 south UTM coordinate reference system in order to be able to create coordinates using GIS. The VLUP maps were produced by ground surveying and mapping during land use planning. A spacing of 500 m by 500 m grid with consideration of the size of the land use zones and heterogeneity from the VLUP was established [19]. The x and y coordinates were generated forming grids in which the sampling points were established at the intersection of each coordinate. The sample size for the survey was determined using the formula with finite population correction factor (Eq. 1) since it allows adjustment of the sample size accordingly [20].

$$n = \frac{4N\,(CV)2}{E^2N + 4(CV)2} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where:

n=Sample size
N= Population size
CV=Coefficient of variation
E= allowable error

A total of 114 points were sampled for Kichangani village while 95 points were sampled for Iragua village. Weighted stratified sampling technique was used to determine the number of points from each zone (stratum). In order to avoid bias during selection, simple random

sampling was used to select points from each stratum, thereby giving an equal chance of each point to be selected. Formula for weighted stratification (Eq. 2) is as specified by Kothari (2004).

$$ni = n\frac{Ni}{N}$$…………………………………………(2)

Where:

n= sample size
ni = number of sampling unit allocated to stratum i
Ni= sampling frame for stratum i
N= Total area

The study considered comparing the zoned land uses and the actual utilization of land through field observation survey method modified from that previously used [21,22]. The sampled points (Figs. 2 and 3) were tracked by using a Global Positioning System (GPS) receiver assisted by a local guide, VLUP map and topographical map. The observed incidences of adherence were recorded in a data collection form. The collected data were analyzed using Kappa statistics technique in GIS software. Adherence in each land use zone was organized into a table, then converted into text file and then converted to

shape file using GIS. Using GIS software, the points were spatially presented by overlaying on the respective VLUP map and then subjected to Kappa statistics. The Kappa statistics output included Kappa coefficient and percentage of adherence of each zone as was determined. The Kappa coefficient (K) measures pair wise agreement (observed v/s actual land use) among a set of coders making category judgment [23–27].

The interpretation of Kappa coefficient is presented in Table 1 [28]. The Formula for Kappa coefficient is as presented below (Eq. 3):

$$K= \frac{P(A)-P(E)}{1-P(E)}$$ ……………………………… (3)

Where:

K=Kappa coefficient
P (A) = presents observed agreement of planned versus actual land use
P (E) =is the proportion that may be expected to arise by chance.
The result for Kappa analysis is then interpreted with reference to Table 1.
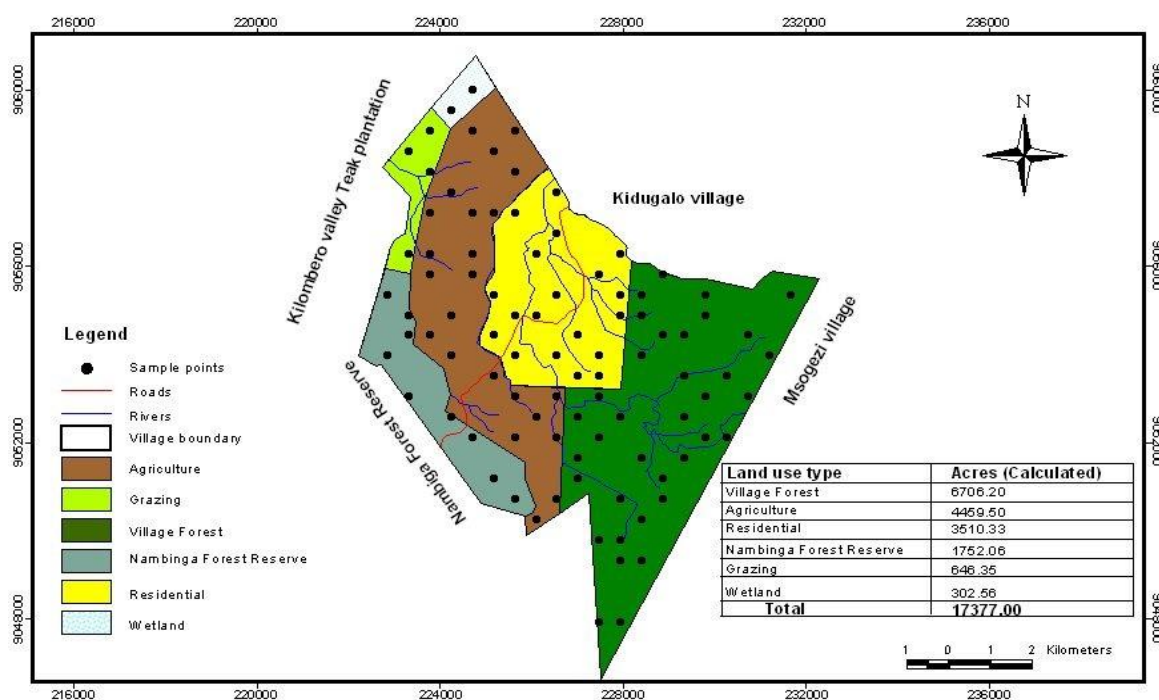


