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Review paper

Philosophical Perspectives on Wildlife Crop Damage and Management

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This paper traces and elaborates on the philosophical thinking on the history of wildlife crop damage and management measures to mitigate the damages. It explores how crop farmers become vulnerable to wildlife crop damage, besides identifying useful theories and practices on wildlife crop damage and management. Vulnerability to crop damage is depicted from the biophysical, social and institutional vulnerability. In the absence of appropriate compensation schemes, wildlife crop damage management interventions and strategies, crop farmers around protected areas remain vulnerable to crop damage by wildlife globally. The location of crop farms the protected area and the nature of agricultural activities practiced by farmers near protected areas make them vulnerable to crop damage by wildlife through foraging. Since foraging by wildlife is triggered by nutrition stress and crops grown by farmers are of more nutritive value as per optimal foraging theory. The need for compensation for wildlife crop damage always arises around protected areas and this task institution mandated with managing wildlife to find appropriate crop damage mitigation measures. Wildlife crop damage is a natural phenomenon presumed to have existed since the birth of agriculture and emphasizing wildlife freedom irrespective of damage wildlife imposed on agriculturalists was key philosophical thinking that boosted wildlife populations which resulted in increasing damage by wildlife. This paper evaluates policies on wildlife crop damage management and suggests how to mitigate wildlife crop damage.

Keywords: Wildlife crop damage, management philosophies

INTRODUCTION

Wildlife crop damage management dates back to the times of the dragons (Boreiko *et al.*, 2013, Frank and Conover, 2015). Local farmers who were tired and hungry could not think about the role played by dragons in the ecosystem. Eradication of the dragons was the only ultimate goal and the local farmers were successful in eliminating them in order to protect their crops (Frank and Conover, 2015). Wildlife crop damage management dates back to pre-agricultural times of the human society (Boreiko, 2004). Later as agricultural practices started developing at different rates in civilisations around the globe (Descartes, 2010), wildlife crop damage started, and in 200 B.C, Hippos in the Nile Delta in Egypt were reported to feed and damage agricultural crops (Bullard, 1985).

During the era of Pre-3500 B.C, humans looked at wildlife damage management from a utilitarian view of nature by practising hunting and gathering (Descartes, 2010). Crop loss to wildlife damaging species was not common as this period was marking the birth of agriculture. Humans were an integral part of the food chain, and killing of wildlife was majorly done to ensure human safety but not for crop protection. Wildlife crop damage started to intensify during the ancient-medieval times. The period from 3500 B.C - A.D 1607 (Ancient–Medieval) marked the spread of agriculture; humans

begun to treasure farming and keenly looked at their crops not as food for wildlife. Agriculture was viewed as a major source of food as opposed to hunting and gathering. Herbivorous wildlife found crops as the convenient source of food readily available in nearby locations. Damage of fruit crops by primates started becoming a problem and farmers started wildlife crop damage management measures. Agriculture begun benefiting society, humans started building permanent shelter for safety and protection. Agriculture was then viewed as a source of income and any natural disaster that affected agricultural production, subsequently increased resentment to wildlife. This period paradigm was referred to as *Detached Utilitarian.* Humans managed wildlife damage with help of domesticated species such as cats to chase rodents (Conover, 2001). The period of *Detached Utilitarianism* in wildlife crop damage management is followed by the era of *Manifest Destiny* or the Colonial and Frontier America (1607 – 1890).

This period (Colonial and Frontier America 1607 – 1890) the first permanent English settlers in America were faced by eminent starvation. To protect their crops, many colonists adopted Native American technique to manage wildlife crop damage such as erecting platforms in crop fields so that children can throw stones at birds (Conover, 2001). Frontiersmen viewed wildlife as good and bad and not utilitarian (*Manifest Destiny).* Colonists believed that taming the wilderness was much more important than living with wildlife. The use of firearms to decimate wildlife started and bounties were offered for nuisance crop damaging wildlife especially birds such as passenger pigeons, *Ectopistes migratorius* (Lund, 1976, Conover, 2001); in addition, market hunting begun as way of boosting economic growth in the found country.

