



Analysis Of Storage Practices And Economic Benefits Of Agricultural Products In Dharwad District

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The recent study highlights the inadequate accessibility of rural godowns and warehouses for farmers, leading them to predominantly rely on household-level storage. However, the persistent lack of sufficient storage facilities in agriculture remains a pressing issue. Effective storage plays a pivotal role in safeguarding harvested crops from damage and preserving their quality. Storage facilities are fundamental infrastructure components essential for preserving farm produce before its sale. Key elements in establishing efficient agricultural storage solutions include managing moisture levels, ensuring security, and selecting appropriate locations. In this context, this paper aims to analyze the storage practices and the economic benefits associated with agricultural products in Dharwad district. Drawing upon data collected from a sample of farmers residing in 10 selected villages within the district, this paper seeks to explore the storage practices and their consequential economic advantages concerning agricultural products.

Key Words: Agricultural production, storage Practices, storage Benefits.

1. Introduction

The Indian agriculture sector has grown at an average annual rate of 4.6 percent over the past six years. In 2021-22, the sector grew by 3.0 percent, compared to 3.3 percent in 2020-21. India has additionally become a net exporter of agricultural products in recent years. In 2020-21, exports of agriculture and allied products from India increased by 18 percent more than the preceding year. According to the World Bank, the Asian Development Bank, and the IMF, India is projected to be the fastest-growing major economy in the world in the 2021 to 2023 Economic Survey (2022). The sector contributes to the gross value added (GVA) with a share of 18.8 percent. "Out of 320 million workforces, 170 million are employed in agriculture" (Shakeel, 2012).

The government has implemented interventions in line with the recommendations of the Committee on Doubling Farmers' Income, which identified enhancement in crop and livestock productivity, diversification towards higher value crops, better resource efficiency, enhanced cropping intensity, excellence in real prices received by farmers, and the transfer from farm to nonfarm occupations as major sources of growth (Economic Survey, 2022-23). The present government's vision for New India revolves around the principle of "Sabka Saath Sabka Vikas" (Collective Efforts, Inclusive Growth). At the heart of this vision lies the credit of the agriculture sector. The Central Sector Schemes, such as the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN), complement the financial needs of land-holding farmers. Various initiatives focus on sustainable agriculture, rural development, and farmer welfare. The Agriculture Infrastructure Fund (AIF) is a financing facility for the creation of post-harvest management infrastructure and people's farm assets, providing benefits with 3 percent interest financial assistance and credit assurance support. However, the majority of farmers do not have access to storage facilities after harvesting their produce. Efficient post-harvest management is fundamental to ensuring food security and reducing food waste. Inadequate storage facilities and improper warehousing practices can lead to spoilage, pest infestations, and considerable reductions in nutritional value, resulting in decreased accessibility and utilization by farmers (Hodges et al., 2019).

Storage is a crucial marketing function that involves keeping and preserving goods from the time they are produced until they are needed for consumption. The storage of goods from the time of production to the time of consumption ensures a continuous flow of goods in the market. Storage protects the quality of perishable and semi-perishable products from deterioration, as some goods have seasonal demand. To meet this demand, continuous production and storage become essential. It helps to stabilize prices by adjusting demand and supply. Storage is essential for the performance of other marketing functions and provides employment and income through price advantages.

Scientific storage facilities are convenient and crucial at doorsteps to mitigate storage losses in agriculture. These facilities improve the quality of stored goods by minimizing waste and bolstering the agricultural marketing system. Studies indicate that storage and warehousing of agricultural products are major challenges for farmers. Without these facilities, farmers cannot obtain better prices. The importance of storage facilities for agricultural production was recognized in India as early as 1928 in the Royal

Commission on Agriculture (1928) report. Literature reviews indicate a healthier growth in warehousing capacity in recent years (Agricultural Warehousing in India, 2022). The recent study by Patil and Kulkarni (2023) indicates that both rural godowns and warehouses are not adequately accessible to farmers, and hence farmers mainly depend on household-level storage. However, the lack of adequate storage facilities in agriculture remains a persisting issue. Proper storage is vital for protecting harvested crops from damage and maintaining their quality. Storage facilities serve as key infrastructure to preserve farm produce before it is sold. Key factors in emerging effective agricultural storage solutions include managing moisture levels, ensuring security, and selecting appropriate locations. Ensuring proper storage is a mandatory step from production to consumption, preserving the quality of products, preventing deterioration, and creating seasonal demand. In this context, the present paper aims to analyze the storage practices and their economic benefits of agricultural products in Dharwad district. The paper is based on data collected from sample farmers from 10 selected villages in Dharwad district.

