

Integrating indigenous knowledge of farmers for sustainable organic farming: An assessment in Uttarakhand state of India

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Success of organic farming largely depends on farmers' knowledge of ecological systems, environment and on-farm renewable resources, as per the principles of organic farming. A study has been conducted to know the traditional knowledge and indigenous practices being followed by farmers in agriculture and animal husbandry to assess the possibility of integrating with organic farming in Uttarakhand, which is the first state in India promoting organic farming in a systematic way. The farmers of Uttarakhand especially women possessed a vast pool of indigenous knowledge with regards to livestock management leading to reduced dependence on externally purchased inputs as required under organic farming systems. And the farmers were in the practice of utilizing renewable farm resources. The Uttarakhand Organic Commodity Board (UOCB) had taken initiatives like compiling farmers' age old knowledge, "sayings" and "practices" relating to natural resource management in the form of booklets to protect it from gradual extinction and integrating it successfully with organic production methods. Such knowledge and practices of farmers is worth validating and exchanging with the other parts of the world to make organic agriculture sustainable.

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India, the country of *Rishi* and *Krishi*, has a very rich heritage of traditional health control methods and several treatment systems (Ayurvedic, Unani, Homeopathy). Moreover, history of Indian agriculture shows that most of its farming community relies on traditional methods and ecological agriculture such as '*agnihotra*' and '*panchagavya*' the farming systems based on ancient techniques for soil and animal management. Organic agriculture, the innovative farming system can build-on and enhance the traditional knowledge and practices of local and indigenous communities, and moreover, the interface between organic agriculture techniques and farmers' traditional agriculture knowledge offers a fertile ground for this innovation and improvement in local agriculture productivity¹. This means farmers' knowledge of ecological systems, environment and their conventional wisdom has to play more role in making organic farming more sustainable. Keeping in view the India's age

old farming systems and the opportunities for the organic farming, the Government of India (GOI) has taken initiative in promoting organic agriculture. Uttarakhand is the pioneering state in promoting organic agriculture in India where farmers are practicing organic farming through registering with the organic promoting agency Uttarakhand Organic Commodity Board (UOCB) and could market organic crop products on premium prices. The livestock production practices of these farmers which are mostly traditional can also be integrated into organic systems in view of the due recognition and importance in organic systems. Hence, the indigenous knowledge and livestock production practices of farmers in the Uttarakhand state were assessed in order to integrate and promote the organic livestock production.

Research methodology

Exploratory research design reinforced with 'Case Study' method followed and multistage sampling procedure was adopted to conduct the

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study in the state of Uttarakhand. Agriculture along with livestock is the single largest employer in the state and 80 % of the rural households earn over a third of their income from livestock. Contribution of livestock sector accounts for over 9.5 % to the gross domestic product of the state². Study was conducted in 2006-07 for a period of six (February-July) months in the three districts of Uttarakhand state. Kalsi, Vikanagar, Shaspur blocks of Dehradun and Narendranagar, Kirtinagar and Chamba blocks of Tehri Garhwal from Garhwal region and Ramnagar, Kotabagh and Ramgarh blocks of Nainital from Kumaon region, where farmers were with maximum number of livestock farming activities. A total of 18 villages were visited by the researcher and interacted with 180 registered organic farmers comprising of 110 from hill region and 70 farmers from plain (*bhavar*) region. The study involved field observations, direct interviews using semi-structured interview schedule and Prior Informed Consent was taken from the registered farmers through the network of UOCB officials, i.e. master trainers of the respective areas. The researcher stayed in each respective village for a couple of days, interacted with the farmers along with salient observation of the farming practices of the farmers. Secondary data available from UOCB are also taken into consideration for the study. The average age of farmer involved in organic agriculture was 42 yrs and majority of the farmers belong to general category, i.e. higher castes and the group studied included both male (111) and female (69) farmers.

Results and discussion

The findings represent the registered organic farmers' farm characteristics, farming practices and their traditional knowledge in crop and livestock

management. The usage and applicability of these practices and systems into organic production systems is also discussed.

Farm characteristics

Type of farming enterprises

All the registered organic farmers were with mixed farming systems. Majority (63.89%) of the farmers were in the traditional production systems before taking up the organic farming (Table 1). The livelihood systems in the society has been agriculture and livestock based from ages³. Being away from the reach of green revolution technologies, most of the farmers in mountain region were with traditional farming practices, for whom this innovative practice of organic farming became a boon, where traditional farming practices were given due recognition.