In Europe, this era marked the enactment of the Game Act of 1831 for protection of birds in England and Wales. This was an Act that also controlled hunting seasons. The purpose of the law was to balance preservation needs while ensuring economic growth (Bolen and Robinson, 1999). The killing of wildlife in Britain without a license was almost equivalent to killing a king's subject (Pevsner, 1961). Rhodes Island in America closed hunting seasons for the deers (Potter *et al*., 1973), The Sea Birds Preservation Act of 1869 was enacted as the first nature protection law in the world (Pevsner, 1961). Such laws boosted wildlife populations, increasing threats to crop damage by wildlife. This was the transition to the industrial era.

The industrial revolution (1890 – 1914) allowed human needs to be met on larger scale than ever before. This era required increased and efficient production of food to nourish populations (Wrigley, 2018). People begun living in cities, the economy boomed, and jobs were created (Junie, 2016). The American Frontier closed, and environmental problems such as pollution begun to emerge and people started reconsidering their new progress (Conover, 2001). People started to rethink about the loss wilderness and resources. New awareness about the importance of wildlife resources and wilderness started to characterize the industrial era. Two paradigms emerged during this era; the *conservation* and *preservation* paradigm. Conservationists such as Roosevelt and Gifford started advocating for promotion and sustainable use of natural resources (Callicott, 2000), whereas preservationists such as Muir argued that nature and wildlife should be protected for spiritual and intrinsic values (Callicott, 2000).

Due to a stable economic basis, wildlife damage management begun to emerge as a profession C. Harter Merriam conducted the first survey on birds on agricultural fields in 1885 (Timm, 2000; Hawthorne, 2004; Miller, 2007). This marked the birth of Wildlife Damage Management (WDM) as a science. In 1899 British Amateur Naturalist Charles Rothschild established the first nature reserve in Britain (Leopold, 1963) to protect wildlife from the eminent danger posed by industrialization. The wildlife populations protected in nature reserves were later to be decimated by world wars.

During the era of Great Depression and World Wars (1914 – 1945), though the industrial revolution had birthed Wildlife Damage Management as a science, the period of Great Depression and World Wars, characterized by increasing foreign tensions and concerns about the war substantially decreased tolerance for wildlife crop damage. Enormous funds were made available for wildlife damage control during 1915 (Miller, 2007). The basic needs of people were not being met world over due to war, food shortages and increasing food prices made society to view wildlife from a '*Utilitarian Perspective'.* To-date (Modern Era), some members of society still view wildlife from the utilitarian perspective.

Scheffer, (1980) referred to the *Modern Era (1945 – Present)* as the Age of Environmental Awareness. This Age dawned in 1960's and marked the benign – 'sympathetic' use of wildlife resources in ways that were less harmless and exploitative to wildlife and human populations. The Age has marked the growth of the economic sector through activities such as wildlife watching, growth of interest in recognition of animal rights, legislating in favour of wildlife protection, decrease in sport hunting and popular sentiment has increased influence on wildlife use decisions (Jacobson *et al*., 2010).

The human population has increased substantially during the Modern Era, though characterized by poverty. With over 800 million people living under extreme poverty spending < $1.25 a day (UNDP-SDG Report, 2015), there is increasing demand for land resources to practice agriculture. Agriculture has decimated wildlife habitats increasing vulnerability to crop damage by wildlife (Lynagh and Uric, 2011). In Uganda over 80% of the populations are agriculturalists farming in the country side

where protected areas such as KNP are found (Jason and Eric, 2009). Overall, wildlife crop damage has increased as a result of wildlife habitat encroachment, and intolerance to wildlife damage has increased due to crop loss and damage which is subduing economic needs (Frank and Conover, 2015).

This paper aimed to trace the history of wildlife crop damage and management, examine how crop farmers near protected area become vulnerability to wildlife crop damage, establish the philosophical perspectives that shaped wildlife crop damage and management, and evaluate policies on wildlife crop damage and management, with a view of wildlife crop damage mitigation.

METHODOLOGY

The information contained in this paper was reviewed from existing literature. Information on policies and laws was reviewed from the national laws of Uganda in line with wildlife conservation and crop damage management. Several secondary data sources online were reviewed to build the philosophical and historical sections of this paper.

