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RESEARCH PAPER

Assessment of Post-harvest Losses in Chickpea Production: Evidence from Kurnool District of Andhra Pradesh

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ABSTRACT

The study assesses the magnitude and determinants of post-harvest losses in chickpea production in Kurnool district of Andhra Pradesh using primary data collected from 80 farmers, 10 wholesalers, and 10 retailers through a multi-stage sampling framework. Both tabular and functional analyses were employed to estimate losses and examine their economic impact across the supply chain. The results indicate that the average post-harvest loss of chickpea is 6.4 kg per quintal, with the highest losses occurring during harvesting and drying stages. Regression results show that harvesting, threshing, and marketing losses significantly reduce farm income. At the farm level, weather conditions, availability of threshing machines, and timely labour significantly influence losses, while at the intermediary level, quantity handled, storage duration, and transportation constraints are key determinants. The study highlights the need for improved post-harvest management practices and infrastructure to minimize losses and enhance farmers' income.

HIGHLIGHTS

- Average post-harvest loss of chickpea is 6.4 kg per quintal.
- Harvesting and drying stages account for the highest losses.
- Post-harvest losses significantly reduce farmers' income.
- Weather, labour, storage, and transport are key determinants.

Keywords: Chickpea, Post-harvest losses, Supply chain, Regression analysis, Farm income, Kurnool district, Storage and transportation

The chickpea is grown in an area of 137 lakh hectares with a production of 142.4 lakh tonnes and productivity of 1038 kg/ha (Anonymous, 2019). India contributes 70.00 per cent of total world chickpea production of 116.2 lakh tonnes cultivated under 112 lakh hectares with productivity of 1036 kg/ha in 2020- 21 (Anonymous, 2021). In India, Andhra Pradesh produces 5.66 lakh tonnes in an area of 4.65 lakh hectares with 1218 kg/hectare productivity in 2020-21 (Anonymous, 2020-21). Chickpea is the major crop in Kurnool district of Andhra Pradesh. In Kurnool, chickpea is grown in area of 1.56 lakh ha with production of 1.99 lakh tonnes and with an average yield of 1273 kg/ha (Anonymous, 2021). Food grain loss accounts for 10% of overall food loss. The study on post-harvest food losses indicated that the post-harvest losses in pulses were estimated to be high and accounted for 16 per cent of the total crop harvested (Basavaraja *et al.* 2006 and Kumar *et al.* 2010). Chickpea losses in India are around 8.41 per cent. The loss of grain is due to faulty harvesting and processing procedures, poor storage and loss during transportation was enough to feed

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about 70 to 100 million people. Before agricultural commodities reach the customer, they must go through a number of processes such as harvesting, drying, threshing, packaging, shipping, storing, processing and exchange, there are significant losses at all stages. Unscientific storage procedures at homes, farms and godowns add to the losses. Farmers, dealers and processors must be educated on scientific storage techniques and scientific bulk storage facilities must be built. (Vishwakarma *et al.* 2019). Keeping this in view, the current study attempts to assessing post-harvest losses in chickpea production Kurnool District of Andhra Pradesh in turn would help to develop proper measures to reduce these losses and enhance production.

MATERIALS AND METHODS

The study was conducted in Kurnool district of Andhra Pradesh during 2022, which was purposively selected due to its prominence in chickpea cultivation. A multi-stage sampling technique was adopted, wherein four mandals (Gospadu, Koilkuntla, Uyyalawada, and Sanjamala) were selected based on area under chickpea, followed by the selection of eight villages. From each village, ten farmers were randomly selected, constituting a total sample of 80 farmers. Additionally, 10 wholesalers and 10 retailers were selected to represent intermediaries. Primary data were collected through personal interviews using a pre-tested schedule, while secondary data were obtained from official records and published sources.

The analysis was carried out using tabular and functional approaches. Tabular analysis was used to estimate post-harvest losses at different stages such as harvesting, drying, threshing, storage, and marketing. Functional analysis using multiple linear regression models was applied to assess the economic impact and determinants of losses. The economic impact model is specified as:

$$Y = a_0 + a_1X_1 + a_2X + a_3X_3 + a_4X_4 + a_5X_5 + e$$

where Y represents farm income (₹/ha), X_1 to X_5 denote losses at different stages (harvesting, drying, threshing, storage, and marketing), and e is the error term.

The farm-level determinants model is expressed as:

$$Y = a_0 + a_1X_1 + a_2X + \ldots\ldots\ldots\ldots + a_9X_9 + e$$

where Y denotes post-harvest losses (q/ha), and explanatory variables include education, production, cultivated area, age, weather dummy, transportation dummy, threshing machine availability, storage facility, and labour availability.

Similarly, the intermediary-level model is given by:

$$Y = a_0 + a_1X_1 + a_2X + \ldots\ldots\ldots\ldots + a_7X_7 + e$$

where Y represents losses at intermediary level, and variables include education, quantity handled, experience, age, storage duration, transportation, and storage facility.

RESULTS AND DISCUSSION

The magnitude of post-harvest losses at the farm level is illustrated in Fig. 1, which shows that losses vary across farm sizes but consistently follow a similar pattern across stages. The average total post-harvest loss was estimated at 6.4 kg per quintal, with harvesting losses being the highest (2.44 kg), followed by drying (1.35 kg), threshing (0.90 kg), storage (0.86 kg), and marketing (0.85 kg). Higher harvesting losses are primarily attributed to delayed operations, labour shortages, and grain shattering, while drying losses are linked to adverse weather conditions. These findings are consistent with earlier studies (Seth *et al*. 2018; Monika *et al*. 2018).