**Fig. 2. Iragua Village land use map 2008-2018 with sampled points. Maps were produced using ground-based surveying and mapping and used UTM zone 37 south coordinate reference system**

**Table 1. Interpretation of Kappa coefficient**

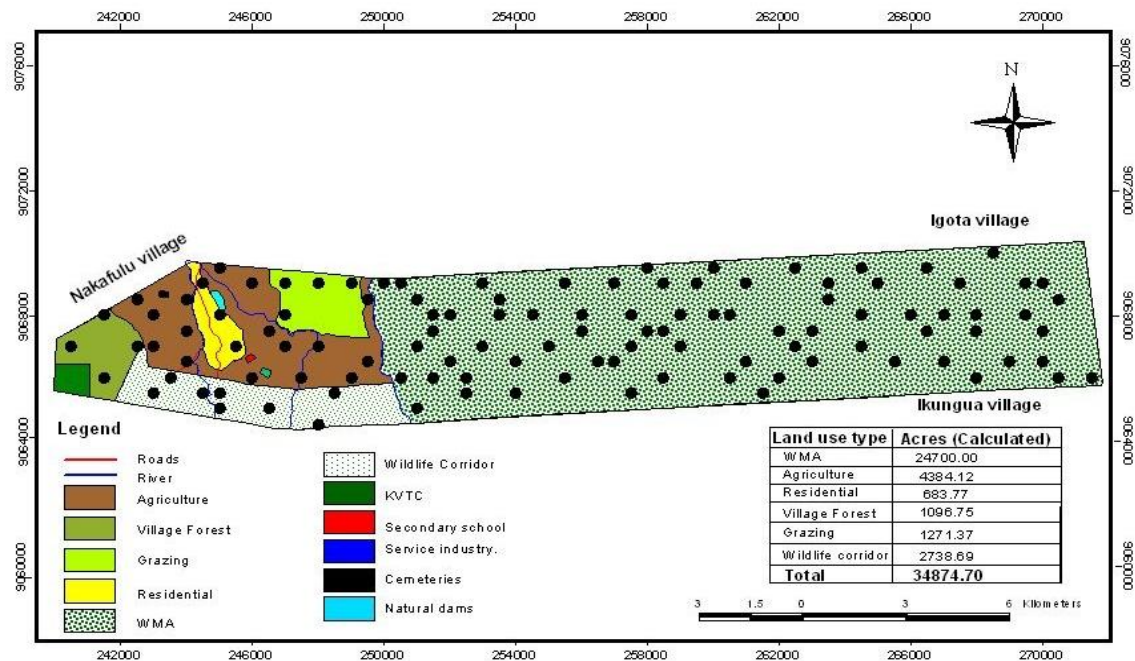| Kappa | Agreement |
|---|---|
| <0 | Less than chance agreement |
| 0.01-0.20 | Slight agreement |
| 0.21-0.40 | Fair agreement |
| 0.41-0.60 | Moderate agreement |
| 0.61-0.80 | Substantial agreement |
| 0.81-0.99 | Almost perfect agreement |

*Source: [28]*



**Fig. 3. Kichangani Village land use map 2011-2021 with sampled points. Maps were produced using ground-based surveying and mapping and used UTM zone 37 south coordinate reference system**

The FGD was conducted prior to household survey in order to get the most influential factors influencing adherence to VLUP. In the FGD, the participants listed and ranked the factors influencing adherence to VLUPs. These factors were leadership, zonation, corruption, population, awareness of land use plans, enforcement of by-laws, sufficiency of zones, overstocking, transparency, inadequate penalty, lack of land security and invasion of land. A dummy table comprising of boxes whereby each box represents intersect (or pairing) of two factors out of the listed factors. For each pair there was group consensus oriented discussions to determine which of the two factors won against the other and suggested reason for the choice.

