

Tradition Grain Storage Structures and Practices Followed by Farm Families of Kumaon Region in Uttarakhand

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ABSTRACT

The present study was carried out to find the tradition grain storage structures and practices followed by farm families of Kumaon region (Uttarakhand). Two blocks namely Garur and Bageshwar were selected purposely where farm families only practicing traditional methods of cultivation and post harvest management of food grains. Total 100 farmers sampled from Bageshwar district and traditional practices were documented from well experienced farmers from four villages through interviews and focus group techniques. It was found that all the farm families used traditional methods for storing and drying of grains which includes plastering of storage structures with cow dung and mud paste and keeping leaves of wall nut, turmeric rhizome, lime powder, mixing ash of cow dung and mustard oil for long time preservation of food grain from insect and pests. Thus it is important to validate the traditional practices followed by farm families by the scientist community for their large scale application.

Key words: Grain storage structures, Traditional practices and Group techniques;

Agriculture is the major occupation of the people all over the world. More than 70% of Indian population depends on agriculture for their livelihood (Chandrasekar *et al.*, 2005; Jeeva *et al.*, 2006; Kiruba *et al.*, 2006). After harvesting food grains are being spoiled due to lack of sufficient storage and processing facilities (Singh and Satapathy, 2003). Storage is the process of keeping grains to protect them from changing weather and pests for a short or long period. The basic requirement of a good storage practice is a healthy, clean and uniformly dried grain.

Grain storage plays an important role in preventing losses which are caused mainly due to weevils, beetles, moths and rodents (Kartikeyan *et al.*, 2009). It is estimated that 60-70% of food grain produced in the country is stored at home level in indigenous storage structures. The storage methods range from mud structures to modern bins. The containers are made from a variety of locally available materials differing in design, shape, size and functions (Kanwar and Sharma, 2003). The materials used include paddy straw, wheat straw, wood, bamboo, reeds, mud, bricks, cow dung etc. Grains

can be stored indoors, outdoor or at underground level (Channal *et al.*, 2004). Kumaon region farm families used locally available plant products which are efficient for protection of food grains as they have advantage over scientific methods because of their low cost or easy availability. It comes from the combination of skills and knowledge of local peoples which they acquire through their interaction with environment and experiences. Proper storage of food grains is necessary to prevent spoilage, increase keeping quality and for monetary reasons. The practice of using natural sources for storage of various household items dates back to the very earliest periods of known history (Karthikeyan *et al.*, 2009). There is a need to preserve the indigenous knowledge as the documentation of traditional knowledge may create a pressure on policy makers to pay due respect for people's knowledge and to incorporate this knowledge in rural development planning (Gupta *et al.*, 1994). Keeping all this in view, the exploratory study was taken to identify and document traditional knowledge regarding storage structures and practices used by the farm families of Kumaon region.

METHODOLOGY

The present study was conducted in the year 2013 in Bageshwar district of Uttarakhand state. Total four remote villages namely, *Garkhet*, *Tilsari*, *Harbaar* and *Akhison* were selected randomly from Garur and Bageshwar Blocks. From each of the identified village, 25 farm families above 40 years of age were selected randomly for the study. Thus total 100 farm families constituted the sample. Information about the traditional storage structures and practices followed by farm families were obtained through direct interviews and focused group discussion. The questions were asked in local dialect (*Kumaoni*) consisting of background information of the respondents and different drying material used by respondents, storage structures for keeping food grain and traditional practices for keeping the grain safe from insects and pest. The data collected from the respondents was scored, tabulated and analyzed by using suitable statistical tools such as frequency and percentage.

RESULTS AND DISCUSSION

Background information of the respondents : Regarding background information of the respondents, more than half of the respondents belonged to the age group of 51-60 years and 42 per cent of the respondents of the study area were illiterate. Majority of the farm families (73%) belonged to upper caste and 68 per cent respondents were marginal farmers who possessed the land below 2.5 acres. Majority of the respondents had more than 20 years of farming experience and as far as the occupational status was concerned, majority (66%) of the respondents had agriculture as their main occupation with no subsidiary occupation. Regarding organizational membership majority of the respondents (77%) had no membership in any organization and 13 per cent of the respondents had membership in one organization (Table 1).

