



## Indigenous storage practices for paddy in shimoga district, Karnataka

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### Abstract

Storage of paddy is one of the important intermediate stage between production and consumption. Use of paddy is regular in daily basis in most part of the world. Storage of paddy done in many ways by considering usage. If paddy has to be transported it will be stored in bags some other methods are also used by farmer's or by storage holders. These storage methods studied in present work are following from generation to generation hence they considered as indigenous storage practices. Practices followed for storing paddy in many villages of Shimoga district were studied, each storage structure is unique and different in its method of construction, materials use and usage. Farmers or storage holders are using these methods which have retained from more than hundreds of years accordingly their capacity in maintaining the quality and quantity of stored paddy seeds.

**Keywords:** paddy, traditional storage, non-chemical storage, ecofriendly storage

### 1. Introduction

Paddy (*oryza sativa*. L) Is consumed worldwide. It is one of the staple food, grain produced and consumed by India is increasing Prakash *et al*, (2016) <sup>[9]</sup> and consumption rate also becoming more. 17% of the year food production must be stored considered security of the nation according FAO (food and agriculture organization) Xiaoli *et al.*, (2008) <sup>[7]</sup>. It is easy for paddy to grow, harvest, pack, store and transport. It had good amount of nutritions, vitamins, carbohydrates and many varieties of food can be prepared, so consumption percentage is high among the world. One of the major challenges for the paddy grower is to match the need of demand within the time period, make reach for the maximum population even one in longer distance. Improper handling of postharvest processes maximize the fungal activity and mycotoxin percentage during storage was recorded by Magan and Aldred (2004) <sup>[5]</sup> so storage systems must be very good, it's very much need to consider physical and chemical properties otherwise changes occur as ages passes during storage it down grade the milling quality also Zhongkai *et al.*, (2003) <sup>[4]</sup>. For storage of paddy many more methods are followed in some part of world air tight storage are preferred in this insects and microbes get controlled by increase rate of carbon dioxide within the closed system by Thilakarathna *et al.*, (2005) <sup>[6]</sup>. Insects in storage container can live in temperature between 8 - 41°C (Jayas and White 2003) <sup>[3]</sup>. Considering safety, quantity and transportation storage done by some methods which is following traditionally by people at their household level. In our study area 27 villages are visited and interacted with the storage holders and to farmers. Our study area Shimoga is part of Malnad region, we selected parts of shimoga region for field survey which comes under the Malnad belt. It receives more rainfall in a year, weather and land is very much suitable for paddy to grow, as rice is main course in the daily food of people of Malnad they prefer paddy to grow regularly. Farmers who growing paddy will store paddy by some of the method which became common method among them in their region, which referred as traditional storage systems.

Pre storage process like drying is needed, improper drying effect on antioxidants (phenolic and anthocyanin) which lead early aging of stored rice by Lindemann *et al.*, (2019), these precautions help paddy to store for longer period. It's an important decision to select good suitable storage structures which are user friendly ecofriendly and economic. Economic storage systems has to be promote more considering the poor farmer number among the nation (Mehta *et al.*, 2012) <sup>[8]</sup>. Maximum quantities like several quintals of paddy can stored in these systems at household level. In early days paddy stored in panatha or kanaja are used for sowing also, as per the farmers feedback seeds stored for 3-5 months shows more than 80% of germination in field condition. There for these storage methods are very preferable ones among the farmers in Shimoga region.

### 2. Methodology

#### 2.1 Field survey

During the survey we observed several storage systems which in use, most of the storage holder's prefer 2-3 type of storage system to use regularly at their household level. We done the survey in taluks of Shimoga district which comes under Malnad belt region. There are three taluk Sagara, Hosanagara and Thirthahalli come under Malnad belt. These field areas was visited during the month June-August 2019 in this visit we approached many villages of the three region and interacted with number of farmers and storage holders. Information regarding Paddy growing, variety of paddy growing, harvesting, drying and storage process are collected. Here mainly we are focusing on method of traditional storage using. So collected some important and elaborate information about storage system we got the information like type of a storage system used, the construction methodology, maintain process & cost, pre filling process, method followed to get optimum moisture in paddy before filling are noted in our data sheath. Paddy sample and storage system photos was collected. Three taluk was surveyed people of these taluk in between them sharing the information or knowledge about to choose best

storage system and any adopted method to existing storage system, and also about suitable paddy varieties to grow with its process. So best of the selected storage system in regular use in entire our study area.