Vulnerability to wildlife crop damage in Africa

In tropical Africa where there are abundant biological resources being used by humans, crop damage is inevitable and is the most significant source of human-wildlife conflicts (Walpole and Thouless, 2005; Barirega *et al.,* 2010; Howlett and Hill, 2016). Since protected areas in the world are always often implemented as top-down conservation strategies (Adam, 2004a), this makes it difficult for crop farmers to protect themselves from crop raiding and damage by wildlife (Woodroffe *et al*., 2005). This has made wildlife flourish and become common pests to crop farmers near protected areas in Africa (Drazo *et al*., 2008). Several species of wildlife have been implicated to cause crop damage especially in Africa.

Species such as the African elephants [*Loxodonta africana*] (Barnes, 1996; Lahm, 1996; Nyhus, 2000; Sitati *et al*., 2005) and primates (Naughton-Treves, 1998; Hill, 2000; Sillero-Zubiri and Switzer, 2001; Madden, 2006) are recorded to cause severe damage to subsistence crop farmers in Africa. Several factors are known to increase crop damage. Factors such as growing crops between forest patches and farming close to the protected area boundary (Naughton-Treves 1998, Hill 2000; Kagoro-Ruganda, 2004; Linkie *et al.,* 2007) are known to increase agricultural crop damage by wildlife. Farmers living close to permanent water sources and well distributed rainfall can also increase crop damage (Barnes *et al*., 2006).

Increasing natural forest cover near crop gardens (Tweheyo *et al*., 2005), types of crops grown and their maturation period (Hill, 2000; Linkie *et al*., 2007) can also exacerbate crop damage. Understanding the natural environment where crop farmers practice agriculture, the nature of crop damaging wildlife, the social and political circumstances are important parameters in understanding wildlife crop damage (Hoare, 2001). Thus, crop farmer's vulnerability to crop damage by wildlife can be categorised into three dimensions, biophysical, social and institutional vulnerability (Fairet, 2012).

Vulnerability to crop damage by wildlife increases food and economic insecurity among subsistence farmers in Tanzania (Kaswamila *et al*., 2007) and Uganda (Barirega *et al*., 2010). Food insecurity can be defined as adequate food in terms of quality, quantity and safety of food reserves and economic security as subsistence income for daily needs (Gross, 2002. Farmers around Kibale National Park in Uganda are prone to food insecurity, since they could be deprived of adequate food reserves through crop damage (Hill, 2000).

Apart from deprivation of food and income, crop damage makes crop farmers vulnerable to diseases such as malaria which could be contracted during guarding of crop gardens (Hill, 2000, 2004). Children are also deprived of adequate time to sleep and attending school especially during crop growing and fruiting seasons, as they have to provide labour and guard crop farms around Kibale National Park (Linkie *et al.,* 2007; Hartter *et al*., 2011).

Institutions such as Uganda Wildlife Authority which is mandated with management of protected areas in Uganda, though not liable to compensating crop loss and damage, are also vulnerable to continue spending income in crop damage management in form of formulating strategies and designing interventions to deter crop damaging wildlife (UWA, 2014), thus vulnerability to crop damage by wildlife has far reaching implications ranging from social, economic and those that are institutional in nature (Cutter *et al*., 2003). Crop farms location from the protected area and the nature of agricultural activities practiced by farmers make them vulnerable to crop damage by wildlife. Some farmers are known to plant crops which attract wildlife to their farms. This makes institutions mandated with managing crop damage also vulnerable to compensate communities for crop loss or damage and mitigation (Figure 1). Therefore, identifying suitable buffer crops which crop can adopt and grow to mitigate wildlife crop damage could reduce vulnerability to crop damage by wildlife around protected areas.

Philosophy behind wildlife crop damage and its management

Though damage to agricultural crops by wildlife is a natural phenomenon presumed to have existed since the