Sun drying material used by the farm families : Data in figure 1 depicts that 95 per cent of the farm families used *Mauhat* for drying the food grain like wheat and paddy grains. Respondents further informed that *Mauhat* is similar to mat made of bamboo stripes interwoven by hand and *Bisau* is used by 92 per cent of the farm families to dry cereal and pulses. It is a flat and oval shaped structure made up of bamboo stripes which is plastered with mixture of cow dung, cow urine

Table 1: Background information of the respondents (N=100)

Variable	Category	%
Age(Years)	40-50	24
	51-60	56
	Above 61 years	20
Education	Illiterate	42
	Literate	22
	Primary	24
	Middle	12
Caste	Upper caste	73
	Backward caste	12
	Lower caste(SC/ST)	15
Land holding (in acres)	Marginal (<2.5 acres)	68
	Small (2.6-5.0 acres)	24
	Medium(5.1-10.0 acres)	08
	Large(>10.0 acres)	0
Farming experience (in years)	Less than 10	0
	10-20	25
	More than 20	75
Family occupation	Agriculture alone	66
	Agriculture +Business	12
	Agriculture +Labourers	08
	Agriculture +Caste occupation	09
	Agriculture +Service	05
Organizational membership	No membership	77
	Membership in one organization	13
	Membership in more than one organization	05
	Holding position in organization	05

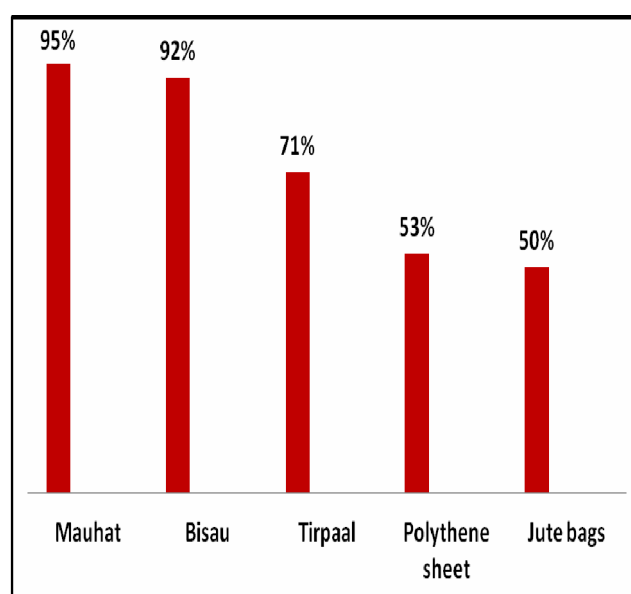


Figure 1: Drying material used by the farm families

and black ash of *chula* from outside and inside. *Tirpaal* is used by 71 per cent of the respondents for drying the food grains where polythene sheets and jute bags is used by 53 and 50 per cent respondents, respectively for drying pulses and millets (fig 1).

Traditional Storage Structures for Cereal, Pulses and Millets : The traditional structures followed by the respondents for storage of cereals, pulses and millets are described as under and data given in Table 2.

It is estimated that sixty to seventy per cent of food grains produced in India is stored at household level in traditionally fabricated storage structures and containers. The traditional fabrication is governed by availability of eco friendly materials such as straw, cereal stalks, reed, bamboo, mud, wood, etc. (Verma *et al.*, 2005). In *Kumaon* region farm families use various kinds of storage structures for keeping the grains for their long shelf life.

(a) *Bhakaar* (Wooden box) - *Bhakar* is a huge wooden rectangular box used to keep wheat and paddy for longer time period. It is generally made up of pine or deodar wood. The wooden box is plastered with a mixture of mud, cow urine and cow dung on the inner as well as outside. The respondents reported that the plastered box has to be sun dried properly otherwise it may cause insect-pest infestation in the stored produce.

(b) *Doke*- *Doke* is a cylindrical or oval bamboo (*nigal*) basket plastered inside and outside with a mixture of cow dung and mud then dried in sunlight. The capacity of *doke* ranges from 50 to 100 kg. Plastering of structure with cow dung and mud protects the grain from the spoilage and infestation from the insect and pests as reported by the farm families.

