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NURTURING FOOD SECURITY THROUGH URBAN AGRICULTURE LIVELIHOODS IN THE MIDST OF CLIMATE CHANGE

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ABSTRACT

This paper examines the immediate and long-term effects of climate change on the sustainable development of Urban Agriculture (UA) livelihoods among the horticultural food producers and sellers (HFPS). The findings are derived from an exploratory survey study which was carried out among producers and sellers of horticultural food crops in Eldoret Municipality in Kenya to determine the respondents UA characteristics and the effect of climate change on the natural resources required for UA livelihoods, and hence the effect on the food security of the households. The study was both qualitative and quantitative, and both descriptive and inferential statistics were used to lay out the results. The problems faced due to emerging trends of climate change and their effect on the UA livelihoods were evident as observed, elicited and discussed by the respondents and the researcher. Promoting pro-poor initiatives such as community capacity building, collective responsibility, and enhancing and expanding good NRM practices should be encouraged in order to build sustainable urban agriculture livelihoods and reduce hunger and poverty especially among the vulnerable poor urbanites. Sustainable environmental practices that empower individuals with better livelihoods, employment, adequate incomes and household food and nutrition security are a necessary venture in order to build a healthy gender-balanced and empowered working nation that may enable Kenya to achieve the goal of vision 2030 that aspires to improve incomes for all cadres of the population.

Keywords: NRM, urban agriculture, livelihoods, food security.

INTRODUCTION AND THEORETICAL FRAMEWORK

Urban agriculture (UA), which entails the production, processing, and selling of food is a trend that is inescapable. It is a livelihood that the poor engage in and depend on for their food and nutrition security. Eradicating hunger and poverty requires an understanding of the ways in which these two injustices interconnect in the context UA interactive livelihoods and the climate change challenge. Currently, there is an increasing growth in the urban population in the world and Kenya which has led to a competitive demand for the natural resources required for UA livelihoods.

The challenges Africa faces in building food security include physical factors such as climate, geography, and poor resource endowments, political factors such as lack of sound governance, infrastructure and inefficient public private partnership arrangements and the need for political reform to enable the poor to secure land and other necessary resources, and also socio-economic factors such as HIV/AIDS, poverty and hunger.

Hunger and poverty persist even in the face of economic growth. The numbers are alarming and it is noted that ninety percent of the world's hungry people live in South Asia and Africa, and more than 50 percent of them engage in producing food for the world. In a year during which the world registered an overall economic growth rate of about 8 percent, the number of unemployed people increased by nearly 2 percent (IFPRI, 2007), thus poverty and both chronic and acute hunger were more evident. Economic growth in many developing countries has only a limited impact on the livelihoods of extremely poor and food-insecure people.

One billion people in the world live on less than one dollar a day, and about 800 million go hungry every day. Hunger reduction has been slow in most regions and has not decreased at rates corresponding to economic growth and the poorest of the poor are increasingly being left behind, with incomes falling farther and farther below the absolute poverty line and below national averages. Even if the first Millennium Development Goal to halve the proportion of extremely poor people and hungry by 2015 is achieved, hundreds of millions of people will continue to live in extreme poverty (IFPRI, 2007).

A food secure household is generally described as one that can reliably obtain food of adequate quality and quantity to support a healthy and active life for all members of the household (IFPRI, 2005). The five A's, (availability accessibility, affordably, adaptability and acceptability) are all essential components of food security, and are influenced by multiple natural resources whose efficient management is essential for the public-good (Mugalavai, 2008).

By 2015-2020 well over half of the world's population will be living in urban and peri urban areas. If present trends hold, the vast majority of these people will be living in irregular settlements without access to decent food, shelter, water and sanitation (UN-HABITAT, 2004).

Meeting MDGs in cities requires recognition, support and empowerment of the urban poor's own livelihood strategies. The urban population is setting new standards and cities must reinvent themselves with new

references. This paper looked at some of the assets within the livelihood framework, which include financial capital (e.g. credit, cash); physical capital (e.g. markets); human capital (e.g. labour); and natural capital (e.g. land, water, forests), which were examined to see how their availability and access affects livelihoods and food security of households within the context of UA.