To establish our result we classified study area into three regions Sagara, Hosanagara and Thirthahalli (Figure.1) area marked in colour are the regions which come under Maland belt and visited.

## 2.3 Types of Storage Structures

### 2.3a. Kanaja

Kanaja is one of the commonest storage structure used for paddy in many parts of the Shimoga. Construction of Kanaja need skilled persons, for the construction they use Bamboo plants. Here they select bamboo plant which is not too young nor too old, the stem part is used to make the skeleton of kanaja wall. Bamboo stem is sliced for few feet as much as long they can get or to the entire length of the bamboo stem. This strip have 1-3mm thickness and 3-4inches width and 5-8 feet in length, like this many strips are prepared. These strips have moisture content in it before these strips get dried used to construct Kanaja wall. These strips are sewed, that is each strip is crossing over many other strips which arranged right angles to it repeatedly and tightened by stretching little bit, in the same way many numbers of stripes are weaved together to get required size of kanaja wall.

This whole sheath is folded in such a way to get cylinder like structure and tied the edges. This entire cylinder is placed on the ground directly or placed on the wooden floor made by wooden plates. Kanaja wall is smeared by slurry made by the mixing of cow dung in some case farmers use purified red soil powder in paste form for smearing on both the surface of the wall. This cylinder is known ready to use, before paddy is poured in firstly the bottom is covered with paddy husk (hottu) for 2-3 inches, this avoids paddy from direct contact with floor and prevent the cold effect.



Fig 2.3a: Kanaja bult by bamboo



Fig 2.3b: kanaja bult by alluminium sheth



Fig 2.3c: Bamboo basket

### 2.3b. Kanaja of Aluminium Sheath

Here the kanaja was constructed by use of aluminum sheath available in local market. The sheath are of length 3ft wider and 5-7ft longer are used, According to required size number of sheath are used. These sheaths are joined by the help of nut and bolt, this entire length of sheath is folded to get cylinder like structure and both ends are locked with nut and bolt. Now this cylinder structure is ready to use, before storing paddy bottom was filled by paddy husk for about 3-4in

### 2.3c. Bamboo Basket

These are small basket like structures made by bamboo. Bamboo sticks are prepared by slicing bamboo stem in length wise to get many numbers of small sticks of thickness 8 to 12mm and 2 to 3m in length. These threads are sewed to form a spherical structure over the base made

by bamboo strips which are arranged diagonally without space between them and the edges are folded to get insert in spherical which on it. These bamboo pots are used to store small amount in small amount the size of this structure will up to 10-15kgs.

### 2.3d. Panatha

Panatha is one of the good old structure have been following from more than two hundred years earlier. Panatha is constructed by using wood as primary material, very commonly forest trees are used example *Terminalia eliptica* (matti), *Butea manasperma* (muthuga), *Artocarpous heterophyllus* (halasu) and some other. Panatha can be constructed to various size to store required quantities, in largely constructed panatha many chambers are made, chamber number may vary form 2-8, and in one of the panatha eight chambers are observed. Entire panatha structure is constructed above the ground level of 6-15 inches height.

Entire Panatha structure is constructed above the ground level of 6-15inches height, it achieved by the help of square shaped rock placing below four corners of the structure. As the base of the structure on these four, rock square shaped wooden beams with thickness 4-6 inches of required length was placed horizontally in square or rectangular shape (figure.2). Panatha size of five feet long have four pillars one at the corner, 8-10 feet long structure had six pillars for more stability. These pillars also of wooden having size of the beam, these pillars were fixed vertically one on each corner. While fixing six pillars out of the four remain two was fixed as it come center in-between the cornered pillar. To complete the box like structure wooden plates are used, these plates are fixed between pillars on all four face of the box. Top plate provided with doors (1 or2) to load and unload paddy. The plates size usually they prefer was of 2.5 inches thickness with length of 3-5 feet. Box may or may not painted, it had protecting roof on over it which made of wooden beams were mud plates arranged on it. This structure placed in outdoor or indoor for use

### 2.3e. Panatha of cement and bricks

To construct these structures rather than wood, cement and bricks used for flour, wall and roof. The figure.2a, showing square shaped panatha with no chambers. The wall has 12 inches thickness and the height five feet the top is also made of cement but there is wooden door for load and unloading of paddy.