Farm diversity

All the organic farmers were maintaining diversity in crops through crop rotation along with 2-3 livestock species. Farmers were maintaining biodiversity in terms of keeping 2-3 species of livestock, and growing more than 2-3 crops in a year. Farms were well diversified in maintaining the plants as well as livestock, which is one of the pre-requisites of organic farming. This kind of integration of more than one livestock species and the integration of livestock with cropping, allows nutrient cycling and effective resource use. This can be considered as the basis of a balanced and sustainable farming system, which is one of the aims of organic farming. Experience shows that diversified farms are best in meeting the various demands of ecosystem, self sufficiency and financial needs⁴ and also livestock and animal husbandry might make these people more dependent on their immediate environment

Table 1—Type of farming systems - Present & previous

S.No	Type	Number (%) of organic farmers		
		Hill (n=110) F %	Plain (n=70) F %	Total (n=180) F %
	Present			
1.	Mixed / integrated farming	110 ---	70 ----	180 ----
	Previous			
1.	Conventional	03 (02.73)	27 (38.57)	30 (16.67)
2.	Traditional	86 (78.18)	29 (41.43)	115 (63.89)
3.	Partly conventional	21 (19.09)	14 (20.00)	35 (19.44)

and accordingly they have diversified their resource use practices³.

Breeding

Breeding technique

Findings reveal that over 80 % of cattle and buffalos belong to local (*desi*) breeds, whereas, in case of goat and poultry, *desi* variety constitutes 100 %. Crossbred (11.44%) and exotic breeds (1.56%) were few in number among total cattle population, and graded buffalos constituted 19.38 % of total buffalo population. The reproduction/breeding technique followed by farmers is presented in the Table 2, which reveals that 87.92 % and 68.18 % of farmers were following natural service method for cattle and buffaloes, respectively. Green revolution technologies like cross breeding couldn't reach many of the remote areas including mountain tracts due to lack of infrastructure and focused attention, and as a result, farmers were continuing with traditional breeds. And also the compatibility of farmers' socio-cultural and psychological values and beliefs with the indigenous breeds are might also one reason for maintaining majority traditional breeds. Regardless of species, the primary breeding objectives in organic farming are disease resistance, longevity, good mothering ability along with fertility, whereas, production is seen as secondary to these. In organic production systems, natural service is recommended in order to provide the animals with natural behavioral pattern.

Feeding practices of organic farmers

Feeding is a major element of exchange and interaction between the two main components of the

farm's agro-ecosystem i.e. the land and the animals. Trees and shrubs are of value in agriculture as they provide fodder to animals and replenish soil fertility. Different feed and feed resources are available in the study area (Table 3). A basic principle of organic agriculture is that livestock are kept as a part of the farming systems, and that their nutrition should be based on home-grown feeds⁵, which is intended to guarantee optimum feed quality. The feeding practices of organic farmers in the study area indicating that the farmers were following the age old traditional practices. Feeding of diverse feed and fodder resources and the tradition of collecting and feeding forest produce rich in medicinal properties to livestock might also be one of the traditional health management practices the farmers were following.

Women in many societies are in-charge of feeding animals as recorded in India⁶ and Egypt⁷,

Table 3—Feed and fodder resources available

S.No	Sources	
1.	Crop residues	Straws, stalks, stovers, tops and crop thrush like wheat, Paddy straw, stovers from Bajra & Ragi, Sugarcane tops
2.	Crop by-products	Bran, husk, Chunni of Wheat, Rice, Bajra, Maize, Barley, Mandua, Pulses and expeller cakes and solvent extraction meals of oil seeds.
3.	Grazing	Common property resources like permanent pastures, current and other fallows, land under miscellaneous trees and groves, cultivable wastes, forests, along with harvested fields.
4.	Cultivated green fodder	Berseem; sudanchari, maize; elephant grass etc.

Table 2—Breeding technique

S.No	Species	Number (%) of organic farmers								
		Hill area			Plain area			Total farmers		
		Ns	AI	Total	Ns	AI	Total	Ns	AI	Total
1.	Cattle	82 (93.18) *	06 (06.82)	88	49 (80.33)	12 (19.67)	61	131 (87.92)	18 (12.08)	149
2.	Buffalo	69 (86.25) *	11 (13.75)	80	21 (40.38)	31 (59.62) **	52	90 (68.18)	42 (31.82)	132
3.	Goat	79 (100.00)	--	79	9 (100.00)	--	9	88	--	88
4.	Poultry	44 (100.00)	--	44	30 (100.00)	--	30	74	--	74

*Significant at 5 % level; ** Significant at 1 % level
Ns= Natural services; AI= artificial insemination

and they possess detailed knowledge of the best kinds of feed for each season and type of animal (e.g., lactating animals require high levels of protein). And also, farmers in hill region are totally dependent on the locally available feed resources like oak tree leaves, unclassified grasses grown in the forest area for feeding of animals round the year⁸. These practices need scientific validation for proper integration with the organic production systems and for recommendation in the similar agro-ecological areas.

