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Popular ITK Practices in Kumaon Region of Uttarakhand

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Abstract

Indigenous technical knowledge (ITK) is the information base for a society which facilitates communication and decision-making. The rural people have intimate knowledge of many aspects of their surroundings and adopt them based on needs to solve local problems in managing agricultural and related activities. ITK envisages the villagers to diagnose the particular disorder or disease in field crops, vegetables, and livestock, as well as its management through their capabilities as proved by their ancestors. This technique is largely based on the farmer's assumption, reliable evidences, economic viability, farming community consent, traditional sound knowledge, and positive result. Villagers in hilly areas are more sensitive to adopt ITK practices as they are far away to recent agricultural as well as social developments. They easily follow the traditional knowledge that they have learnt from their older generations. A number of ITK practices are also frequently used by the villagers of Kumaon region of Uttarakhand in North India. Some very popular ones are discussed.

Indigenous technical knowledge

The increasing attention that indigenous knowledge is receiving by academia and development institutions has not yet led to a unanimous perception of the concept of indigenous technical knowledge (ITK). ITK is the local knowledge – knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and several other activities in rural communities. Indigenous information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems. This knowledge system is usually not found in written form and is transmitted from generation to generation through word of mouth. It includes concepts, belief, and perception and usually found in various folk forms (Jardhari, 2007; Kareem, 2008). All traditional knowledge is not indigenous but all indigenous knowledge is traditional.

Today, many ITK systems are at risk of becoming extinct because of the rapid changing natural environment and fast pacing economic, political, and cultural changes. Many practices have vanished as they became inappropriate for new challenges. However, a number of practices disappear only because of intrusion of foreign technologies or development

concepts that promise short-term gain or solution to problems without being capable of sustaining them.

Objective and methodology of the study

In the present agriculture scenario, insecticides, fungicides, herbicides, etc. are being used in large quantities in field crops, vegetables, and orchards. Due to the imbalanced and excessive use of chemicals on large scale, fields are becoming barren and infertile leading to decline in productivity. On the other hand, in the indigenous technique there is no or little use of chemicals because of the farmer's ecofriendly attitude; it is less expensive, has subsidiary benefits, results in less insect pest and disease incidence in crops, and leads to long-term sustainability of soil and crop productivity (Sundamari and Rangnathan, 2003).

Therefore, realizing the importance of ITK, the popular ITK practices prevalent in Kumaon region of Uttarakhand in North India have been documented. This activity was executed during Front Line Demonstration visit to the villages through meetings, group discussions, interaction with villagers (including elderly persons) and also exploring such knowledge by traveling in remote/interior areas (Dubey *et al.*, 1993). This assignment was carried out during 2007–10 under the project "Development of organic package of practices for various farming situations of Uttarakhand Hills". About 800 villagers in 105 villages were contacted for the purpose to share their experiences. Some of the most popular ITK practices are discussed.

Popular ITK practices

Breaking of clods during plowing

After harvest of the crop, especially transplanted rice, the soil becomes very hard. Under this situation when plowing is done, many big clods appear on the soil surface. Farmers use an implement, locally called *dilar* (Fig. 1a) to break the clods for subsequent easy plowing and sowing. The *dilar* is beaten on the clod for breaking into small pieces (Pandey *et al.,* 2006). The implement is easily available in the villages or local market and costs ₹ 30–60.

Breaking of hard pan of soil and weed control in upland crops

When rainfall occurs after sowing of French bean, soybean, or other crops, the soil becomes hard after drying and hinders seed germination. To overcome this problem farmers use a small forked implement known as *rake*, which is attached to a wooden stick for easy handling (Fig. 1b).The *rake* is gently moved in the field to loosen the soil surface. This practice not only breaks the hard pan but also the prevailing weeds are uprooted. It also facilitates easy germination of crop seeds and destroys the capillaries through which evaporation takes place, resulting in moisture availability for longer duration (Pandey *et al.,* 2006).

Weed control and moisture conservation

In hilly areas, crops like upland spring or *jethi* rice, finger millet, black soybean, horse gram, etc. are raised on conserved moisture. After monsoon rains the crop seedlings

emerge very fast; however, a number of weeds also emerge in the field, which affect the growth and yield of the crop. To overcome the problem, instead of manual weeding or use of chemicals, farmers plow the field in July–August with an implement called *danala* (Fig. 1c). It breaks the soil crust favoring moisture conservation and uprooting of many weeds.