2. Results and Discussion

In the selected villages, farmers cultivate black gram, green gram, sugarcane, groundnut and other crops during Kharif season. In Rabi season, they produce Bengal gram, soybean, chili, cotton, maize, and other crops. After the harvesting agricultural produce, farmers keep their product as per their convenience. Agricultural produce are mainly kept in open field covered with tarpaulins, storage in their own houses or any available place, or they store in separate rooms or sheds. Most of the farmers in the study area are marginal and small farmers. In order to study the storage practices among the farmers, we have selected the farmers who have some experience of storage in the recent years. Hence, the study got higher proportion of large, medium, semi-medium and small farmers. Table 1 shows types of respondent farmers in the selected villages.

Table 1: Types of respondent farmers (%)

Name of the Village	Marginal	Small	Semi Medium	Medium	Large	Total
Amminabhavi	6.7	26.7	16.7	16.7	33.3	100.0
Badrapur	20.0	13.3	23.3	10.0	33.3	100.0
Bhogenagarkopa	30.0	26.7	33.3	6.7	3.3	100.0
Kiresur	16.7	40.0	10.0	6.7	26.7	100.0
Kundagol	13.3	23.3	33.3	16.7	13.3	100.0
Mantur	10.0	33.3	16.7	16.7	23.3	100.0
Mugad	3.3	40.0	30.0	3.3	23.3	100.0
Sanshi	3.3	23.3	30.0	6.7	36.7	100.0
Tabakadahonnalli	6.7	26.7	10.0	13.3	43.3	100.0
Tirlapur	0.0	33.3	13.3	6.7	46.7	100.0
Total	11.0	28.7	21.7	10.3	28.3	100.0

Source; Field survey

Table 1 displays the distribution of farmers based on their land holdings. As categorized by the Agriculture Census of India, farmers with less than 2.5 acres of land are considered marginal, while those with 2.5 to 5 acres are small, 5 to 10 acres are semi-medium, 10 to 15 acres are medium, and those with above 15 acres are considered large farmers. The table indicates that 28.7 percent of the farmers are small, and an equal percentage, 28.7 percent,

are large farmers. Medium and marginal farmers represent only 10.3 percent and 11 percent, respectively, while 21.7 percent are semi-medium farmers.

Table2 illustrates the storage practices of farmers in selected villages.

Village	In open field covered with plastics	Any place in the own house	separate shed	kept in the separate room in the house	Total
Amminabhavi	6.7	43.3	3.3	3.3	5.7
Badrapur	0.0	23.3	6.7	16.7	4.7
Bhogenagarkopa	6.7	33.3	0.0	6.7	4.7
Kiresur	0.0	30.0	0.0	0.0	3.0
Kundagol	3.3	26.7	0.0	0.0	3.0
Mantur	0.0	43.3	6.7	3.3	5.3
Mugad	0.0	30.0	13.3	3.3	4.7
Sanshi	0.0	40.0	6.7	6.7	5.3
Tabakadahonnalli	6.7	16.7	3.3	6.7	3.3
Tirlapur	3.3	16.7	13.3	0.0	3.3
Total	2.7	30.3	5.3	4.7	43.0

Source: field survey

The above table shows that on an average only 43.0 per cent of the farmers store their produce. This is mainly due to lesser land holdings and hence little production, immediate need of cash, small size of houses, and lack of other storage facilities. Among these farmers who have stored, 30.3 percent kept the product at their own houses, 5.3 percent kept in their own sheds or godows and 2.7 percent kept in open field covered with plastic. There has been variation in distribution of storage facilities among the villages. For instance, Amminabhavi, Mantur, and Sanshi villages predominantly use household spaces for storage while others rely on separate sheds or rooms within their homes. It is observed that Soybean is stored in open field covered with plastic. Thus, farmers in the absence of access to institutional storage facilities, keep their produce mainly at their homes.

Storage and Economic Benefits

In this section, average quantity stored, price at the time of storage, period of storage and price gain after the storage, etc has been presented village wise. The table below show details of storage and economic benefits of agricultural products in selected villages.

Table 3: Details of Storage and Economic Benefits in Amminabhavi

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	28	4950	140085	28	5400	152820	12735	338	12398	438	15
Black Gram	22	5300	116600	57	5900	129800	13200	340	12860	585	15
Cottan	100	5000	500000	26	7000	700000	200000	200	199800	1998	2
Green Gram	70	4900	343000	20	5325	372750	29750	575	29175	417	8
Soybean	15	4500	67500	60	5000	75000	7500	500	7000	467	33

Source: field survey

Table 3 presents information on various crops stored in the village of Amminabhavi. In this village, farmers store Bengal gram, Black gram, Cotton, Green gram, and Soybean to get better prices. Farmers store the products from one month to two months. Soyabean and black gram are stored for more days compared to other products. After storage, farmers get the net benefit ranging from Rs. 438 to Rs. 1998. For cotton farmers get more benefit i.e., Rs.1998 per quintal, followed by black gram, Bengal gram and green gram.

