TRADITIONAL AND MODERN METHODS AND TOOLS ADOPTED BY INDIAN FARMERS AGAINST WILDLIFE CROP DEPREDATION

M.N. Ramesha[1], J.M.S. Tomar[2] and S.L. Patil[1]
[1]*CSWCRTI, Research Centre, Bellary, Karnataka-583104, India*
[2]*CSWCRTI, 218, Kaulagarh Road, Dehradun, Uttarakhand- 248195, India*

Ecologically in coexistence, certain levels of conflict among biota are inevitable and never ending but amenable to management (Madhusudan, 2003; Karanth *et al.*, 2012). Food chain, the basic ecological principle that governs planet's balance has been evolved over millions of years ago, and which has been disrupted due to anthropogenic activities. It has caused imbalances in prey and predator population and their trophic relationships with each other. As a result, reports of man-animal conflicts are increasing day- by-day. Farmers across the globe continue to face various threats from pests, natural calamities, thefts and damages by animals resulting in loss to crop, livestock loss and human injury and death (Karanth *et al.*, 2012; Karanth and Nepal, 2012). Also effective implementation of wildlife protection laws, thereby reduced game hunting caused an improvement in population of certain animals in wild such as wild boar (*Sus scrofa*) (Schlagete and Wackernagel, 2012; Kumar, 2012; Saito *et al.*, 2011), Nilgai (*Boselaphus tragocamelus*) (Karanth *et al.*, 2012; Kumar, 2012; Chauhan, 1989), elephant (*Elephus maximus*) (Karanth *et al.*, 2012; Karanth and Madhusudan, 2002; Sekhar 1998), tiger (*Panthera tigris*) (NCTA, 2010; Hindu, 2012) etc. Thus animals extended their activity into agricultural land, which intensified conflicts with humans. Further fragmented and isolated islands of protected forest areas and intensive and modern agriculture techniques brought large scale fallow land under cultivation which aggravated conflicts. According to Karanth (2012) the reasons for crop raiding by wild animals can be as follows: (i) Increased crop intensity or cropping months in a year; (ii) Reduced fallow lands due to farm mechanization; (iii) Reduced forest land and its intensive use by domestic livestock ; (iv) Poor maintenance or encroachment of village common lands, pastures and forests; (v) Increased population of wild animals due to lack of predation upon them by higher order carnivores; (vi) Fragmented forest patches.

From time immemorial man has fought with wild animals for survival, food and space. Man has tried and designed many self defending methods and techniques to quench such attacks. For crop protection farmers also have tried various methods to control crop depredation from wild animals since time immemorial. In this article different practices traditionally adopted by farmers and designing of modern techniques with available resources have been described. Also an attempt has been made to illustrate farmers practice and accounted cost, applicability, advantages, disadvantages, technological gaps, effectiveness, longevity and scope for up scaling of the local practices.

1. Manual Night Patrolling of Fields with Beating Drums or Empty Tin Cans

Night patrolling of fields is the very oldest method where farmers used to go together after sowing seeds in the fields till emergence of seeds from the soil. Farmers' use drums or empty oil tins for creating noise in the night to scare away wild animals. This method adds drudgery to the farmer, as farmers usually engaged in day works and also has to patrol fields in the night. This method is not foolproof one as tired farmer get into nap while patrolling provides chance to the wildlife to enter the field.

2. Night Patrolling of Fields and Firing Crackers

This method envisages using cracker that will scare away wild animals. Fired crackers generate sound and some sorts of fume that serves as gustatory repellent. Wild animals usually avoid fields where they have negative experiences. This learned avoidance as a consequence of negative experience is not a promising means for protection of crops from wild boar damage.