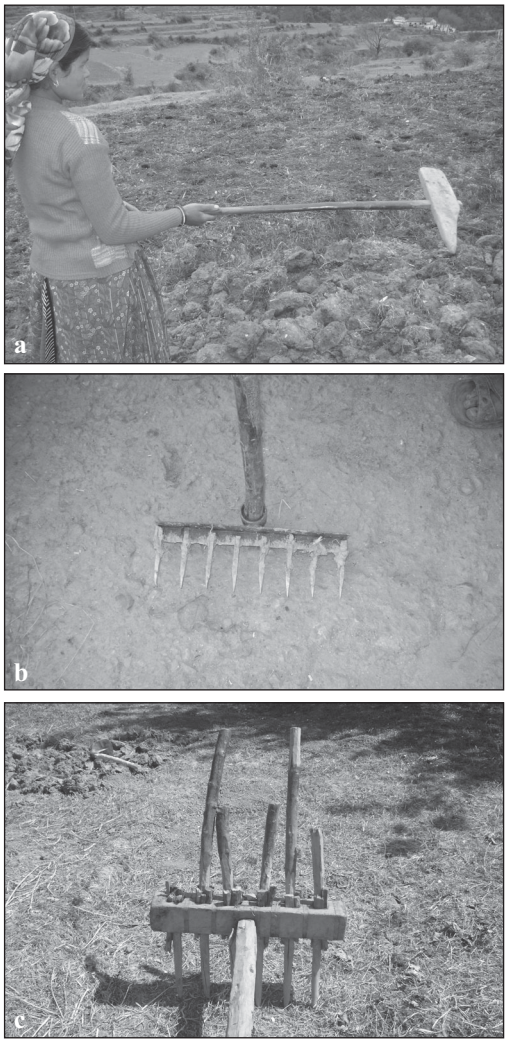

Figure 1. Plowing and intercultivation implements: (a) *Dilar;* (b) *Rake;* and (c) *Danala.*

Weed control in transplanted rice

Dry leaves of pine (*Pinus kesiya*) are spread in mid June in the field where rice has to be transplanted. The pine leaves are burnt before transplanting, i.e., in the first week of July (Fig. 2). This practice controls the germinating or prevailing weeds in the field. Farmers use this practice as a preventive measure for weed control in rice (Pandey *et al.,* 2006). Another advantage of this technique is that the stalks of wheat left during harvesting are also burnt which otherwise create difficulties during transplanting and other cultural activities.

Enhancing vegetative growth of transplanted rice

In hilly areas, farmers give equal importance both to rice grain and straw. The upper 8–10 cm tips of rice leaves are cut one month after transplanting. This practice helps in increasing the vegetative growth of the plant; also farmers use the cut leaves as nutritious fodder. Another advantage is control of stem borer. By cutting the leaf tips, unknowingly farmers

Figure 2. Pine leaves burnt before transplanting rice.

are also controlling the stem borer population because in the early stage of the crop the insect lays eggs on the tips of leaves.

Enrichment of transplanted rice through biofertilizer

Farmers bring the locally available algae from the farm pond or stagnated water in low-lying fields and spread in the transplanted rice at 2–4 kg per *nali* (1 nali = 200 m^2), 1–2 weeks after transplanting. The biofertilizer (algae) nourishes the plants resulting in higher yield.

Nourishment and forced maturity of garlic

In hilly areas, as the temperature increases from February onwards, vegetative growth of garlic also increases. Farmers believe that increased vegetative growth of the plant reduces the size of bulb. Therefore, they tie the garlic leaves on the top (Fig. 3). This technique is practiced in March to check the vegetative growth of the plants and favor increased growth of bulbs and to some extent forced maturity because immediately after harvest of this crop, the next crop has to be taken.

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Figure 3. Garlic leaves tied together to check vegetative growth.

Control of diseases in vegetable crops

About 4–8 kg of widely available *bicchu booti* (*Urtica dioica*) (Fig. 4a) is soaked in 8–10 L cow urine for 24 hours. The herb is then taken out and the solution is sprayed on vegetable crops. The solution is used as an organic fungicide against many fungal diseases of vegetables mainly tomato, capsicum, onion, radish, cucurbits, etc. Some common diseases that are controlled by this practice are anthracnose in capsicum, late blight and fruit rot in tomato, and alternaria blight in cucurbits. The following precaution should be taken while cutting the herb: one should not touch the grass as it causes painful itching for 2–4 hours.