Table 4: Details storage & Economic Benefits in Badrapur

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 - col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	50	6200	310000	60	7100	355000	45000	250	44750	895	5
Chilly	35	4500	157500	180	5000	175000	17500	1200	16300	466	34
Green Gram	3	4000	12000	25	4200	12600	600	250	350	117	83
Soybean	20	3200	64000	365	4000	80000	16000	200	15800	790	10

Source: field survey

Table 4 presents information on various crops stored in the village of Badrapur. In this village, farmers store Bengal gram, Chilly, and Green gram, as Soybean fetches better prices. The storage duration for these products ranges from one month to one year. Chilli and Soybean are stored for more days compared to other products. After storage, farmers receive net benefits ranging from Rs. 117 to Rs. 895. For Bengal gram, farmers obtain the highest benefit, i.e., Rs. 895 per quintal, followed by Soybean and Chilly crops.

Table 5: Details of storage & Economic Benefits in Bhogenagarkop

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col- 10/col 2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Green Gram	23	6333	147566	50	6733	156886	9320	500	8820	379	21
Maize	550	1000	550000	23	1350	742500	192500	350	192150	349	1
Paddy	5	3000	15000	90	4200	21000	6000	100	5900	1180	20
Soybean	50	6133	306665	76	5700	285000	-21665	525	-22190	-444	11

Source: field survey

Table 5 presents information on various crops stored in the village of Bhogenagarkopa. In this village, farmers store Green gram, Maize, Paddy, and Soybean to obtain better prices. Products are stored for a duration ranging from one month to three months, with Paddy and Soybean being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 349 to Rs. 1180. For Paddy, farmers obtain the highest benefit, i.e., Rs. 1180 per quintal, followed by Green gram and Maize.

Table 6: Details of storage & Economic Benefits in Kiresur

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col- 10/col 2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	5	6000	30000	60	7000	35000	5000	250	4750	950	50
Cotton	10	9000	90000	60	10000	100000	10000	600	9400	940	60
Green Gram	50	4800	240000	30	5000	250000	10000	600	9400	188	12
Sunflower	5	7000	35000	20	5000	25000	-10000	250	-10250	-2050	50
Wheat	15	3200	48000	90	4000	60000	12000	200	11800	787	13

Source: field survey

Table 6 presents information on various crops stored in the village of Kiresur. In this village, farmers store Bengal gram, Cotton, Green gram, Sunflower, and Wheat to obtain better prices. Products are stored for a duration ranging from one month to three months, with Wheat, Bengal gram, and Cotton being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 188 to Rs. 950. For Bengal gram, farmers obtain the highest benefit, i.e., Rs. 950 per quintal, followed by Cotton and Wheat.

Table 7: Details of storage & Economic Benefits in Kundagol

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	44	5650	246905	70	6033	263655	16750	283	16467	377	6
Black Gram	8	7000	56000	60	8000	64000	8000	200	7800	975	25
Ground nut	24	5500	132000	60	5800	139200	7200	100	7100	296	4
Soybean	17	4400	74800	30	4400	74800	0	200	-200	-12	12

Source: field survey

Table 7 presents information on various crops stored in the village of Kundgol. In this village, farmers store Bengal gram, Black gram, Groundnut, and Soybean to obtain better prices. Products are stored for a duration ranging from one month to two months, with Bengal gram, Black gram, and Groundnut being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 296 to Rs. 975. For Black gram, farmers obtain the highest benefit, i.e., Rs. 975 per quintal, followed by Bengal gram and Groundnut.

Table 8: Details of storage & Economic Benefits in Mantur

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 - col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col- 9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	44	5875	260263	51	6525	289058	28795	463	28333	640	10
Chilly	27	8500	225250	105	10000	265000	39750	2000	37750	1425	75
Green Gram	54	5700	307800	51	5680	306720	-1080	1120	-2200	-41	21

Source: field survey

Table 8 presents information on various crops stored in the village of Mantur. In this village, farmers store Bengal gram, Chilly, and Green gram to obtain better prices. Products are stored for a duration ranging from two months to four months, with Chilly being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 640 to Rs. 1425. For Chilly, farmers obtain the highest benefit, i.e., Rs. 1425 per quintal, followed by Bengal gram.