The findings of the study get decisive support by the study of Verma *et al.* (2005) on "Eco friendly grain storage structure in India" reported that *hak* is a cone shaped indoor storage basket that is commonly used in the hill zone of Assam. The storage capacity varies from 50 to 200 kg. The grains can be stored for 4 to 6 months only without quality degeneration.

(c) *Tumri*- Farmers reported that *Tumri* is constructed with a round or oval shaped dried bottle gourd (*Tumri*) which is abundantly cultivated in the *Kumaon* region and lid is generally made of either wood or dried grasses. Usually 10-15 kg grains can be stored in a standard size *Tumri* and it is basically used to store seeds for the next season crop.

(d) *Storage bags*-Farm families used storage bags to keep their grain especially wheat, paddy and millets. The respondents reported that various types of bags are used such as jute and polythene- lined jute bags for storage purpose.

(e) *Metal bins*: Metals bins made up of steel, copper and tin are used to store the pulses and millets especially in Himalayan region. The name of the common bins is Kantar, Taul, Gaghar and Kasra.

(f) *Theki*- *Theki* is a wooden container traditionally used for storage of millets and pulses.

It is evident from the Table 2 that for storage of paddy grains, majority of the farm families used *Bhakar*, *Doke* and Gunny bags with 90, 86 and 67 per cent, respectively. A very few respondents (12%) used metal bins for keeping paddy grains. In case of wheat, majority of the respondents (90%) stored the grain in a wooden made *Bhakar*, along with that the respondents also stored in Gunny bags (51%), *Doke* (38%) and in metal bins (9%). For storage of millets majority of the respondents kept in metal bins (84%) whereas, 45 and 30 per cent stored in *Tumri* and *Doke*, respectively. For storage of pulses majority (78%) of the farm families used *Tumri*.

Table 2: Traditional grain storage structures used by the farm families for keeping cereals, pulses and millets

Food grain	Traditional storage structures used by farm families* (%)					
	Bhakar	Doke	Tumri	Gunny bags	Metal bins	Theki
Paddy	90	86	0	67	12	0
Wheat	90	38	0	51	9	0
Millets	3	30	45	13	84	22
Pulses	0	0	78	0	19	32

*Multiple responses

Indigenous storage practices : In traditional storage practices a number of locally available plant leaves, oil, and ash have been used by the farm families to store the paddy, wheat, millets and pulses. Their insecticidal action is not as quick as those of synthetic insecticides, yet these have certain advantages, being least toxic in nature, possess long time surface persistence, without any adverse effect on germinability of seed, cooking or milling. The indigenous storage practices followed by the respondents are given as under (Table no. 3).

Using dried leaves in food grains- A perusal of data given in Table 3 reveal that all the respondents of the study area use leaves of walnut (*Juglans regia* Linn.) in

Table 3: Indigenous storage practices followed by farm families for keeping cereals, pulses and millets (N=100)

Indigenous grain storages practices	Grain	Reason	Shelf life	%
Using dried leaves of walnut	Wheat	Pungent smell of leaves saves grain from insect/pests	1 to 1 ½ year	100
Mixing 10 kg cow dung ash in 60-70 Kg of wheat grain	Wheat	Preserve from insects and pest infestation	1 year	75
Adding 300 gm of common salt in 100 kg bag	Paddy	It controls moth and weevil infestation	6 Months	49
Adding 2-3 rhizomes of turmeric or onion in 50 kg bag	Paddy	Provide protection against insects	6 Months	45
Using of lime and wood ash	Paddy	Save from spoilage	2-3 Years	22
Mixing of 8-10 ml mustard oil and 10 gm common salt in pulses	Gahat & Masoor	Save from spoilage of insects	Upto1 year	90
Using of mustard oil for storage of pulses	Gahat, Masoor & Bhatt	Helps to check insect infestation	Upto 1 year	85
100 gm garlic splits (<i>Allium sativum</i>) in 5kg pulses	Gahat, Masoor & Bhatt	To avoid the attack of pulse beetle (<i>Callosobruchus sp.</i>)	Upto1 year	77
Mixing of turmeric powder and mustard oil	Masoor	It protects from pest infestation	1 year	48
Soaking cow urine followed by sun drying	Gahat & Masoor	Protect the pulse from spoilage and pests	6-7 months	39

storage structures. In an informal group discussion farm families reported that the plants leaves are dried in sun for a day. Then the dried leaves are kept in the food grains at bottom, middle and top layer. Respondents reasoned that these leaves give pungent smell, which do not allow the attack of insect pests and protect grains from insect infestation for six to eight months.