Control of insect pests in vegetable crops

A weed, locally known as *mirchiya* (*Corallocarpus epigeos*) and which grows abundantly in marshy land, is used for the purpose. The morphological characters of the plant are similar to *makoya* (*Solanum nigrum*) having chili-shaped violet colored flowers. About 2–3 kg of the weed leaves

are crushed and mixed in 15 L of water. This solution is sprayed over an area of 1 *nali* in June–July in vegetable crops especially capsicum and cucurbits to control insect pests; for example, aphids on capsicum, fruit and stem borer in brinjal (eggplant), and fruit fly on cucurbits.

Control of aphids in oilseed crops

Aphids are the major pests of oilseed crops, causing heavy yield loss. Therefore, to minimize the problem farmers crush 2–4 kg leaves of herb *rambas* (*Verbascum* sp.) (Fig. 4b) and mix in 15 L of water. The solution is sprayed on the crop at 50 ml per *nali* in mid February to control aphids.

Figure 4. Herbs used for pest control: (a) *Urtica dioica;* and (b) *Verbascum* sp.

Control of white grub (*kurmula*) in grain crops

During field preparation, farmers broadcast the mixture of salt and Dichlorovas or Nuvan in the field for white grub control (Fig. 5). Since white grub is one of the major problems during *kharif* (rainy) season, therefore, this practice is used for various rainfed crops such as upland spring or *jethi* rice, finger millet, black soybean, horse gram, etc.

Control of white grub (*kurmula)* in vegetables

About 2–3 kg of green tender leaves of *bakain* (*Melia azedarach*) or *rambas* (*Verbascum* sp.) are crushed and mixed in 5–10 L of water and used as stock solution. The solution is sprayed on vegetable crops at 50–100 ml per *nali* by dissolving in 8–10 L of water. Some farmers also spray *ritha* (*Sapindus emarginatus*) powder solution to control white grubs (Vivekanandan, 1994).

Control of rodents in rice crop

Generally 5–8 plants of *dhatura (Datura stramonium)* are planted on the border of one *nali* rice field. Before maturity of the rice crop, *dhatura* plants mature and the seed is shattered in the border area. When rats go

Figure 5. White grub: (left) larva and (right) adult.

towards the field, they eat the *dhatura* seeds. As the seeds are bitter, the rats are afraid to enter the rice field again. In some areas, green leaves and flowers of the ornamental plant *pili-kaner* (*Thevetia peruviana*) is also kept near the mouth of rat holes to protect the crop from their attack.

Protection of maize cobs from birds and monkeys

Birds, monkeys and other wild animals damage the cobs of maize resulting in heavy yield loss. To minimize the problem, farmers cover the cobs with polythene or cloth, etc. after seed setting (Fig. 6). This technique protects the crop from birds and animals.

Protection of grains from storage insect pests

Grains of cereals, pulses, oilseeds, etc. are treated with cow urine and are dried in shade overnight. These grains are stored in bins (metal or clay) along with dry leaves of walnut (*Juglans regia*), *timur* (*Zanthoxylum armatum*), and *bakain (Melia azedarach)* and sealed with the paste of cow dung and soil mixture to protect from storage pests (Mehta *et al.,* 2012).

Drying of wheat in the field

Sometimes rainfall occurs during harvesting period resulting in wetness of soil surface and there is no dry space in the surroundings. But farmers are bound to harvest the wheat crop; otherwise some other farmers leave their cattle for grazing which destroys the crop. Under these circumstances, farmers cut the wheat ears, make small bundles, and place them on the stem of the crop (Fig. 7). The ears dry very soon by this practice and then are kept at a safer place.

Storage of rice straw

Rice stalks are the major source of fodder during winter. Hence most farmers in hilly areas prefer tall rice varieties. After manual threshing, small bundles of the rice stalks are prepared. The bundles are placed in a conical heap-like structure called *lutta* on mid-height of a pine tree by a trained villager (Fig. 8) (Singh *et al.,* 2010). In the

Figure 6. Maize cobs covered for protection from birds and animals.

Figure 7. Bundles of wheat ears dried in the field.