Applying the sustainable livelihoods approach highlights the multifaceted interactions between groups and the vulnerability context of households, their asset bases, intervening institutions, and livelihood strategies. Therefore, access and use of natural resources were important aspects for integration to understand how UA impacts on livelihoods. Locality occupies an important position in sustainable livelihood thinking, because natural resources and the actors and interactions are place specific. The environment creates equality, respects diversity, draws upon individual experiences, facilitates shared responsibility, incorporates experimentation and innovation, accounts for emotional attachments to places and people within the group, and encourages social interaction (Carr, 1994). A context of UA that has multiple and adequate natural resources enable interactive livelihoods to flourish. Also, communities of interactional learning based on principles of experience, practice and native intellect are successful especially where local agricultural knowledge is created, socialized and exchanged (Kroma and Flora, 2001).

Purpose of the study

The purpose of this paper is to explore the urban agriculture livelihoods of horticultural food producers and sellers (HFPS) among the urban poor and elicit the livelihood characteristics; the effect of climate change on the access and use of the required natural resources, and its effects on the household food security.

REVIEW OF LITERATURE

Urban agriculture and natural resource management

Poverty in developing countries cannot be seen apart from the crises of agricultural systems. The livelihoods of small farmers are worsening as a consequence of degradation in land or water resources, aggravated by competing claims on these resources by farmers, pastoralists, and industries. Poor people are also characterized by poor health status, high debt, lack of skills and education, and lack of a voice. For instance, many people in developing countries, directly dependent on natural resources, have little say in how those resources are used; instead they suffer the consequences of corrupt decisions and destructive resource use (IFPRI, 2007).

UA plays a potential role in managing urban open spaces, roadsides and undeveloped plots by cultivating them and keeping them clean (Boateng, 2002). Uncultivated areas are also adversely used for all kinds of evil activities such as dumping of refuse, defecation and drugs. Urban greening done by urban farmers enables these places to remain clean and green and at no cost to city authorities or the tax payer, thus reducing the municipal costs for landscape maintenance. The production of trees, shrubs, flowers and ornamental plants and food crops can beautify the city, cool its climate, curb erosion and absorb air pollutants and oduors. Waste management may also be accomplished by sanitizing waste water and solid matter and using it in irrigation and organic farming respectively (del Rosaru *et al*., 2000).

Therefore, with fair access to resources and services, UA can be an integral component of income and employment strategies to curb on unemployment. Through adequate planning, unused areas can be recorded and systematically distributed to the urban poor with rules and regulations governing the user-groups, by issuing them with free lease and user permits. Institutions that target the poor in order to lift them out of structural poverty should be encouraged to work with identified interactive groups (e.g. producers and sellers) and introduce interventions that will enable them to get maximum support and output out of their livelihood ventures (Mugalavai, 2008).

Climate change and the environment

Climate change will inevitably present a significant challenge for developing countries, and the need to adapt to these changes remains inescapable. The longer-term impacts will include: changing rainfall patterns affecting agriculture, food security and economic growth; shifting temperature zones affecting vector diseases; decreased water security; sea level rise; and the economic costs of extreme weather damage. Food security is likely to be affected by increased frequency and intensity of droughts or floods. Climate change may also contribute to desertification by changing the spatial and temporal patterns of temperature, rainfall and winds. Desertification (caused by both climate and anthropogenic factors) has already reduced the potential vegetative productivity of more than a quarter of Africa's land by 25% over the past 30 years. Floods can contaminate public water supplies and drought leads to unhygienic practices because of water shortages. There is also evidence that increased temperatures can increase the levels of cholera bacteria in tropical seas and lakes. By 2050 rainfall in Africa could decline by 5% and become more variable year by year (WWF, 1996).

Ecological systems that have been the basis of life on the planet are increasingly in a state of disrepair. Fragmented by human assault, the inherent resilience of these systems continues to be seriously undermined. There are already signs of this degradation in the form of global changes in climate, hydrological patterns, and other critical ecological functions. Ironically, people who rely on the natural resource base for their production and who live in close association with the natural environment will be hardest hit by the environmental crisis. These people tend to have more limited coping capacities and are more dependent on climate-sensitive resources such as local water and food supplies (IFPRI, 2007). The livelihoods of HFPS fall in this vulnerable group.