3. Night Patrolling of Fields Using Locally Made '*Garnels*'

Garnel is a locally designed tool used to make sound like cracker or gun fire (Fig. 1). Structurally it has one end closed hallow steel rod (8-10 cm) to which an iron rod fastened as a handle (150 cm). Farmers use a nail to close *garnel* mouth after filling it with gunpowder (a mixture of sulfur, charcoal, and potassium nitrate). After loading one fourth of hallow rod with gunpowder to avoid powder spillover, a small paper or other inert material is used close the mouth. Nail has to be slowly and carefully inserted into the hallow iron rod. Pressing nail with force will be dangerous as it fires instantly. Once the nail is inserted the

garnel is ready for firing. For firing *garnel* has to be dropped upright nail end over a stone or rough surface by holding of the handle (150 cm) at the end. The firing creates huge sound like gunfire. Thus it intimidates wild animals entering the field. The great advantage of this method is that it saves money spent for crackers and *garnel* will be last for years. Manufacture of *garnel* will cost Rs 250. Thus farmers provide protection to crop with little money by scaring away wild animals. Sometimes careless filling of *garnel* turned into dangerous and damages fingers. For scaling up use of this techniques and avoid night patrolling an improvement required in mechanical automation of *garnel* firing with time setting. By this way farmer can set time interval for *garnel* fire at different locations in the field to save crops.

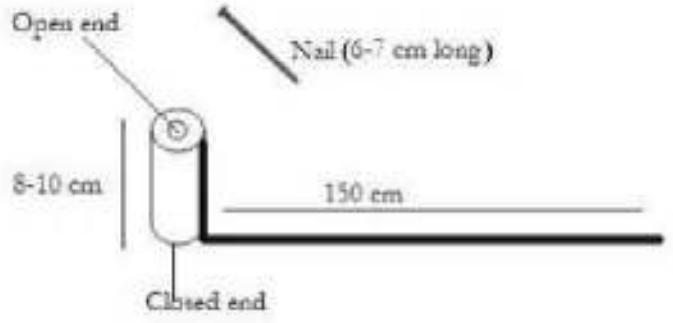

Fig. 1: Local design of *Garnel*

4. Night Patrolling of Fields and Burning of Used Tires

Burning tires generates obnoxious odour and tires burn slowly even in rainy days. Thus farmers used to burn used cycle and scooter tires during night time around the field. Burning tire also serves as a torch during night patrol. As learned experience, wild animals avoid such place from where some new odour or smell sensed. This method followed to protect seed sown fields till the germination of crops such as maize, sunflower, jowar, bajra, ragi, groundnut, chickpea etc.

5. Metallic Wire Tangled Paan Boxes Over Wooden Pegs

In this method farmers encircle their fields by metallic wire (14 gauge or 2.03 mm diameter) enlaced with closed empty metallic pan boxes fixed over wooden pegs at about 35-40 cm above the ground (Fig. 2). Wooden pegs of 60-75 cm posted in 20 cm deep crowbar hole at 5-6 m distance along the boundary of the crop field. Approximately 180 to 225 empty used or new metallic paan boxes and forty kilogram of metallic wire required to cover one hectare area. Total cost of this technology may vary from Rs. 4540- 5125 ha^{-1}. After crop harvest paan box-wire-set has to be removed properly and rolled for using in next season crop. This method is in practice for protecting maize, jowar, ragi, sunflower, beans and vegetable crops from against wild boars, deers, nilgai and porcupines. Boxes filled with stones generate sounds to frighten both animals entering field and send alarm signal to the night patrolling farmers from distant end. Many times animals avoid such fields as learned experience of electric shocks received in a field where similar wire system has been placed in the boundary and connected either to charged batteries or electric lines. To improve its efficiency famers should connect wire to the controlled battery power system in alternative days or specific time intervals and for scaling-up farmers should be given subsidy for procurement of rechargeable batteries.

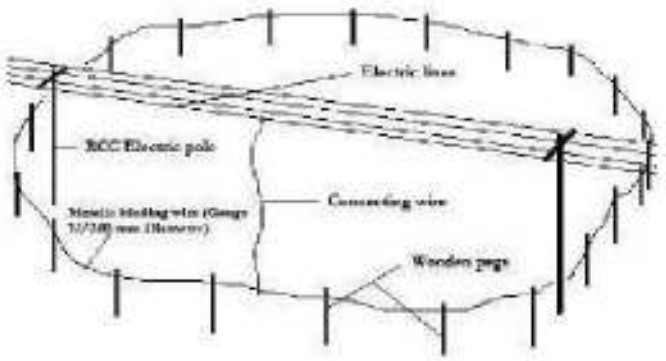

Fig. 2: Binding wire tangled with closed metallic pan boxes and filled with few stones and fixed over wooden pegs