Using cow dung ash in wheat- Table 3 show that three fourth farm families mixed the ash of cow dung (*Khar* in local dialect) with grains before storing in storage structures. Respondents roughly estimated that they mix 10 kg ash of cow dung in 60-70 kg grains and cover the storage structure with a lid. This will preserve the wheat from insects - pest infestation till one year. *Das et al. (1999)* have proved the efficacy of ash against wheat (*Triticum aestivum* L.) grain insect pests. Similarly *Singh, 2003* reported that tribal farmers use dry leaves of *neem* @ 2.5/100/kg seed of wheat for controlling storage pests.

Use of common salt- Due to problem of storage, respondents use to store paddy instead of rice grains, as rice grains are more susceptible to the grain pests. About 2 kg of the salt is mixed with 50 kg of the grains as it controls moth and weevil infestation in paddy for six months (49%).

Use of rhizomes of turmeric or onion- Data in Table 3 reflect that 45 per cent of the farm families kept 2-3

rhizomes of turmeric or onion in storage bags of 50 kg rice as it provide protection against insects and can save upto period of 6 months. *Kanwar and Sharma(2006)* in a study on “Indigenous crop storage practices”, reported that majority of the respondents (93.33%) stated that rice can be stored for 6-7 months by mixing 2-3 bulbs of onion or turmeric in 50 kg of rice or mixing mint(*Mentha longifolia*) leaves.

Using Lime (Chuna) and wood ash - Farmers of Bageshwar districts (22%) were using lime (*chuna*) along with wood ash for storing grains. In the month of May-June wheat grains are dried in sun and then lime @ 2kg and wood ash @ 10 kg per quintal is rub by hand for about half an hour. By using this practice the grain can be store for two to three years without any spoilage.

6. Polishing of pulses with mustard oil and common salt- It was found that majority of the farm families (90%) mixed about 10 ml mustard oil and 10 gm common salt / kg of pulse and rubbing them properly, before storing in the bins. Respondents reasoned that by this the chances of insect-pest infestation can be minimized till one year.

Polishing of pulses with mustard oil - Data in Table 3 show that more than 80 per cent of the farm families used only mustard oil for storage of pulses@ 10 ml/ kg of seed. The coating of mustard oil helps to check insect-pest infestation. *Gogoi and Majumder (2001)* in a

study reported the same that pulses are treated with pure mustard (*Brassica sp.*) oil @ 10 ml/kg seed and stored in a close container or bamboo. This will keep free from damage caused by storage insects.

Use of garlic splits for storage of pulses –More than three fourth of the farm families use garlic splits @ 20 gm /kg of seed for prevention of pulse beetle (*Callosobruchus sp.*) and pulse can be stored up to one year without any infestation.

Use of turmeric powder and mustard oil-Data further show that 48 per cent of the farm families used turmeric powder and mustard oil for storing of pulses especially lentil. The respondents reported that the turmeric powder (20gm) and mustard oil (10 ml) are mixed thoroughly with the seeds and stored in an air tight container.

Soaking of pulses in cow urine – A very peculiar method of storage of pulses was recorded where the farm families used to soak the pulses in cow urine for about half an hour followed by sun drying (39%). Before consumption, the pulses are washed thoroughly in order to avoid pungent smell of cow urine. The respondents

reported that pulses can be stored safely for 6-7 months by following practice.

CONCLUSION

Information from the study depicted that rural farm families use traditional knowledge for constructing eco-friendly grain storage structures and also uses traditional storage practices at household level which protects the cereal and pulse crops from insect-pest infestation during storage. The rationality behind this is the easy availability of user-friendly and cost-effective materials. The storage condition should be such to provide the grain protection from insects. The seeds that contain high moisture are subjected to the attack of insects and microorganisms and for preserving grains and seeds for longer time period proper storage is essential. So, based on the study on traditional knowledge regarding grain storage practices, it is desired to scientifically validate and standardize these practices to disseminate among other farming community. Need of the hour is to strengthen traditional means of storage with modern inputs and to provide cheaper storage to farmers so as prevent enormous storage losses.

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