Table 1: Regression results of the economic impact of post-harvest losses on farmers' income

Sl. No.	Variables	Regression coefficient
1	Intercept	134151.7
2	Harvesting loss (₹) (X_1)	-2.73**
3	Drying loss (₹) (X_2)	-0.40
4	Threshing loss (₹) (X_3)	-1.29**
5	Storage loss (₹) (X_4)	-0.71
6	Marketing loss (₹) (X_5)	-1.02*
| | R^2 | 0.421 |		

Note: ** and ** indicate significance at 5 per cent and 1 per cent levels, respectively.*

The economic impact of post-harvest losses is presented in Table 1, where regression results indicate that harvesting and threshing losses are

negatively significant at the 1 per cent level, while marketing losses are significant at the 5 per cent level.

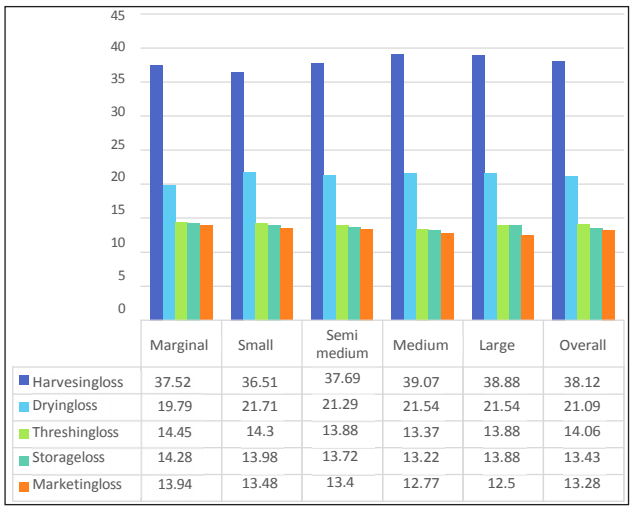

Fig. 1: Stage-wise post-harvest losses of chickpea across different farm categories (kg/quintal)

This implies that increases in these losses significantly reduce farm income. Drying and storage losses, although negative, are statistically insignificant. The coefficient of determination (R^2 = 0.421) suggests moderate explanatory power of the model.

Table 2: Distribution of post-harvest losses at intermediary level (N = 20)

Sl. No.	Loss components	Share of total losses (%)
1	Transportation losses	65
2	Storage losses	35
Total losses		**100**

At the intermediary level, the extent of losses is summarized in Table 2, which shows that total losses amount to 0.93 per cent of the quantity handled. Transportation accounts for the largest share (65 per cent), followed by storage losses (35 per cent). This highlights inefficiencies in logistics and handling practices as major contributors to losses.

The determinants of post-harvest losses at the farm level are reported in Table 3. The results reveal that weather conditions and availability of threshing machines are negatively significant at the 5 per cent level, while timely labour availability is negatively significant at the 1 per cent level. This indicates that adverse weather and labour constraints significantly increase losses. Other variables such as education, age, and production are statistically insignificant.

Table 3: Regression analysis of factors affecting post-harvest losses at farm level (N = 80)

Sl. No.	Variables	Regression Coefficient
1	Intercept	1.873
2	Education (X_1)	-0.064
3	Production (q/ha) (X_2)	0.008
4	Cultivated area (ha) (X_3)	0.072
5	Age (X_4)	-0.014
6	Weather (X_5)	-0.462*
7	Transportation (X_6)	0.069
8	Threshing machine availability (X_7)	-0.025*
9	Storage facility (X_8)	0.129
10	Timely labour availability (X_9)	-0.605**
| | R^2 | 0.489 |		

Note: ** and ** indicate significance at 5 per cent and 1 per cent levels, respectively.*

Table 4: Regression analysis of factors affecting post-harvest losses at intermediary level (N = 80)

Sl. No.	Variables	Regression Coefficient
1	Intercept	1.334
2	Age (X_1)	-0.093*
3	Education (X_2)	0.005
4	Experience (X_3)	0.021
5	Quantity handled (X_4)	0.004*
6	Time of storage (X_5)	0.006**
7	Transportation (X_6)	-0.623**
8	Storage facility (X_7)	0.189
| | R^2 | 0.711 |		

Note: ** and ** indicate significance at 5 per cent and 1 per cent levels, respectively.*

Similarly, Table 4 presents the determinants at the intermediary level. Age is negatively significant at the 5 per cent level, while quantity handled is positively significant at the same level. Storage duration is positively significant, and transportation is negatively significant at the 1 per cent level. These findings suggest that larger volumes handled and longer storage periods increase losses, whereas better transportation reduces them. The R^2 value of 0.711 indicates strong explanatory power.

The results demonstrate that post-harvest losses are influenced by both technical and institutional factors across the supply chain, with significant implications for farm income and market efficiency.

CONCLUSION

The study concludes that post-harvest losses in chickpea production remain substantial, averaging 6.4 kg per quintal, with the highest losses occurring during harvesting and drying stages. These losses significantly reduce farmers' income, particularly through harvesting, threshing, and marketing inefficiencies. At the farm level, factors such as unfavourable weather, lack of threshing machinery, and labour shortages play a crucial role, while at the intermediary level, transportation inefficiencies and prolonged storage periods are major contributors.

To mitigate these losses, policy measures should focus on improving access to farm mechanization, particularly affordable harvesting and threshing equipment. Strengthening rural infrastructure, including scientific storage facilities and efficient transportation systems, is essential. Extension services should emphasize training farmers in improved post-harvest management practices. Additionally, institutional support through cooperatives and public agencies can facilitate access to better storage materials and reduce handling losses. Enhancing supply chain efficiency and promoting awareness of scientific storage techniques can significantly reduce post-harvest losses, thereby improving farmers' income and overall agricultural sustainability.

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