Table 9: Details of storage & Economic Benefits in Mugad

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col-9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	36	4900	176400	43	5250	189000	12600	750	11850	329	21
Cotton	15	6000	90000	36	6000	90000	0	250	-250	-17	17
Green Gram	52	6200	324260	62	6500	339950	15690	2033	13657	261	39
Jowar	5	4000	20000	30	4000	20000	0	200	-200	-40	40
Soybean	9	7500	67500	105	6500	58500	-9000	300	-9300	-1033	33

Source: field survey

Table 9 presents information on various crops stored in the village of Mugad. In this village, farmers store Bengal gram, Cotton, Green gram, Jowar, and Soybean to obtain higher prices. Products are stored for a duration ranging from one month to four months, with Soybean being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 261 to Rs. 329. For Bengal gram and Green gram, farmers obtain benefits, while for Soybean; Jowar, and Cotton, losses are incurred.

Table 10: Details of storage & Economic Benefits in Sanshi

Crops stored	Total Quantity stored (In Quintal)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 - col4)	Total cost of Storage	Net Gain (deducting cost of storage)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col-9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	18	6400	112640	122	5000	88000	-24640	340	-24980	-1419	19
Black Gram	40	6250	251875	25	5500	221650	-30225	475	-30700	-762	12
Cotton	43	5500	233750	65	7850	333625	99875	375	99500	2341	9
Green Gram	78	6000	468000	23	6500	507000	39000	350	38650	496	4
Chilly	20	6000	120000	90	9500	190000	70000	3000	67000	3350	150
Sunflower	50	6000	300000	25	5000	250000	-50000	300	-50300	-1006	6

Source: field survey

Table 10 presents information on various crops stored in the village of Sanshi. In this village, farmers store Bengal gram, Black gram, Cotton, Green gram, Chilly, and Sunflower to obtain better prices. Products are stored for a duration ranging from one month to five months, with Bengal gram being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 496 to Rs. 3350. For Chilly, farmers obtain the highest benefit, i.e., Rs. 3350 per quintal, followed by Cotton and Green gram. However, Sunflower and Bengal gram incur losses.

Table 11: Details of storage & Economic Benefits in Tabakadhonnalli

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col-9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Horse Gram	17	4667	77934	37	5400	90180	12246	167	12079	723	10
Maize	83	2733	227684	20	2533	211024	-16660	633	-17293	-208	8
Soybean	35	6000	210000	195	7000	245000	35000	225	34775	994	6
Wheat	8	3000	24000	45	3200	25600	1600	100	1500	188	13

Source: field survey

Table 11 presents information on various crops stored in the village of Tabakadahonnalli. In this village, farmers store Horse gram, Maize, Soybean, and Wheat to obtain better prices. Products are stored for a duration ranging from one month to seven months, with Soybean being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 188 to Rs. 994. For Soybean, farmers obtain the highest benefit, i.e., Rs. 994 per quintal, followed by Horse gram and Wheat.

Table 12: Details of storage & Economic Benefits in Tirlpur

Crops stored	Total Quantity stored (In Quintals)	Price at the time storage (Rs/Quintal)	Total Value of Produce at the time of storage (Rs)	Period of storage (No of Days)	Price at the time of Sale (Rs/Quintal)	Total Value of Produce at the time of sale (Rs)	Total Gain (col-7 -col4)	Total cost of Storage	Net Gain (deducting cost of storage) (col-8- Col-9)	Price gain (Rs/Quintal) Col-10/col 2)	Cost of storage (Rs/Quintal) (col-9/col-2)
1	2	3	4	5	6	7	8	9	10	11	12
Bengal Gram	13	4000	50000	100	4250	53125	3125	350	2775	222	28
Ground nut	20	4500	90000	30	4800	96000	6000	250	5750	288	13
Cotton	15	8000	120000	90	6200	93000	-27000	200	-27200	-1813	13
Green Gram	44	5050	221190	139	2875	125925	-95265	413	-95678	-2184	9

Source: field survey

Table 12 presents information on various crops stored in the village of Tirlpur. In this village, farmers store Bengal gram, Groundnut, Cotton, and Green gram to obtain better prices. Products are stored for a duration ranging from one month to five months, with Green gram being stored for more extended periods compared to other crops. After storage, farmers receive net benefits ranging from Rs. 222 to Rs. 288. However, farmers incur losses for crops such as Green gram and Cotton.

Concluding Observations

The paper reveals that most of the farmers sell their product immediately after the harvest in the absence of access to institutional storage facilities like rural godowns and warehouses. On an average around 43 percent of the farmers store their produce mainly in their houses. It is found that storage has helped to get higher prices to farmers. If proper institutional storage facilities are provided, all farmers would have got higher prices and other advantages. Therefore, it is suggested that more and more institutional storage facilities should be provided to rural farmers for their sustainable livelihoods.

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