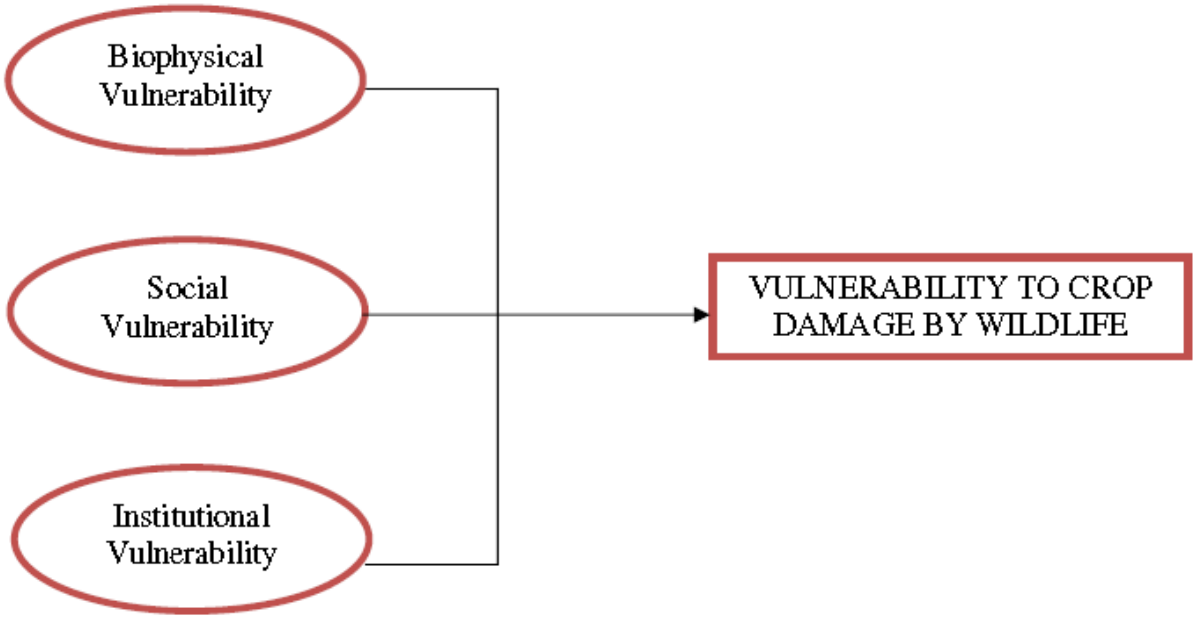

Figure 1. Three-dimensional approach to vulnerability of crops to damage by wildlife (Modified from Fairet, 2012).

birth of agriculture (Ogra and Badoola, 2008) and it has been noted to deprive communities of agricultural livelihoods, eco-philosophers and ecologists continued to value the importance of wilderness especially during the Industrial Revolution (Rolestone, 1991). In the early 19th Century Eco-philosopher Thoreau emphasized wildlife freedom irrespective of damage wildlife imposed to agriculturalists. Radical ecologist Foreman, (1992) noted that it was necessary to let nature go, without any human use of it (Boreiko, 2004 and 2010). Such philosophical thinking boosted wildlife populations in the 19th Century, facilitating increased wildlife crop damage (Boreiko *et al*., 2013).

Eco-philosopher Rolstone III (1992) emphasized that there should be a distinction between natural and artificial interference of men with uses regarding wildlife, Rolstone, (1992) suggested passing a declaration of freedom for the remaining wildlife. He noted that freedom and autonomy should be guaranteed for people managing wildlife in nature reserves and sanctuaries. Eco-philosopher Turner (2003) criticized Rolstone's idea on administration of nature reserves which principally controlled and managed wildlife for tourist recreation. Turner was of opinion that people cannot conserve wildlife like they do to straw berries – picked, cooked and preserved in jars. Turner (2003) emphasized some form of sustainable utilitarianism of wildlife though considering conservation autonomy and freedom. The founding father of utilitarianism Bentham (1823) also noted that *"pleasure is good and pain is evil; and an ethical person should attempt, in choosing courses of action, to maximise one and minimise the other, no matter whose pain or pleasure may be involved".* Jeremy's grounding paved way for utilitarianism of wildlife, though Singer (2009), a resolute philosophical opponent of utilitarianism and supporter of animal liberation did not support utilitarianism of wildlife. Singer (2009) further argues that the interests of animals should be considered because of the ability to experience suffering. Singer instead popularized speciesism a form of wildlife utilisation based on the species membership. Therefore, it can be noted that philosophical viewpoints shaped how wildlife populations could be managed, and this had implication on crop damage by wildlife alongside agricultural developments. Many species of the primate genera include agricultural crops in their diet (Hill, 2017). About 13 species of primates are found in Kibale National Park and 6 of 13 are recorded as wildlife crop damaging species (Naughton-Treves, 1998). Agricultural crops provide wildlife with an alternative and accessible food source (Wallace and Hill, 2012).