It is difficult to predict the impact of increasing climate variability on the poor and levels of poverty. However, it is clear that the impact of climate variability is multiplied in Africa due to the many development problems it faces. The poor face a particularly rapid pace of change in Africa, due to climate change, conflict, demographic change and high rates of inflation. Trends such as the rising burden of AIDS and the impact of prolonged conflicts are reducing the ability of the poor to cope with the existing climate. The increasing climatic variability in Africa, resulting from increasing concentrations of atmospheric GHG emissions, makes poverty reduction more difficult and adds greater urgency to decreasing the vulnerability of the poorest. Africa is in need of urgent effective development action, which, by definition, is resilient to current and increasing climate variability. It is necessary to strengthen systems for coping with climate variability and reducing vulnerability, and to integrate these into planning. Strengthened systems for coping with current climate variability will enable Africa to address the longer-term impacts of climate change among livelihood groups of interaction such as HFPS.

STUDY METHODS

Design and population of study

This study used an exploratory cross-sectional survey design. The research was conducted in Eldoret, which is situated in Uasin Gishu District, Kenya. In this District, the poverty incidence is still high although it is a major food producer in the country (GOK, 2006). The urban aspect exhibited the reality of the UA situation as the movement of goods can be monitored and it also offers a concentrated population of the HFPS required for the study. The producers were those who worked on horticultural food farms whereas the sellers were those who buy their merchandise for informal sell. Producer employees were chosen because they level up socio-economically with most sellers in the informal markets.

Sampling and data collection

Non-probability sampling was used. This is a type of sampling where the chances of members of the wider population being selected for the sample are unknown (Cohen, Manion and Morrison, 2000), and it targets information-rich cases for in-depth study. The researcher came up with a total of 216 UA respondents, who included 108 producers and 108 sellers to participate in the qualitative and quantitative study. Out of these, 8 producers and 8 sellers volunteered to participate in the two focus group discussions. The rest, who were 100 producers and 100 sellers, participated in the questionnaire interviews which were self-administered by the researcher due to the high rate of illiteracy among the respondents. Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS version 15.0). Descriptive statistics used to address the findings include frequencies and percentages, whereas inferential statistics, including the Chi-square and ANOVA were used to test for significant differences of the variables between the study groups. Some qualitative responses have been used to add clarity to the quantitative responses.

RESULTS AND DISCUSSIONS

Characteristics of respondents

Based on a sample (N = 200) of respondents who participated in filling the UA questionnaires, 50% (n = 100) were producers and 50% (n = 100) were sellers, with a total representation of 98 males and 102 females. More males (80%) than females (20%) were involved in producing horticultural food crops, whereas more females (82%) than males (18%) did the selling. This relationship between groups was significantly different ($\chi^2 = 76.911$, $p = .000$, $\alpha = .01$), see Table-1. This finding is consistent with others in Africa (Vide, 2004; Mubvami and Mushamba, 2004; and Nabulo *et al*., 2004), where more men than women were involved in cultivating crops and marketing at wholesale, and women did more of subsistence cultivation and selling. From discussions, it was noted that women would rather perform the activities that will allow them flexibility in time management so as to tend to their other reproductive and productive roles. It also makes sense because women more than men would care to have daily earnings in order to meet the basic household needs as the need arises and this was easily achieved from the selling activities.

About half of the sellers (54%) had primary level education as compared to 43% producers. However, the highest level of education was found among producers although only 12% had attended post secondary education. Both groups had a low level of education, despite the introduction of free universal primary education. This raises a red alert because education empowers individuals into new thoughts, experiences, and greater successes in life.

There were significant main differences between the study groups in their employment status in UA. Sixty eight percent (68%) sellers and 25% producers were self employed. The self employment status of sellers is attributed to their being able to start their UA activities with low capital investments which may be recycled easily in order to cope with economic vulnerability.

More producers (92%) than sellers (54%) indicated that their produce was for both domestic use and sale in a non-significant relationship. Statistically significant differences were noted as far as sufficiency of produce was concerned ($\chi^2 = 5.120$, $p = .017$, $\alpha = .05$), with more producers (58%) than sellers (42%) indicating that their produce was sufficient for both domestic use and sale (see Table-1). This does not mean that the supplies were sufficient for the sellers' needs because producers take care of their domestic needs before any sales are done, whereas sellers cater for domestic needs alongside their daily activities.

Table-1. Characteristics of respondents.