The factors were written in the appropriate box until the matrix was filled. The collected data through FGDs was analysed by ranking the factors using pair wise ranking in order of priority from the most influential to the least influential factor based on the score in the matrix. Potential solutions were sought through discussions.

The household questionnaire was administered to the household respondents to determine factors influencing adherence to VLUP at the household level. Logistic regression (Eq. 4) was used to analyse which factors influence adherence to VLUP at household level (Table 2).

The model was specified as;

$$Logit(Y) = Ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \ldots\ldots\ldots\ldots + .\beta_n X_n + \varepsilon \tag{4}$$

Where:

$\dfrac{p}{1-p} =$ The odds ratio is in favour of adherence to the VLUPs. That is the ratio of the probability that

the respondents will adhere to the VLUPs to probability that respondents will not.
Y= Adherence (1=yes, 0=No) as applied to each land use zone

$\beta_0 =$ Intercept (constant) of the equation,

$\beta_1 - \beta_n =$ Coefficient parameter of logistic equation,

$X_1$-$X_7$= set of independent variables,

$\varepsilon =$ Error term

### Table 2. Variables used in the logistic regression equation

| Variable | Description |
|---|---|
| Y | Adherence (0 = Not adhered, 1 = Adhered) |
| $X_1$ | Age (years) |
| $X_2$ | Education level (0=no formal education, 1=formal education) |
| $X_3$ | Household size |
| $X_4$ | Economic activity |
| $X_5$ | Farm size (acres) |
| $X_6$ | Income (TZS.) |
| $X_7$ | Residential status (1=Native, 0=Immigrant) |
| $X_8$ | Duration of stay (1=Whole lifetime, 0=Not whole lifetime) |
| $X_9$ | Land ownership (1=Inherited, 0=Other means of ownership) |

## 3. RESULTS

### 3.1 Extent of Adherence to Village Land Use Zones

The results show adherence along the shaded area and the non-adherence in the unshaded area (Tables 3 and 4). Total values in columns are the sampled points according to planned land use zones while total values in rows are the observed sampled points. The results further depict that the least adhered to land use zone is the livestock keeping with 25% adherence for both villages while the most adhered to land use zone is wildlife management area with 74.5% for Kichangani and participatory forest for Iragua village with 66.7% adherence. The Kappa results in Table 5 shows non-adherence incidence for Iragua and Kichangani villages are 0.59 and 0.69 respectively. Kappa coefficient for Iragua and Kichangani were 0.47 and 0.49 respectively indicating moderate agreement. This agreement in each village was statistically significant (p<0.001). The interpretation is that the observed adherence is not by chance, but rather there is non-adherence incidence of the land use plan.

### 3.2 Factors Influencing Adherence to Land Use Plan for Different Zones

#### 3.2.1 Socio-economic factors influencing adherence to VLUPs at household level

Socio-economic factors which influenced adherence to VLUP at household level were age, residential status, means of land acquisition number of dependants and income (Table 6). Respondents with age ranging between 22 to 47 years had the highest non-adherence rate to VLUP (Table 7). Most of the immigrants (41.7%) did not adhere to allocated land use zones (Table 7). The findings further revealed that majority of the respondents who had acquired land from inheritance (25%) adhered to VLUPs and most of the respondents (25%) who cleared their own land least adhered to allocated VLUP (Table 7). Households with 5 to 8 members least adhered to VLUP while Majority of the respondents with income ranging from TZS 2,000,000 to TZS 4,000,000 had the highest percentage (19.1%) of non-adherence compared to adherence rate (5.9%) to VLUP (Table 7).

**Table 3. Observed sampled points for Kichangani village land use zones**

| | | Observed land use | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Planned Land use | Zone | Wildlife management | Residential | Wildlife corridor | Forest | Agriculture | Grazing | Total |
| | Wildlifemanagement | 59.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | **59.00** |
| | Residential | 3.00 | 2.00 | 0.00 | 0.00 | 3.00 | 1.00 | **9.00** |
| | Wildlife corridor | 0.00 | 0.00 | 4.00 | 0.00 | 0.00 | 0.00 | **4.00** |
| | Forest | 0.00 | 0.00 | 0.00 | 2.00 | 0.00 | 0.00 | **2.00** |
| | Agriculture | 10.00 | 1.00 | 3.00 | 1.00 | 11.00 | 2.00 | **28.00** |
| | Grazing | 7.00 | 0.00 | 1.00 | 1.00 | 2.00 | 1.00 | **12.00** |
| | **Total** | **79.00** | **3.00** | **8.00** | **4.00** | **16.00** | **4.00** | **114.00** |
| | **Percentage Adherence** | **74.70** | **66.70** | **50.00** | **50.00** | **68.70** | **25.00** | |