This paper is underpinned by philosophies of Peter Singer, Theodore Roosevelt, and Gifford Pinchot who advocate for sustainable use of wildlife resources and Singer also supports moral use of natural resources. There should be a balance between uses of wildlife resources both ethically, morally and sustainably. The returns from wildlife resources should sustainably be used to mitigate wildlife crop damage.

"We have fallen heirs to the most glorious heritage a people ever received, and each one must do his part if we wish to show that the nation is worthy of its good fortune." Theodore Roosevelt.

This statement implores humanity to take charge of natural resource use in a sustainable manner for posterity. In personal view on mitigating wildlife crop damage, there is need to use the returns from conservation to promote conservation, by enabling communities to adopt and grow buffer crops as a mitigation strategy to wildlife crop damage.

Useful theories and practice on wildlife crop damage and management

Contrary to traditional wildlife management techniques such as guarding of crop farms (Hill, 2000), planting of scare crows in gardens and use of fire crackers (Rebekah, 2009), construction of crop field watch-over towers (Sudip and Siddharta, 2006), shooting to death of wildlife crop damaging species trapped using remotely sensed cameras as a way of minimizing crop loss is common trend in Europe and America (Rod and William, 2016). The Optimal Foraging Theory (OFT) asserts that wildlife crop damage can be triggered by nutritional stress caused by a decline in the quality and nutritive value of natural forage (Osborn and Parker, 2003). Vulnerability to crop damage can also be exacerbated by crop farms location from a national park (Wallace, 2010, Shaurabh and Sindhu, 2017). Since proximity to a protected area is the strongest predictor to crop damage, there is need for crop farmers to adopt buffer crops such as tea (Akampulira, 2015) and other “buffer crops” that shall be identified by this study to mitigate crop damage and loss to wildlife.

Policies on wildlife crop damage management in Uganda

Conservation policy in Uganda has evolved from pure-protectionism to a protected-neighbour strategy (Catrina *et al.,* 2017). Most of the legal framework pertaining to wildlife is geared towards wildlife protection and conservation, with less effort geared towards management of wildlife crop damaging species and compensation. Only the Uganda Wildlife Bill 2017 provides for compensation of crop damage by wildlife. Though the Uganda Wildlife Bill 2017 provides for monetary compensation, compensation is slow, cumbersome, may involve corruption, there may be no significant funds to cover compensation, and may not decrease the problem of wildlife crop damage (Naughton-Treves 1999; Hoare, 2000; Envik, 2000). Thus, evaluating the effectiveness of buffer crops and designing mechanisms on how crop farmers can adopt them to mitigate wildlife crop damage, which is the gist of this study can complement compensations schemes by Uganda Wildlife Authority.

The Constitution of the Republic of Uganda (1995) states that natural resources should be conserved and managed in a sustainable way in order to grant development and environmental needs for the present and future generations. The National Environment Act (1995) under section 73 (2) also provides for protection and sustainable use of wildlife. The Land Act (1998) under articles 43 and 44 provides for the right of Government of Local Government to acquire land for wildlife protection. The Uganda Wildlife Act of (1996) as the main legislation pertaining wildlife conservation, management and prosecution of wildlife crime establishes Uganda Wildlife Authority (UWA) and mandates it to manage wildlife and license any activity regarding wildlife use in Uganda. The Uganda Forestry Policy (2001) supports the idea of an inclusive and sector-wide policy, supporting sustainable use of forest resources for economic development, poverty alleviation and environmental sustainability.