Feeding pattern

Farmers were providing grazing to animals along with forage and pasture which varies with the season. In mountain agriculture, cattle are vital components of land-use systems and moreover, the primary reason hill farmers keep cattle is to provide manure for the fields⁹. As per the standards of organic production systems, daily access to forage is a must, and pasture shall provide atleast 50 % of the daily dry matter intake.

Healthcare

Animal health management measures followed

Farmers preferred to follow more than one measure, i.e. more than 75 % of organic farmers following preventive and preventive along with curative measures (Table 4). Majority (61.11%) of the farmers were following traditional methods of treatment, i.e. herbal based *Ayurvedic* medicines (plant products) followed by traditional along with allopathic medicines (Table 4). Care of animals with traditional knowledge, feeding with forest produce rich in medicinal values along with habitations more or less equal to animal requirements and regular grazing etc., all together strengthen the animal

immune system and might have made confident enough the farmers to ensure that animals will be healthy with assured welfare. It has been a long tradition that the livestock owners in India manage livestock asset by using knowledge and material sources available locally. Especially in hill areas, women who are rich source of Indigenous Technical Knowledge (ITK) related to animal husbandry, treat animals through eco-friendly ways, little or no cost means and also which are good for sustainable development.

An explicit goal of organic farming is to promote and sustain health, and thus, animal welfare, which depends on the efficiency of the farmer in managing the farm. Preventive management plays major role in organic production systems and the traditional practices of farmers of the study area were focused more on prevention rather than cure.

Traditional Practices of Animal Health Management

The farmers, especially women possessed a vast pool of indigenous knowledge with regards to livestock management and are less dependent on externally purchased inputs which is insisted much in organic farming systems (Table 5). Moreover, the Uttarakhand Organic Commodity Board (UOCB) oriented farmers to reduce the use of chemicals and encouraged the use of locally available non-chemical alternatives which further added to the farmers' indigenous technical knowledge. And also the UOCB had taken initiatives in compiling farmers' age old knowledge, 'sayings' and practices relating to natural resource management to protect it from gradual extinction and integrating it successfully with organic production methods. However, the farmers' traditional knowledge can be validated by quantifying it with some proven methodology^{10,11} and also by experimentation¹².

Table 4—Farmers according to the preferred health management practices

S.No	Kind of preferred management	Number (%) of organic farmers		
		Hill (n=110) F %	Plain (n=70) F %	Total (n=180) F %
1.	Preventive	98 (89.09)	43 (61.42)	141 (78.33)
2.	Only Curative	12 (10.90)	17 (24.26)	29 (16.11)
3.	Preventive + Curative	86 (78.18)	51 (72.86)	137 (76.11)
	System of treatment followed			
1.	Traditional (<i>Ayurved basis</i>)	78 (70.90)	32 (45.71)	110 (61.11)
2.	Homeopathy	05 (04.55)	08 (11.43)	13 (07.22)
3.	Traditional + Allopathy	27 (24.55)	30 (42.86)	57 (31.67)

Table 5—Traditional practices followed by organic farmers

S.No	Ailment	Practice followed
1.	Wounds	<i>Devadar</i> tree oil
2.	External parasites	Cow urine and black ash; cloth dipped in petrol; camphor application; peach leaves minced and apply; red soil on legs; garlic +mustard oil for drinking; chanting of mantras, Mixture of cow urine and cow dung ash settled for 48 hrs in earthen pot applied externally
3.	Loss of appetite	<i>Dhania</i> + onion + kalajeera + curd Kala jeera + <i>dhania</i> juice
4.	Fever	<i>Kala jeera</i> powder
7.	De-worming	Forest leaves, stem peelings ; Mustard oil, Fermented mixture of butter milk and neem leaves
8.		
9.	Bloat	<i>Kala jeera</i> + <i>dhania</i> mix with feed; cloth dipped in kerosene kept on nose to smell it ; Asafoetida + black salt + tulasi seeds + + ginger powder mixed in water and given orally.
10.	Rumination	<i>Kala jeera</i> + <i>Dhania</i> (Coriander) powder + Jaggery + Onion + curd
11.	Treatment of minor injuries	' <i>Bans</i> ' leaf paste local name of some grass
12.	Control of ticks in animals	' <i>Karoi</i> ' grass is rubbed on skin
13.	Treatment of ' <i>Gal Ghotoo</i> ' in livestock (Galagotu (H.S))	' <i>Bhang</i> ' (<i>Canabis sativus</i>) and ' <i>Shivali</i> ' leaves are grinded together, put in cloth and whole cloth is boiled. After cooling, cloth is applied on affected portion; <i>Seera</i> (molasses by product) + <i>Tambaku</i> inside the throat
14.	Foot and Mouth Disease (<i>khuriya</i>)	Animals with rotten foot are kept in mud; phenyl is applied on foot; and in condition of sour mouth, wheat flour is given to animal, decoction of babool+ Jamun bark ; paste of peach leaves applied on lesions.
15.	For higher milk production	' <i>Pinda</i> ' a local feed prepared by mixing wheat flour in lukewarm water with ' <i>Gur</i> ', butter (extracted from curd), rice, <i>Jhingora</i> (<i>Echinochola frumentacea</i>) etc. ; ' <i>Bhimal</i> ' leaves + Bhatt (black Soybean) + Wheat, feeds combination of <i>Binola</i> (cotton seeds), <i>Methi</i> seeds, <i>Dhalia</i> and <i>Jaggery</i> .
16.	Excessive bleeding during calving	' <i>Kala Jeera</i> ' boiled in water and water is given to animals. Roasted <i>Jeera</i> powder is mixed in lukewarm milk and given to the animal.
17.	Mouth ulcers	Lemon + salt
18.	Mastitis	Honey + <i>Haldi</i>
19.	Diarrohea	Powder of half ripe <i>Bael</i> fruit; powder of <i>Shisam</i> (<i>Dalbergia sissi</i>) leaves