### 2.3f. Jute Bag

Jute bag (Figure. 4) is another kind of storage method used regularly since long time. Jute bags are more regularly used by farmers because of its easy handling, it can be used with deferent sizes and very much convenient for transportation. The bag size can be varied from few kgs to 100kg as per requirement, to store or transport same bag was used. Jute

bags are made by using coconut jute, the jute is used to make long threads. These threads are sewed in such a way that many number of threads are made crossing throw another set of threads arranged in right angles to it. By crossing the threads or arranging the threads like this will give aa sheath like structure which used to make bag. The sheath is folded to rectangular shape the length is little bigger than broad because it is folded onside close other two side is sewed and side is kept open to fill and remove the storing material of the bag. After filling the known amount of seed bag is closed by sewing it ready to store or transport. The threads in the bag are loosely arranger these have many small openings which provide good aeration it is better for long storage while many bags arranger in one place one above the other. Advantages of jute bag is these are biodegradable, plant origin, production of the jute bag can be increased to maximum level, re-usable for many times, it can be handled by common people, lighter in weight, can be used to store other than seeds, will be used in all kind of weathers, no chemical is used in this jute bag, even some time some chemicals like DDT powder is used to prevent some insects and ants these bags will not get damaged and its reused with good wash, bags are washable and after drying it is use again with almost same stability.

### 2.3g. Polythene Bag

Packaging of paddy is one of the important part in agriculture and marketing process. So polythene bags (Figure. 5) is one which using frequently by the farmers to store and for marketing (polythene is using since 1957) Polythene bags are made by using artificially synthesized polythene threads, these threads are used to c in such a way that to form a flat sheath. The long flat sheath can be used to prepare different size of bags. According to the size needed, the long flat sheath are cut and fold it in to a bag shape and sewed on three side, one side is kept open as mouth to fill seeds. After filling the proper amount of seeds, it will be closed by sewing. This packed bag is kept in storage room for the maximum duration of years up to two years. Main advantage of these type of bag is very convenient to store, transportation, can be reused for several times, cost is low, light in weight and have good durability.

## 3. Result and Discussion

Several storage systems are recorded during survey good old storage systems were observed. These methods are being in use since two hundreds of years as per the local people information. The storage system recorded are as explained above in those few are using in large quantity they are Jute bag, Polythene bag and Panatha the Kanaja, Bamboo basket comes next. The usage of these system has no issue with different verities of paddy. The percentage of use of different system in three different study area were mentioned below.

**Table 1:** Types and number of storage structure used in Shimoga for paddy

Type of paddy storage structure	Number of storage units in sagara taluk	Number of storage units in hosanagara taluk	Number of storage units in thirthahalli taluk
Panatha of wood	18	22	20
Panatha of cement	55	35	50
Kanaja of bamboo	7	20	7
Kanaja of aluminum	5	3	2