6. Electric Power Circulation Through Metallic Wire Fixed Over Wooden Pegs

In this method farmers encircle their field with metallic wire fixed over wooden pegs (Fig. 3). Wooden pegs of 60-75 cm posted in 20 cm crowbar hole at 5-6 m distance along the boundary of the crop field. Fourteen gauge (2.03 mm diameter) metallic wires fixed over the wooden peg at about 35-40 cm above the ground. Approximately forty kilogram of metallic wire required covering one hectare area and the total cost of technology is Rs 3800 ha^{-1}, when no charges paid towards electricity used. After crop harvest wire will be removed and stored for next season crop. This method is very crude and many casualties of animal and human reported. An improvement in this technology is required to regulate the use of electricity for crop protection by using voltage regulated system to scare animal and payment for usage of electricity. Rechargeable battery system with voltage regulators would be the better alternative system. This method is effective against wild boars, deers, blackbuck, porcupines and elephants.

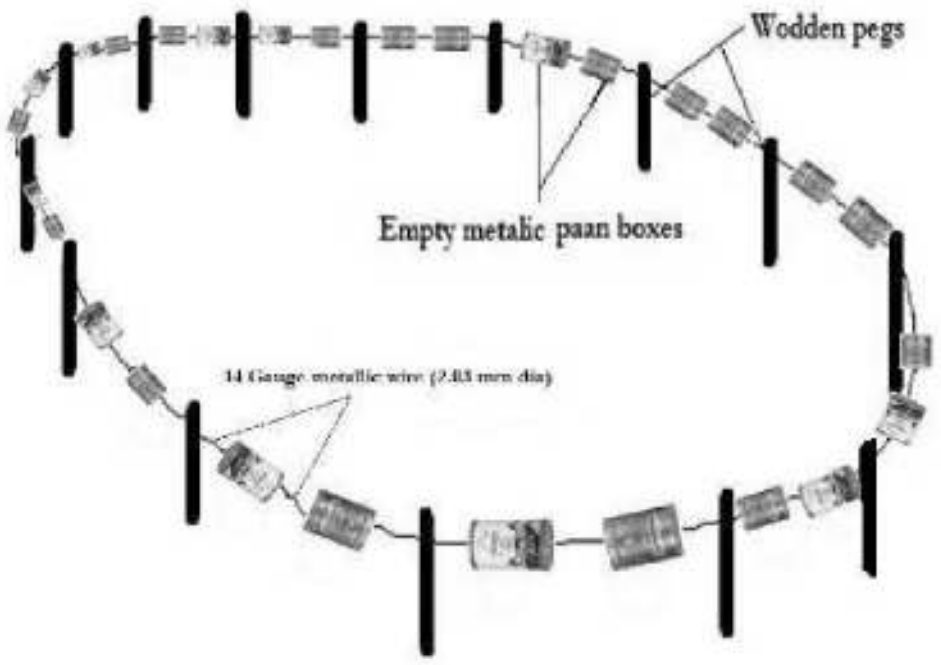

Fig. 3: Encircling field with metallic wire fixed over wooden pegs and connecting it to single phase electricity line

7. Battery Powered Metallic Wire Line

This method is very similar to electric power circulation through metallic wire fixed over wooden pegs but source of electricity is rechargeable batteries instead of electric lines. In this method too farmers encircle their field with metallic wire fixed over wooden pegs. Total cost of technology involves cost of metallic wire, labour charges and mainly rechargeable battery. Batteries may cost Rs 6000/- each. Thus total cost would be around Rs 10000 ha^{-1}. Regular battery charging is also seems to be added drudge to the farmers and lack or failure power supply during rainy seasons in villages render batteries useless.

8. Hatchery Waste Spraying

Unhatched, broken, damaged, old, liquefied, or even ordinary table eggs emit pungent odour upon spoilage. Thus spraying spoiled egg contents mixed with water around home gardens and farm lands ward off plants and crops from deer graze and browse. Interestingly, workers in chick hatcheries noticed behavioural changes in deer herds which do not come near the places where they dispose their hatchery waste. Intense spraying on the borders of the crop fields for about 10 feet width on all around or on the side (forest side) from which animals enter the field will repel them from a distance. The pungent odour generated by the eggs, will repel the herbivorous animals from entering into the field for about a month except during rainy season. However, for large scale use, unintended consequences like spread of avian diseases and effect on inhabitants needs to be ascertained.