**Table 4. Observed sampled points for Iragua Village land use zones**

| | | Observed land use | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Planned Land use | Zone | Grazing | Nambinga Forest | Residential | Participatory Forest | Wetland | Agriculture | Total |
| | Grazing | 1.00 | 3.00 | 2.00 | 9.00 | 0.00 | 3.00 | **18.00** |
| | Nambinga Forest | 0.00 | 5.00 | 1.00 | 0.00 | 0.00 | 0.00 | **6.00** |
| | Residential | 1.00 | 0.00 | 11.00 | 1.00 | 0.00 | 3.00 | **16.00** |
| | Participatory Forest | 0.00 | 0.00 | 0.00 | 24.00 | 0.00 | 4.00 | **28.00** |
| | Wetland | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | **1.00** |
| | Agriculture | 2.00 | 2.00 | 5.00 | 2.00 | 1.00 | 14.00 | **26.00** |
| | **Total** | **4.00** | **10.00** | **19.00** | **36.00** | **2.00** | **24.00** | **95.00** |
| | **Percentage Adherence** | **25.00** | **50.00** | **57.90** | **66.70** | **50.00** | **58.30** | |

**Table 5. Overall adherence rate to VLUPs for the two villages**

| Overall score | Adherence rate | Non -adherence rate | Kappa | P values for Kappa | Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Iragua | 0.41 | 0.59 | 0.47 | 0.001 | 0.34 | 0.60 |
| Kichangani | 0.31 | 0.69 | 0.49 | 0.001 | 0.36 | 0.61 |

**Table 6. Socio-economic factors influencing adherence to VLUPs at household level**

| Variables used in the equation | B | S.E. | Wald | df | Sig. | Exp(ß) | 95.0% C.I.for Exp(ß) Lower | Upper |
|---|---|---|---|---|---|---|---|---|
| Age | 0.037 | 0.019 | 3.886 | 1 | **0.049***  | 1.038 | 1.000 | 1.077 |
| Education level | 0.590 | 0.445 | 1.759 | 1 | 0.185 | 1.803 | 0.755 | 4.310 |
| Household size | 0.042 | 0.058 | 0.523 | 1 | **0.034*** | 1.043 | 0.931 | 1.168 |
| Economic activity | -0.530 | 0.557 | 0.905 | 1 | 0.342 | 0.589 | 0.198 | 1.754 |
| Farm size | -0.009 | 0.012 | 0.545 | 1 | 0.460 | 0.991 | 0.967 | 1.015 |
| Income | 0.000 | 0.000 | 0.268 | 1 | **0.005**** | 1.000 | 1.000 | 1.000 |
| Residential status | 1.593 | 0.572 | 7.756 | 1 | **0.005**** | 0.919 | 1.603 | 15.092 |
| Duration of stay | 0.265 | 0.608 | 0.190 | 1 | 0.663 | 1.304 | 0.396 | 4.292 |
| Land acquisition | 1.017 | 0.513 | 3.934 | 1 | **0.047*** | 0.765 | 1.012 | 7.552 |
| Constant | -2.659 | 1.101 | 5.834 | 1 | **0.016*** | 0.070 | | |

*Note: *Indicates statistically significant at p<0.05*
**Indicates statistically significant at p<0.01*
*PAC Null Model = 69.2, Cox and Snell $R^2$ 0.181, Nagelkerke $R^2$: 0.243,Sample size used in the analysis (n=120)*