Conclusion

The indigenous technical knowledge (ITK) regarding animal husbandry is considered as old as domestication of various livestock species. Indigenous knowledge may contribute in several ways such as by helping identification of cost-effective and sustainable mechanisms for poverty alleviation, which are locally manageable and meaningful. Organic farming has revived the interest of farmers, policy makers and development workers in indigenous knowledge. Farmers of Uttarakhand state are rich in traditional knowledge transferred and adopted from generations together. Such knowledge and practices of farmers is worth validating and exchanging with the other parts of the world to make organic agriculture sustainable, the innovative farming which is gaining importance locally as well as globally. The authors recommend scouting of farmers' traditional

knowledge from different parts of the world, its proper documentation, validation and sharing and exchange of knowledge on global basis to provide good quality food on sustainable basis with reduced adverse impact on the environment. Through a better understanding of the sustainable development in its ecological and social diversity and integrating it to promote organic agriculture towards sustainable human development will enhance local communities with socio-economic empowerment.

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References

- 1 Twarog S, Organic Agriculture: A Trade and Sustainable Development opportunity For Developing Countries, *UNCTAD Trade and Environment Review*, 2006, 140- 193.
- 2 Kurup M G P, Livestock sector in Uttaranchal. *Sector Analysis, Policy perspectives, Integrated Development Plan*, commissioned by the Diversified Agriculture Support Project, a World Bank Project of the government of Uttaranchal, 2003.
- 3 Varun Joshi, Rawat M S, Sharma AK, Kumar K & Panda AK, Traditional knowledge of natural disaster mitigation and ethano medicinal practices in Himalaya with special reference to Sikkim, *Indian J Tradit Knowle*, 10 (1) (2011) 198-206.
- 4 Zundel C & Kilcher L, In: *Organic agriculture and food availability*, Papers submitted to the International Conference on Organic Agriculture and Food Security, FAO, Rome, Italy, 2007, 3-23.
- 5 European Communities Council Regulation (EC) No. 1804/1999 of 19 July 1999 supplementing regulation (EEC) No. 2092/91 on organic production of agricultural products and indications refereeing there to on agricultural products and food stuffs to include livestock production, *Official Journal of the European Communities*, Brussels, L (222) (1999) 1-28.
- 6 Paris T R, Women in a crop-livestock farming systems project in Sta. Barbara, Philippines, In :*Gender issues in farming systems research and extension*, edited by S Poats, M Schmink & A Spring. Boulder, (Colo.: Westview Press), 1988.
- 7 FAO, *Expert consultation on women in food production*. (ESH Division), FAO, Rome, 1983.
- 8 Meena H R, Ram H, Singh S K, Mahapatra R K, Sahoo A & Rasool T J, Animal husbandry practices at high altitude (> 6000 feet) in Kumaon region of Utrtrakhand, India, *Livestock Res Rural Dev*. 19 (2007) **pp**.
- 9 Ashish M, A suggested statement of problems, In: Working paper presented to the task force, *The study of development in the Himalayan region*. (Planning Commission, Government of India, New Delhi), 1992.
- 10 Villiers Anne K de, Quantifying indigenous knowledge: A rapid method for assessing crop performance without field trials, AgREN Network paper No. 66, 1996, *ODI Agricultural Research & Extension Network*.
- 11 Sillitoe P, Indigenous knowledge development in Bangladesh: Present and future, (Intermediate technology publications & Dhaka, University Press, London), 2000.
- 12 Mukherjee R & Chander M, Validating Indigenous Technical Knowledge (ITK) for animal health management under organic production systems: Mastitis in dairy cattle, In: Rowlinson P, Wachirapokorn C, Pakdee P and Wanapat M (eds) Integrating livestock–crop systems to meet the challenges of globalization, *Br Soc An Sci*, 2 (2005) T61-62.