9. Sari Guard

This new form of prevention of wild animal pestilence has come into practice by vogue recently. Farmers having lands adjoining to the forests employ this method to safeguard their crop. The farmer tried some out of the box idea and covered field with sari all along the border.

10. Effigies of Empty Fertilizer Bags

Usually moisture proof white or yellow poly bags and retired clothes have been used to pack fertilizers. Farmers use empty fertilizer bags to scare away wild boars from seed sown fields. Empty bags have been capped over the two wooden pegs fixed over ground by crowbar hole. Such fixtures have been made all along the border of the field to serve as an effigy and in wind poly bags make some sounds Famers erect such effigies at a distance of 15 to 25 m along the border adjoining forest areas. Empty fertilizer bags available at free of cost after using fertilizer thus no cost involved in this practice except labour work for fixing bags over wooden pegs. This method is instant and provides very short duration effect.

.

11. FM Radio and Loudspeaker

In this practice, farmers' fixing amplifiers to trees and other posts available and turning on the music broadcasted by FM radio channels at night in FM Radios. This method was evolved from playing small batteries powered tape-recorder at night as supportive mechanism to keep awake farmers. Possible improvement in the technology could be achieved through employing rechargeable battery supported amplifiers system with music player having USB port to connect pen drives. Thus farmers can switch on the music player using records stored in pen drives which can be played over night. Different sounds, music and mimics could be played to scare away the wild animals.

12. Dadhi method

The 'dhadi', an indigenous method of fencing agricultural fields in which locally available materials viz., twigs of bamboo and *Zizyphus jujube*. This practice is coming back in a big way as more number of farmers opting for cultivation of food grains and vegetables during kharif other wise left as fallow. It is the cheapest, durable and effective in protecting crops from wild animals and stray cattle. Tightly fixed and filled fence will last for five to six years with annual minor repairs.

References

Chauhan NFS & Sawarkar VB. 1989. Problems of over-abundant populations of Nilgai and Blackbuck in Haryana and Madhya Pradesh and their management. *Indian Forester* 115(7):488-493.

Karanth KK, Gopalaswamy AM, DeFries R & Ballal N. 2012. Assessing Patterns of Human-Wildlife Conflicts and Compensation around a Central Indian Protected Area. PLoS ONE 7(12): 1-13. e50433. doi:10.1371/journal.pone.0050433

Karanth KK & Nepal S. 2012. Local perceptions of benefits and losses of living around protected areas in India and Nepal. *Environmental Management* 49: 372–386. doi: 10.1007/s00267-011-9778-1.

Karanth KU & Madhusudan MD. 2002. Mitigating human-wildlife conflicts in southern Asia. In: Terborgh JW, van Schaik C, Davenport L, Rao M, editors. Making Parks Work: Identifying key factors to implementing parks in the tropics. Covelo, CA: Island Press. 250–264.

Kumar H. 2012. Human-wildlife conflict in a degraded habitat of lower chambal valley. *Asian J Res Social Sci Human,* 2 (4): 193-205

Madhusudan MD. 2003. Living Amidst Large Wildlife: Livestock and Crop Depredation by Large Mammals in the Interior villages of Bhadra Tiger Reserve, South India. *Environmental Management,* 31(4): 466-475.

NCTA (National Tiger Conservation Authority). 2010. Details of tiger estimation for the year 2006 and 2010. (available at http://projecttiger. nic.in/content/106_1_Detail of Tiger estimation theyear2006and2.aspx accessed on 17.05.2014)

Saito M, Momose H & Mihira T. 2011. Both environmental factors and countermeasures affect wild boar damage to rice paddies in Boso Peninsula, Japan. *Crop Protection,* 30:1048-1054.

Schlagete A & Wackernagel DH. 2012. A Gustatory Repellent for Protection of Agricultural Land from Wild Boar Damage:

An Investigation on Effectiveness. *Journal of Agricultural Science*, 4(5):61-68.

Sekhar N. 1998. Crop and livestock depredation caused by wild animals in protected areas: the case of Sariska Tiger Reserve, Rajasthan, India. *Environmental Conservation* 25: 160–171.