**Table 7. Socioeconomic characteristics of respondents and their adherence to VLUPs for different zones**

| Variable | Adherence | | Non-adherence | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| **Age category** | | | | |
| <22 years | 2.0 | 1.7 | 3.0 | 2.5 |
| 22 to 35 years | 12.0 | 10.0 | 20.0 | 16.6 |
| 36 to 47 years | 7.0 | 5.8 | 39.0 | 32.5 |
| 48 to 55 years | 7.0 | 5.8 | 7.0 | 5.8 |
| >56 years | 13.0 | 10.8 | 10.0 | 8.3 |
| **Total** | **41.0** | **34.1** | **79.0** | **65.7** |
| **Residential status** | | | | |
| Immigrant | 15.0 | 12.5 | 50.0 | 41.7 |
| Native | 29.0 | 24.1 | 26.0 | 21.6 |
| **Total** | **44.0** | **36.6** | **76.0** | **63.3** |
| **Means of land acquisition** | | | | |
| Inherited | 30.0 | 25.0 | 14.0 | 11.7 |
| Rented | 6.0 | 5.0 | 10.0 | 8.3 |
| Village allocation | 7.0 | 5.8 | 8.0 | 6.7 |
| Bought | 5.0 | 4.1 | 7.0 | 5.8 |
| Illegal Clearance | 3.0 | 2.5 | 30.0 | 25.0 |
| **Total** | **51.0** | **42.4** | **69.0** | **57.5** |
| **Number of dependents** | | | | |
| 1 to 4 members | 36.0 | 30.0 | 34.0 | 28.3 |
| 5 to 8 members | 10.0 | 8.3 | 30.0 | 25.0 |
| 9 to 32 members | 2.0 | 1.6 | 8.0 | 6.7 |
| **Total** | **48.0** | **39.9** | **72.0** | **60.0** |
| **Annual income (TZS)** | | | | |
| <1 000 000 | 28.0 | 23.3 | 18.0 | 15.0 |
| 1, 000 000 to 2 000 000 | 15.0 | 12.5 | 24.0 | 20.0 |
| 2 000 001 to 3 000 000 | 5.0 | 4.2 | 15.0 | 12.5 |
| 3 000 000 to 4 000 000 | 2.0 | 1.7 | 8.0 | 6.6 |
| >4 000 000 | 1.0 | 0.8 | 4.0 | 3.3 |
| **Total** | **51.0** | **42.5** | **69.0** | **57.4** |

**Table 8. Factors identified to influence adherence to VLUPs during pair wise ranking**

| S/n | Factors | Male Farmers | Female farmers | Male pastoralists | Female pastoralists | Total score | Overall Rank |
|---|---|---|---|---|---|---|---|
| | **Iragua village** | | | | | | |
| 1 | Corruption by village leaders | 11 | 13 | 12 | 10 | 46 | 1 |
| 2 | Inadequate awareness / knowledge on VLUPs | 6 | 12 | 13 | 10 | 41 | 2 |
| 3 | Leaders failure to implement VLUP | 13 | 10 | 8 | 7 | 38 | 3 |
| 4 | Unclear zoned land uses | 12 | 8 | 9 | 9 | 38 | 3 |
| 5 | lack of land security (CCROs) | 8 | 5 | 10 | 10 | 33 | 4 |
| 6 | lack of transparency by village leaders in allocation of land | 8 | 11 | 6 | 7 | 32 | 5 |
| 7 | Increased population | 7 | 10 | 5 | 9 | 31 | 6 |
| 8 | Illegal invasion of land | 8 | 6 | 8 | 9 | 31 | 6 |
| 9 | Insufficient allocated land uses | 5 | 3 | 9 | 12 | 29 | 7 |
| 10 | Inadequate enforcement of the plan | 1 | 9 | 5 | 4 | 19 | 8 |
| 11 | Overstocking of livestock | 6 | 1 | 4 | 3 | 14 | 9 |
| 12 | Inadequate penalties on non-adherers | 6 | 3 | 2 | 0 | 11 | 10 |
| 13 | Land users failure to implement | 0 | 0 | 0 | 1 | 1 | 11 |
| | **Kichangani village** | | | | | | |
| 1 | Leadership failure to implement | 10 | 12 | 13 | 11 | 46 | 1 |
| 2 | Corruption by village leaders | 11 | 13 | 8 | 12 | 44 | 2 |
| 3 | Increased population | 7 | 9 | 12 | 9 | 37 | 3 |
| 4 | Insufficient allocated land use zones | 9 | 8 | 9 | 8 | 34 | 4 |
| 5 | lack of transparency by village leaders in allocation of land | 9 | 10 | 8 | 6 | 33 | 5 |
| 6 | Inadequate awareness / knowledge on VLUPs | 8 | 4 | 7 | 13 | 32 | 6 |
| 7 | lack of land security (CCROs) | 7 | 9 | 6 | 6 | 28 | 7 |
| 8 | Overstocking of livestock | 5 | 6 | 7 | 7 | 25 | 8 |
| 9 | Inadequate enforcement of the plan by village leaders | 5 | 0 | 10 | 8 | 23 | 9 |
| 10 | Illegal invasion of land | 2 | 7 | 6 | 4 | 19 | 10 |
| 11 | Inadequate penalties on non-adherers | 6 | 11 | 0 | 0 | 17 | 11 |
| 12 | Land users failure to implement | 12 | 0 | 1 | 1 | 14 | 12 |
| 13 | Unclear zoned land uses | 0 | 2 | 4 | 6 | 12 | 13 |