UA Characteristics	All respondents N = 200%	Producers. n = 100%	Sellers n = 100%	Chi square	Sig α
Gender of respondents					
Males	49	80	18	76.911	.000**
Females	51	20	82		
Respondents level of education					
None	13	14	12	1.593	.661 ns
Primary	49	43	54		
Secondary	29	31	28		
Post secondary	09	12	06		
Status in UA					
Self employed	47	25	68	42.159	.000**
Employee	53	75	20		
Mean age of respondents	28.1 ± 8.07	26.4 ± 5.1	27.5 ± 6.5	.519	.472 ns
Mean household size	4.05 ± .648	4.03 ± .643	4.07 ± .655	.436	.663 ns
Purpose of produce					
Sale	27	08	46	44.018	.000**
Both domestic and sale	73	92	54		

**Significant at α < .01, *Significant at α < .05, ns = not significant

Urban agriculture characteristics of respondents

The results also showed significant differences in the size of land used for UA, with more sellers (95%) using one-eight of an acre or less, and more producers (84%) using more than one-eighth of an acre ($\chi^2 = 27.634$, p = .000, α = .01). It makes sense that producers need more land than sellers for their livelihoods to be successful. Nevertheless, there were differences cited in the land-use patterns whereby in some instances land was put to maximum use and in some, it was not.

A majority of the respondents (80%) did not experience long dry water spells. However 50% of the sellers did not bother to look for alternative sources during water shortages as compared to 24% of the producers who fetched water from other sources. The difference was statistically significant ($\chi^2 = 14.676$, p = .001, α = .01), (see Table-2). A majority of producers depended on well, tap and rain water whereas sellers used more of tap water. Producers more than sellers certainly need water for the survival of their livelihood and they have to depend on diverse sources to enable them to deal with dry spells so as to try and keep sellers supplied with merchandise. Sellers are able to survive with meager supplies of water which they mainly use for short-term preservation of vegetables, cleaning of merchandise, drinking and also for keeping dust around their environment or shelters at minimum levels.

Very few of the respondents rated their performance in UA as very good (13%), whereas 35% found it satisfactory, and those who thought that the performance was poor were 52%. The difference between the subgroups was statistically significant ($\chi^2 = 38.749$, p = .000, α = .01).

Statistically significant differences were also noted as far as sufficiency of produce and sales were concerned ($\chi^2 = 5.120$, p = .017, α = .05), with more producers (58%) than sellers (42 %) indicating that their produce was sufficient for both domestic use and sale (see Table-2). This does not mean that the supplies were sufficient for the sellers' needs because producers take care of their domestic needs before any sales are done, whereas sellers cater for domestic needs alongside their sales.

There was no significant difference in the average daily household income for the study groups. Sixty five (65%) percent producers and 54% sellers indicated that they got about one dollar of daily income, and 23% and 31% producers and sellers respectively indicated that they got less than one dollar a day.

The producers (70%) who recorded seasonal surpluses were more than sellers (50%) in a statistically significant relationship ($\chi^2 = 8.333$, p = .003, α = .01). Despite the lack of variety to meet demand from sellers, producers may have a season of plenty for the more commonly grown fruits and vegetables when supply supersedes demand, which they sell without profit or give to neighbours and livestock, and yet during harsh seasons, they are not able to meet the sellers' needs.

Table-2. Respondents' urban agriculture characteristics.

UA Characteristics	All respondents N = 200%	Producers. n = 100%	Sellers n = 100%	Chi square	Sig α
Size of land used for UA					
⅛ of an acre and less	55	16	95	27.634	.000**
More than ⅛ of an acre	45	84	05		
Is the land used for UA well/fully utilized?					
Always	41	19	63	7.660	.023*
Sometimes	19	17	21		
Never	40	64	16		
Does water dry up?					
Yes	20	24	16	2.00	.108 ns
No	80	76	84		
Source of water in drought					
Never dries up	44	52	36		
Fetch from elsewhere	19	24	14	14.676	.001**
Do not bother	37	24	50		
Purpose of produce					
Sale	27	08	46	44.018	.000**
Both domestic sale	73	92	54		
Sufficiency of farm produce /sales					
Sufficient	50	58	42	5.120	.017*
Not sufficient	50	42	58		
Performance of UA					
Very good	13	07	19	38.749	.000**
Satisfactory	35	23	48		
Poor	52	70	33		
Average daily household income					
More than one dollar	11	12	15	2.536	.469 ns
About one dollar	62	65	54		
Less than one dollar	27	23	31		
Daily average food expenditure					
More than one dollar	49	18	13	21.523	.000**
About one dollar	16	33	65		
Less than one dollar	35	49	22		
Adequacy/sufficiency of income					
Not adequate	74	88	60	20.374	.000**
Adequate	26	12	40		
Does produce meet customers' needs?					
Always	32	11	53	68.793	.000**
Sometimes	38	47	30		
Never	30	42	17		
Do you get any surplus?					
Yes	60	70	50	8.333	.003**
No	40	30	50		