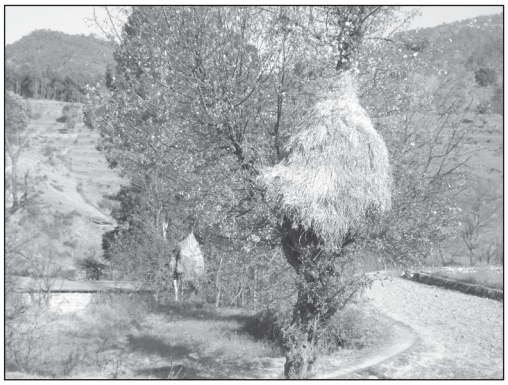

Figure 8. Rice stalk bundles stored on a pine tree.

lean months, i.e., winter, when there is acute shortage of fodder, the rice stalk bundles are taken out, chopped, and fed to cattle.

Green fodder for milch cattle

The stem along with leaves of *bheamel* or *bihul* (*Grewia optiva*) is cut periodically and fed to milch cattle (Fig. 9). This practice is adopted in lean months, i.e., December–February, when fodder is not available due to extreme cold. Further, after separating the leaves, the stems are fermented in water and the fiber is separated and used to make various kinds of ropes.

Beekeeping

Farmers make a hollow space of 1.5 ft^2 area from the inner side of the wall of the house. After keeping little honey, *gur* (jaggery), or sugar, the inner wall is blocked with copper net or wooden chips with the paste of cow dung and soil mixture. This fencing prevents the movement of bees inside the house. Similarly, in the outer wall, about 1–3 holes are made by which bees are attracted in the hollow space and the queen and worker bees start making honey in subsequent intervals. After 4–5 months, the inner wall is gently broken and a burning stick is inserted in the hollow space to drive the bees away from the hole and honey is collected and sold at ₹ 300–500 per liter.

Fishing

About 4–5 kg green leaves of the weed *rambas* (*Verbascum* sp.) are crushed and thrown in the stagnated water of fish pond or water stagnated area in the river. Due to

Figure 9. *Bheamel (Grewia optiva)* tree (left) with vegetative growth and (right) after cutting the foliage.

the poisonous effect of the weed, the fish become unconscious, and come up on the surface of water. Then they are easily caught by the villagers. However, this technique of fishing should be banned because it may kill many fingerlings and other important fish species.

Bone fracture treatment in cattle

Bone fracture in animals can be treated by making a paste consisting of green leaves of pine, red soil (*geru*), and lime. After heating the above ingredients, it is placed on the fractured portion and tied with cloth/ bamboo sticks. The affected cattle get relief very soon.

Control of muscle cramps in cattle

The herb *bicchu booti* (*Urtica dioica*) grows abundantly in the region and is easily collected. About 500 g of the leaves is crushed and a paste is prepared. The paste is placed on the strained portion of the leg of cattle to get relief.

Recovery from throat and tonsil swelling in cattle

The ash of the weed *babila* (*Tridax procumbens*) is rubbed about 3–4 times on the swollen portion of the throat. Thereafter a hot *taav* is applied four times on the same point. This practice gives relief to the animal.

In case of tonsillitis, a paste of finger millet (*Eleusine coracana*) flour, oil, *gur*, and water is placed on the affected area and covered with cloth. Through this treatment the animal recovers soon. Sometimes this treatment is also used for human beings.

Protection of cattle from stomach infection

Some of the common preparations used to feed the sick animals for relief from the infection are: (i) Paste of black soybean and black pepper; (ii) Fish oil mixed with wheat flour; and (iii) Mixture of raw turmeric and the medicinal plant *gania* (*Salvia lanata*).

Control of leech in cattle

The animals that are left for grazing are mostly infested with leeches. Sometimes during grazing, the leeches get into the nostrils of cattle. Sucking of blood by the leech causes laziness in the animal. For control of this parasite, villagers provide drinking water mixed with tobacco leaves and salt crystals contained in a copper vessel. After drinking water, the animals sneeze with high pressure and the leech comes out and can be easily pulled.

Control of foot and mouth disease in cattle

The infected cattle are isolated from the herd and shifted in a shady and muddy place. A paste consisting of tender leaves of peach (*Prunus persica*), *bakain* (*Melia azedarach*), and chilies mixed in heavy clay soil is placed on the wound of the animals. Sometimes a paste of the mixture of *gur*, turmeric, and mustard oil is used on the wounded portion. This practice checks the infection of this disease.

Remedy for snakebite in cattle

Banana bark, ground coriander seeds, and *deshi* ghee are fed to affected cattle. This reduces the poisonous effect of snakes on the animals.

Conclusion

The above techniques are more beneficial, easily adaptable, less costly, economically viable, and help in insurance against insect pest and disease occurrence in field crops, vegetables, fruit orchards, and cattle and even in human beings. These techniques, however, require validation for future use.

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