### 3.2.2 Socio-economic factors influencing adherence to VLUPs at group level

Focus group discussion with different land use groups prioritised several factors (Table 8) influencing adherence to VLUP. Corruption ranked first at Iragua village, inadequate awareness ranked second, leadership implementation failure and unclear zones tallied in the third position. Leadership implementation failure, corruption and increased population were prioritised at Kichangani village. Corruption and leadership implementation failure appeared to be a key factor influencing adherence ranked in both villages.

Interview with VEOs revealed that there were no succession plans in the implementation of VLUPs due to change of leadership who serve a term of 5 years while plans are made for 10 years. The VEO at Iragua who was just transferred to the village said that the Village land use plan lies in their office as documents but they had limited capacity to interpret and implement the plan. During pair wise ranking exercise land use groups argued that most of the other factors influencing adherence stem from leadership failure to implement VLUPs. Such factors include corruption and lack of transparency reflecting poor governance, overstocking due to inadequate control and enforcement measures by leaders, inadequate awareness and knowledge expected to be provided by village leaders consequently land users do not adherence to VLUPs. Therefore weak leadership leads to weak implementation of the plan. Low awareness of VLUPs among the land use groups was a third reason which influenced the implementation of the plans. This is because the land use groups were inadequately involved during the planning process. Discussion with VLUMC proclaimed that VLUP planning process was conducted in a rush limiting awareness to native farmers who were present during planning. While the agro pastoralists who immigrated after the plan said they were not aware of VLUPs.

Increase in population both by birth and immigration increased demand for land thereby causing insufficiency of allocated zones. The polygamous behaviour of agro pastoralists and extended family was a key factor pointed out by the VEO of Kichangani village to have increased the population thereby influencing adherence to the allocated zones. Moreover, increased population relative to allocated land use zones,

non-adherence incidences of encroachment and land use conflicts were experienced during field observation. Increased number of agro pastoralist influenced adherence more land was acquired for farming, grazing zone and residence.

Inadequate funding during planning and implementation of the plan was a key limiting factor mentioned by the district PLUM team. The implication of limited resources according to the District Land Officer was that VLUPs were prepared in a rush and rarely got beyond step 4 of the planning process as per the NLUPC guidelines which have six steps. Therefore, most plans implemented were incomplete and therefore unable to achieve the intended goals. Inadequate resources also resulted in insufficient follow up on the implementation of the plan, thereby advancing to other stages relevant for enabling adherence to VLUPs.

## 4. DISCUSSION

### 4.1 Extent of Adherence to Village Land Use Plans Zones

The mostly affected zone by incidence of non-adherence was the grazing zone which can be explained by the fact that unlike the agriculture and residence zones with each land parcel privately owned, this zone was communally owned (Table 4 and 5). The implication of commonly owned land is subject to tragedy of the commons as each individual user seeks to maximise profit by having an additional stock at the communal cost incurred thereafter [29].

In a study in three municipalities in Belgrade, Kappa values portrayed highest non-adherence incidence in green zones and agriculture zones due to illegal construction of houses [25]. Contrary, to this study finding adherence incidence was least at grazing zone due to multiple land uses by agro-pastoralists where farming, grazing and settlement was done within the same zone. Analysis of satellite images for a study conducted in four districts Paklao, Bouami, Phoukong and Phakokin Lao Peoples Democratic Republic similarly showed non-adherence incidences [30]. Adherence to land use plan was high at open space on the contrary no zones are classified as open space rather even the occupied zones revealed non-adherence incidences [13]. In Ashiyie Ghana, the overall non-adherence incidence was 50% for

the different land uses [31]. Non-adherence incidence observed by different studies varies with context which cannot only be analysed by spatial means rather further results from socioeconomic factors influencing adherence to VLUPs were relevant to establish the reasons behind the of spatial patterns.