**Significant at $\alpha < .01$, *Significant at $\alpha < .05$, ns = not significant

Reasons for low output by producers in urban agriculture

A significant majority of producers indicated that they experienced low output due to inefficient and inadequate land use, (85%), low quality inputs (80%), low quantity inputs (80%) and poor weather (72%), at $\alpha = .01$ (see Table-3). However, significantly less producers (24%) indicated that they experienced low output due to insufficient labour ($\chi^2 = 27.040$, $p = .000$, $\alpha = .01$). Both inadequate and inefficient technology and infrastructure, the quality and quantity of inputs used were said to affect output and hence the sustainability of the interactive livelihoods of producers and sellers. Lack of efficient irrigation infrastructure (75%) was also a hindrance to sustainable production.

Table-3. Showing reasons for low output from producers.

Reasons for low output	Producers (N = 100) % Yes	No	Chi square	Sig α
Inadequate land use	85	15	32.048	.000**
Insufficient labour	24	76	27.040	.000**
Low morale/low returns	54	46	.640	.424 ns
Low quality inputs	80	20	36.000	.000**
Low quantity inputs	82	18	34.960	.000**
Poor weather	72	28	19.360	.000**
Poor irrigation	75	25	26.430	.000**

**Significant at $\alpha < .01$, ns = Not significant

The relationship between qualities and quantities of produce required by sellers

The sellers were further asked whether the producers were able to supply to them all that they needed for their livelihood in expected qualities and quantities, on a Likert scale of 1-3 whereby 3 = always, 2 = sometimes, and 1 = never. The Chi square test of significance revealed a significant difference in their responses with 50% sellers indicating that they never got all they needed ($\chi^2 = 18.171$, $p = .000$, $\alpha = .01$), (see Table-4). Only 26% of the sellers indicated that they "always" got the produce they needed for sale in their required qualities whereas 60% stated that they "sometimes" got the produce required for sale in the required qualities ($\chi^2 = 34.160$, $p = .000$, $\alpha = .01$). Needed quantities were obtained "always" by 34%, "sometimes" by 46% and "never" by 20% of the sellers in a significant difference ($\chi^2 = 10.160$, $p = .006$, $\alpha = .01$).

The correlation of two variables, "do producers provide all you need" and "do producers supply needed qualities" were positive ($r = .307$, $p = .002$, $\alpha = .01$). The sellers settled for as many varieties of merchandise as the quality dictated. On the other hand, the relationship between "do producers supply all you need" and "do producers supply needed quantities" also revealed a significant and high positive correlation ($r = .578$, $p = .000$, $\alpha = .01$). In effect, the availability of merchandise and the quantities required by the sellers dictated the quantities given (see Table-4). Generally, quality of produce and quantity required by sellers correlated positively ($r = .498$), so that sellers were able to take more when the quality was good enough for a successful sales day.

Table-4. Respondents' livelihood dynamics.

Livelihood characteristics	Sellers n = 100%	Chi square	Sig α
Do producers supply to you all you need?			
Always	16	18.171	.001**
Sometimes	34		
Never	50		
Do producers supply the needed qualities?			
Always	26	34.160	.000**
Sometimes	60		
Never	14		
Do producers supply the needed quantities			
Always	34	10.160	.006**
Sometimes	46		
Never	20		
Correlations	Pearson r	Sig α	
Do producers provide all you need in needed qualities?	.307	.002**	
Do producers provide all you need in needed quantities?	.578	.000**	
Do producers provide the qualities and quantities?	.498	.000**	

**Significant at α < .01, ns = Not significant

Respondents' constraints in the use of natural resources

There were significant differences in the constraints faced by the study groups in the access and use of natural resources, (land, bio-energy, biodiversity, forests, and knowledge and skills, water), whereby sellers faced less constraints in accessing and using land (M = 2.19) and biodiversity (M = 1.60) at α < .01, whereas producers had less constraints in accessing bio-energy (M = 1.40), water (M = 2.53), forests (M = 1.22), and knowledge and skills (M = 1.76), at α < .05, than sellers (see Table-5).