The Uganda Wildlife Policy (2014) is focused on sustainably managing wildlife resources and health ecosystems through sustainable utilisation of wildlife resources for economic development through curbing wildlife crime. The National Policy for the Conservation and Management of Wetlands (1995) supports utilisation of wetlands in a way that they do not lose traditional benefits while providing basic livelihoods to communities. The National Forestry and Tree Planting Act 2003 regulate use and accession of forestry resources and their derivatives. The Local Government Act, Cap 24, mandates Local Government Committees to initiate and formulate policies regarding use of natural resources. The Uganda Wildlife Conservation Education Centre (UWEC) Act (2015) mandates UWEC to manage and promote conservation education in Uganda. The Uganda Wildlife Act Cap 200 does not provide compensation for loss of property and lives from wildlife escaping from protected area. Furthermore, under Uganda Wildlife Act Cap 200, Uganda Wildlife Authority (UWA) is not fully liable to wildlife induced damage occasioned on communities by wildlife crop damaging species (Uganda Wildlife Bill, 2017), though some revenue is shared as per revenue sharing guidelines to cater for crop damage. The money is sent by Uganda Wildlife Authority (UWA) to the Local Government (districts) which share boundaries with protected areas, who remove only 5% as administrative costs and 95% is sent to sub-counties for the agreed upon projects between communities and UWA (UWA, 2014). For instance, revenue shared around Bwindi Impenetrable National Park has increased from 3,000,000/= per parish in 1995 to 15,000,000/= per parish in 2014 (UWA, 2014). However, UWA not fully being liable to wildlife crop damage could keep farmers more vulnerable to individual agro-economic losses, threatening food insecurity and increasing resentment to wildlife. Section 58(1) of the Uganda Wildlife Bill (2017) provides for farmers to report any form of crop damage to a wildlife officer. Clause 2(1) provides for assessment of

damage and clause 3 provides for decision making on compensation in line with the conservation status of crop damaging wildlife. Section 82(1) provides for formation of wildlife compensation verification committee, with 82(2) defining the roles of the committee. Section 83 creates compensation scheme 83(1) clauses a, b and c provides for monies to be used in compensating crop damage, and other damage occasioned by wildlife to communities living outside protected areas.

The Fourth Schedule of the Uganda Wildlife Act 2019 (*compensatable wildlife species whose damage creates liability to compensation*) Section 84(1) clause b on damage to property which also involves crops, only buffalo hippopotamus, baboons, gorillas, chimpanzee and bush pigs are listed for compensation, this leaves out other primates which are known to raid crops around Kibale National Park. Apart from baboons and chimpanzees which are listed on the list of compensatable wildlife on the Fourth Schedule of The Uganda Wildlife Bill (2017), the other four wildlife crop damaging species such as red-tailed monkey (*Cercopithecus ascanius*), vervet monkey (*Cercopithecus aethiops*), black and white colobus (*Colobus guereza*), L'Hoest's monkey (*Cercopithecus lhoesti*), are not listed. These species not listed were recorded in 1998 as crop damaging wildlife (Naughton-Treves, 2005).

The Uganda Wildlife Act 2019 provides for compensation schemes that could help farmers to replace agricultural livelihoods lost. However, there is no policy to promote the adoption and growing of suitable buffer crops to mitigate wildlife crop damage, since Akampulira, (2015) noted that tea was effective in buffering for crop damage at 93% around Bwindi Impenetrable National Park and Sitati *et al.* (2005) also observed that compensation could exaggerated by afflicted farmers, policies on promoting buffer crop growing are feasible. What is necessary now is to identify the several buffer crops, quantify crop damage in absence of buffer crops and develop mechanisms of encouraging farmers to grow the buffer crops, which this study seeks to undertake.

Conclusion

Wildlife crop damage remains a threat to agricultural livelihoods of crop farmers farming near protected area (MacKenzie and Ahabyona, 2012). There is need to introduce a new approach of farmers identifying buffer crops and devise appropriate mechanisms for involving crop farmers in practicing sustainable agriculture by growing buffer crops which are not palatable to wildlife yet of economic value to farmers. This will not only be a mitigation strategy to enable farmers practice sustainable agriculture but it will also be a new strategic approach to prevent wildlife from damaging crops as well as protecting the wild animals themselves.

Recommendations

(i) There is need to identify suitable buffer crops which crop farmers can adopt and grow to mitigate wildlife crop damage to reduce vulnerability to crop damage by wildlife around protected areas.
(ii) To mitigate wildlife crop damage, there is need to use the returns from conservation to promote conservation, by enabling communities to adopt and grow buffer crops as a mitigation strategy to wildlife crop damage.
(iii) Since proximity to a protected area is the strongest predictor to crop damage, there is need for crop farmers to adopt buffer crops such as tea to mitigate crop damage and loss to wildlife.
(iv) The proposed compensation schemes by Uganda Wildlife Authority as per the Uganda Wildlife Act (2019) can be complemented by encouraging farmers to grow buffer crops. Sensitization and agricultural education are necessary to get crop farmers involved in buffer crop growing.

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