## 4.2 Factors Influencing Adherence to Village Land Use Plans for Different Zones

### 4.2.1 Socio-economic factors influencing adherence to village land use plans zones at household level

Household size influences a number of factors. For instance, large household size may influence income earnings and expenditure; thus, it may influence the level of labour force and may as well as the diversification in economic activities [14]. Bigger households demand more space and, therefore, are unlikely to adhere to allocated land use zones [31].

People with high income earnings can afford to employ modern technology and increase their land size for both commercial and subsistence agriculture unlike those with low income who utilise land for subsistence farming and use hand hoe to till their land. Subsistence farmers in Tanzania utilise average land size of 2-2.2 hectares annually for agriculture as they employ hand hoe [32,33]. Income also gives power to individuals to influence decision in their favour through bribes and access to land in zones not designated for farming or grazing [10,34]. The need to generate income from land was among reasons established for non-adherence to allocated land use plan implementation (Matey, 2016).

Migrants employ unsustainable agricultural practices that lead to their encroachment into other conserved zones due to shorter planning horizons that influence them not to adhere to VLUPs as compared to host population [35]. Illegal migrants are more likely to invade into forested areas than the native communities [36].

The mode of land acquisition reflects on land tenure and property rights. In this case, 41% of respondents acquired land from inheritance while 30% of respondents illegally cleared their own land through converting non-cultivated land into farms. This implies that there was no adherence to land use plans due to insecure tenure. Similar

to a generalisation made by a previous study [37], this study found that households with insecure property rights and tenure (farmers and agro pastoralists) informally established de facto rights through clearing or invading conserved areas or unclaimed land. Insecure land tenure stimulated conversion of marshland to rice fields in Madagascar [38]. Other studies have reported of persistence of traditional land use ownership despite established formal ownership [38,39]. Attempts by the government of Tanzania to enhance conservation through restriction of use seem to be unsuccessful on village land due to diverse social and ecological factors that undermine adherence to land use plan.

### 4.2.2 Socio-economic factors influencing adherence to Village Land Use Plans Zones at community level

Corruption was a major cause of non-adherence to land use plans leading into conflicts between farmers and pastoralists groups in Kilosa District [40]. Similarly, corruption was not only observed at village level plans but also it was mentioned as major cause of non-adherence to land use plans leading to many conflicts in the urban areas in Tanzania [41,42]. In this study, leadership failure and corruption were the key factors influencing adherence to VLUPs. In support of this results discussion by different land use groups brought to light that the government's notice of 2012 to evict pastoralists from Kilombero valley Ramsar site to Lindi region, was not effected at Iragua village [43]. The farmers group claimed that substantial amount of money was collected and used to bribe the District Officials so as to sabotage eviction of agro pastoralists from Iragua village.

Strong leadership is a vital component within stakeholders' characteristic that was emphasized as a major factor influencing adherence in Iskadar Malaysia [12]. Similarly, little participation by farmers and local government in developing land policy in Central Rift Valley of Ethiopia led to ineffective implementation of land use policies, on the contrary higher government informants were aware of the land policies [44].

Compensation for lost land was a major reason influencing non-adherence to the VLUPs [21]. On the contrary this study found that during the time when the plans were made, land was abundant; hence, no compensation for lost land was required. Similar observations have been made previously on leadership implementation failure

[40,44]. Other studies also have established that unclear implementation roles for stakeholders from the village, district to the national levels had influence in effecting the implementation of the plan as expected [45,46].

High quality arable land and cheap farmland attracted immigrants into Ulanga District from Mwanza, Shinyanga, Arusha, Kilimanjaro, Singida, and Tabora regions [47]. About 62% of the immigrants were from pastoral communities alleged to be Maasai, Barbaig and Sukuma tribes [48]. The reason for immigrants was due to land use degradation and population increase in their originating regions [49]. FGDs explained that increased population pressure had increased land use pressure in residential, agriculture and grazing zones as a result immigrants did not adhere to VLUPs as they encroached and invaded into forest and wildlife management zones. The discussion further revealed that agro pastoralists demanded large parcels of land as they used ox ploughs to till land for commercial crops hence invaded the conserved zones.