Jute bag	87	76	88
Polythene bag	90	80	85
Bamboo basket	5	8	3

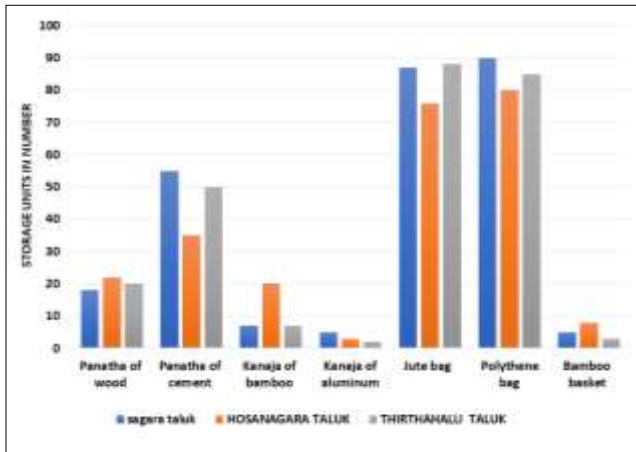


Fig 6: Types and number of storage structure used in Shimoga for paddy

At household level in Srilanka some unusual methods used to protect stored product from insects by non-chemical method like by using magnetic field which affect to moth growth Longstaff (1994) [1]. Close and controlled environment system increase CO<sub>2</sub> quantity, it inhibits insect's growth and improves storage time (Carvalho *et al.*, 2019) [10], storage system preference of our study area is also closed systems, with this they also consider budget, space to build, materials, durability, duration and maintenance cost. Usually they store for one month to 1-2 year, most farmer store for consumption purpose. Use of outdoor storage structure is very common for paddy in Asian countries it not going to affect its quality even after milling and fumigation can achieve easily as per Rajendra and Muralidharan (2001) [2]. Storage system protect the paddy from adverse temperature they had good aeration it maintains the required temperature. Difference in optimum temperature, Water and stored atmosphere influence yellowing the stored paddy. Trigo-Stockli and Pedersen (1991) so it's very much important to choose perfect system like Jute bag, Kanaja of bamboo and Polythene bag will provide good aeration.

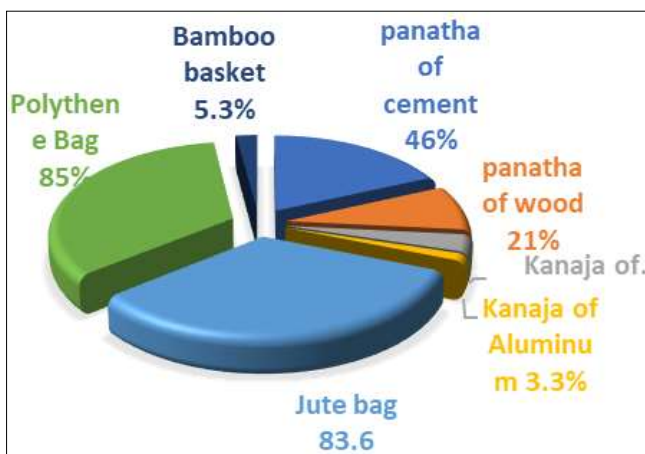


Fig 7: Overall percentage of storage structures use in shimoga district

In the study area when we look at the overall use of storage structures, it was observed that peoples are preferring more of polythene bag and jute bags. Farmers or storage holders eventually moving from large traditional structure to these compatible storage bags considering the utility. In above graphical representation it shown that in Shimoga district region polythene bag usage about 85 percentage also it holds first position in the preference list of farmers, jute bags is in second with the use of about 83.3 percentage. The other structures were also in use but not in every village of the study area there for minimum usage percentage was recorded.

4. Conclusion

It's been observed that storage of paddy by using traditional methods are declining with respect to the modernization and socialistic change. Preference to select these methods is there in the mind of farmer but the available of materials to construct storage structure is not there and the needed skill persons to construct are available very few. The storage structure like kanaja need bamboo plant but bamboos are not easily available and in some study areas it is prohibited to cut bamboo so for these technical issue's formers are lag behind to follow these good old methods. As for discussion with the formers and storage holders these traditional methods are better in usage, durability and eco-friend. This opinion is similar in all the three study area, in KSH the Kanaja structures are more recorded compare to KSS and KST because of available bamboo is more. In all the three study area Panatha of cement is very common and most preferable one. Both Panatha and Bamboo are subjected to change as Panatha of cement and Bamboo of aluminum due to unavailable of required wood and bamboo. But use of jute bag and polythene bag is more of its availability, durability, reusable and its handling. Modified structure like Kanaja of aluminum have some issue as the paddy stored are close to the wall get affect by the cold as aluminum absorbs more col during night and winter time. Panatha of cement showed good protection against rat. So use of traditional storage method are still there and more preferable ones, being these methods are following since last two hundred and more years, also become part in their culture and tradition.

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