Table-5. ANOVA table showing respondents' access to natural capital.

Type of capital	Nature of capital	Mean Sellers	Mean Producers	F values	Sig α
Natural	Land	2.19	1.72	24.979	.000**
capital	Bio energy	1.22	1.40	4.923	.028*
	Bio diversity	1.60	1.36	6.867	.009**
	Forests	1.10	1.22	4.727	.031*
	Unpolluted environment	1.54	1.76	3.771	.054 ns
	Water	2.37	2.53	96.161	.014*
	Knowledge and skills	1.53	1.76	4.431	.037*

**Significant at α < .01, *Significant at α < .05, ns = Not significant

Description of sufficiency of food eaten by households

The respondents were asked questions regarding whether their households had enough food in the last 12

months. Fourty three percent (43%) of the respondents stated that they sometimes did not have enough food to eat and very few (3%) indicated that they had enough of the food they wanted to eat. More producers (40%) than sellers (6%) indicated that they had enough food but not always the kinds they wanted to eat, whereas more sellers (45%) than producers (16%) indicated that they often did not have enough to eat. These differences were statistically significant (see Table-6), ($\chi^2 = 46.809$, $p = .000$, $\alpha < .01$). However, having enough food to eat did not necessarily mean that the quality or daily quantity of food was right but for most sellers, putting food on the Table, whatever the quantity or quality was a success story for their households.

Table-6. Description of sufficiency of food eaten in the last 12 months.

Food security questions	All Respondents N = 200%	Producers n = 100%	Sellers n = 100%	Chi square	Sig α
Description of food eaten by household					
Enough of food that we want to eat	3	6	8	46.809	.000**
Enough but not always the kinds we want	23	40	6		
Sometimes not enough	43	38	40		
Often not enough	31	16	46		
** Significant at α < .01					

CONCLUSIONS AND RECOMMENDATIONS

The city's natural resource ecosystem should be protected in order to reduce the adverse effects of climate change by adopting technologies and infrastructure that may enable sustainability of the UA interactive livelihoods. It is important to remove the obstacles that hinder sustainable livelihoods of urban agriculture workers as this is the arena whose job-creation is less costly and can accommodate many of the vulnerable job seekers among the urban poor. This may enable them to earn decent incomes for the purposes of meeting individual and household basic needs, especially food and nutrition security for a healthy, active, and productive household.

In order to rapidly overcome extreme poverty and hunger and to include all segments of society in the development process, policymakers need to promote the kinds of growth that can do the most to benefit poor people and to introduce social protection policies on a much larger scale. Therefore, UA should be recognized and developed since it is a livelihood whose benefits can enhance the lives of the poor in society.

Poor people are not a homogenous or monolithic group. Even the structures under which the poor work within UA differs in infrastructure, knowledge and skills used, and the availability and state of the natural resources required such as water, land, forests, animals, all of which affect the biodiversity and thus the adequacy of the livelihoods of HFPS. This inadequacy makes them vulnerable to shocks brought by climatic variations.

Therefore, in order to determine the strategies, policies, and interventions needed to rapidly reduce extreme poverty, it is crucial to have a clear understanding of the characteristics of the extremely poor, especially how climate change is affecting the natural resources that their livelihoods depend on, and the reasons why existing policies do not work for them. Governments have a responsibility to share the burden of climate risks and take specific action to reduce the vulnerability of the poor. Researchers and development partners on climate change have a duty towards empowering farmers with information in order for them to adapt to the changes using different technologies and systems that may enable sustainability of UA livelihood and create a win-win environment for the dependent livelihood groups of producers and sellers.

It is notable that UA is a threatened and endangered livelihood and it affects the value chain of the producers, sellers and consumers. Poor NRM and inadequate buffering resources may hinder the development of UA as a livelihood. Small steps can be taken through community mobilization and cooperate social responsibility towards reducing the UA vulnerability to climate change and maintaining a healthy ecology for sustainable UA livelihoods.

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