Limited funding resulted in failure to implement all the stages of the land use planning process as stipulated by the government [1]. At the village level, funding to support enforcement of by-laws, motivate village game scouts and VLUM committee to conduct patrols, follow up on the implementation of the plan as well as build capacity further crippled the implementation of the VLUP. Similar observation was made by a Ugandan study team when they visited villages with VLUPs at Kigoma and Tabora Districts [50].

Inadequate knowledge on the value of conservation along with sustainable land use practices was a factor that significantly influenced the implementation of the plan. This finding was similar to previous reports on other areas of Tanzania [46]. Review of the land use documents showed that the representative quorums from both villages were not reached since 142 households out of 925 in Iragua village and 18 households out of 980 in Kichangani village were involved in the exercise [51], [52]. Inadequate involvement in the planning process signifies insufficient time spent for preparation and the planning process; subsequently influencing its implementation.

The implementation of the national land policies and laws have since not only depended on the government's own funding. It has rather relied on funding provided by partners or donors for implementation process. Considering that donors have their priorities depending on their own mandates, it is, therefore, questionable on the ownership of the planning process and its sustainability during implementation [53]. Likewise, often plans are developed to meet government targets. As a result, a top-down approach leads to inadequate involvement of local communities and time allocated for monitoring. Poor involvement during planning leads to lack of a sense of ownership of the plan at the village level, thereby resulting in its poor implementation.

A study conducted in Babati and Monduli districts in Tanzania similarly noted that local communities were inadequately involved in the preparation of VLUP [46]. The study also revealed that there were no implementation strategies and roles of the different actors in the implementation of the plan that had been stipulated. Furthermore, the map as a tool to guide the implementation of the plan lacked coordinates which could direct the location of various designated zones.

## 5. CONCLUSIONS AND RECOMMENDA-TIONS

### 5.1 Conclusions

Moderate agreement was obtained from spatial comparison between planned and actual land use using kappa statistic. The grazing zone was the most affected zone by incidence of non-adherence attributed by the fact that it was communally owned. Age, household size, residential status, land tenure and household income were significant factors influencing adherence at household level. Respondents aged 22-47 years had the highest non-adherence rate to VLUP. Most of the immigrants did not adhere to allocated land use zones. The findings further revealed that majority of the respondents who had acquired land from inheritance adhered to VLUPs and most of the respondents who cleared their own land least adhered to allocated VLUP. Households with 5 to 8 members least adhered to VLUP while majority of the respondents with annual income ranging from TZS 2,000,000 to TZS 4,000,000 had the highest percentage (19.1%) of non-adherence compared to adherence rate (5.9%) to VLUP. At community level corruption and leadership failure were key factors leading to non-adherence to

VLUP in both villages. Other factors included inadequate awareness, unclear demarcation of the zones, and increased population.

## 5.2 Recommendations

Based on the findings and conclusions, this study makes the following recommendations:

a) The National land use planning commission need to validate spatial data and population data at village level to avoid discrepancies which affect implementation of the village land use plans.
b) Short term review of land use plans should be conducted in order to accommodate changes and unaccounted circumstance as well as address factors that influence the implementation of village land use plans.
c) The NLUPC should consider developing implementation strategies during planning that are flexible to accommodate different circumstances within the community. Specific zones may require specific strategies which will allow adherence to the plan. These strategies have to be developed at local level to ensure that they are achievable.
d) Continuous education and capacity building should be part of implementation strategy to increase awareness and knowledge among land users on sustainable land use management practices, conflict resolution, land use legal procedures and rights.
e) This study recommends that the Ministry of Natural resources and Tourism facilitate in establishment of direct tangible benefits as a strategy to enhance conserved zones (WMA or forest zone). This can be through exploiting opportunities for bee keeping projects, tourism as well as payment for ecosystem services. A global approach of payment for carbon storage in forest plantation and reserves through Reduction of Emission from Deforestation and Degradation (REDD) Programme under the United Nations Framework Convention on Climate should be adopted. Once this is implemented, the land users will benefit from economic opportunity from the conserved zones hence promote sustainable land use practices in conserved zones.
f) There is need for coordination not only during planning but also in implementation of the plan between the organization hierarchy vertically from the central, district, ward and village level and horizontally across sector officials, village organs and committees.
g) The government should privatise ownership of grazing land to replace the existing communal zoning to limit the number and size of herds kept within the carrying capacity of individuals/private land holding. Alternatively, the government may empower the community to manage the grazing land by establishing a communal grazing management plan to ensure sustainable utilisation of resources in this zone and hence adherence to the plan.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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