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RESEARCH ARTICLE

Seed Replacement Rate of Groundnut in the Saurashtra Region of India : A Study

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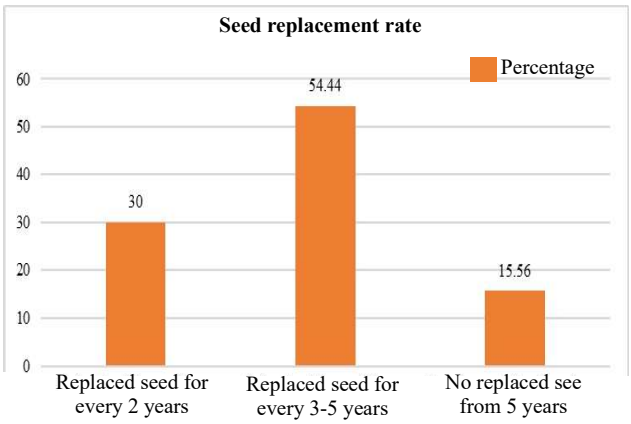
HIGHLIGHTS

- Many farmers use seeds sourced from the previous year's harvest without realizing the possible detrimental effects on yield from not utilizing certified seed or truthfully labeled seed every year.
- Key barriers identified include the high cost of new seeds, fear of seed mix-ups from external sources, and skepticism about the reliability of private seed companies.
- Farmers' preferences are significantly influenced by the affordability of seeds and perceived local suitability.

GRAPHICAL ABSTRACT



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ABSTRACT

Context: Groundnut is a significant oilseed crop that ranks first in acreage and second in production, after soybean. The Seed Replacement Ratio (SRR) in Groundnut. The study investigates the dynamics of Seed Replacement Rate (SRR) in groundnut cultivation in Gujarat, India, which contributes significantly to the country's oilseed production.

Objectives: To document the extent of the seed replacement rate of the groundnut farmers at the field level. Analyze the perception of groundnut growers about seed replacement and factors affecting the perception and extent of SRR among groundnut growers.

Methodology: The study encompasses 180 farmers from three districts in the Saurashtra region, where 40.5 per cent of the nation's groundnut production originates. Perception of SRR was quantified by developing a schedule with statements on a three-point continuum. The extent of SRR was quantified on a three-point continuum based on the period in years in which farmers have changed the seed. Factors affecting the SRR perception and extent of usage were calculated based on the chi-square value.

Results and Discussion: The majority of farmers exhibit an unfavorable perception of SRR, with 37.22 per cent holding this view. The majority (54.44 per cent) of the respondents had replaced seed every 3-5 years followed by 30.00 per cent of the respondents who had replaced seed every 2 years. While around 15.56 per cent of the respondents had no replacement of seed from 5 years. *Significance*: There is a positive and highly significant relationship between perception towards SRR and the extent of SRR at a 1 per cent significance level with a chi-square value of 18.47**.

In India, groundnut is a significant oilseed crop that ranks first in acreage and second in production, after soybean. Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, and Rajasthan have the highest percentage of groundnut production. About 90 per cent of the groundnut area is made up of these six states with a share of about 25–30 per cent of the international market. India is the second-largest producer, processor, and exporter of groundnuts worldwide with 48 per cent of the country's groundnut production coming from Gujarat, as it's India's top producer. Gujarat and Rajasthan provide most of the groundnuts used for Indian exports. Despite being a major groundnut exporter, the country faces challenges in achieving high seed replacement rates (SRR) and varietal replacement rates (VRR). Seed is the most crucial basic part that affects agriculture's growth and sustainability. Seed is the medium through which technology is delivered. The ability of high-quality seeds to grow new, healthy plants is essential for the production of food, the security of the food supply, and eventually the population's survival (Muschick, 2009). Seed replacement is the percentage of area sown with certified/quality seeds, out of the total cultivated area under a crop in a season (Singh and Chand, 2011). Farm-saved seed (FSS) is the most popular source for raising crops in India year after year since farmers are accustomed to the seed, cultivate it themselves, and are aware that the variety is suited to the climate and preferences of their region. Groundnut, the highest-producing state of Gujarat has only 20 per cent SRR, and Rajasthan only 7-9 per cent (Digital, 2023). (Table 1)

The seed production across all categories for Rabi 2022-23 and Kharif 2023 exceeded the targets, reflecting highly successful efforts in seed multiplication and quality control. The most significant production surpluses were seen in the Breeder and Truthfully labelled seed categories, which surpassed their targets by 72 per cent and 82 per cent, respectively. Regarding legumes in general and groundnuts in particular, farmers prefer home-saved seeds because they tend to have higher seeding rates and/or lower multiplication rates, which raises seed prices and comparatively raises seed costs (Nigam *et al.,* 2004). Groundnut has a low germination percentage – 70 per cent for certified seeds and even lower for truthfully labeled seeds (IMSCS) – So there is a need for higher seeds which increases the cost of cultivation. The seed multiplication ratio in groundnut ranges between 1: 5 and 1: 10 (1: 8) (Annual, 2022). This multiplication ratio can be further increased under assured growing conditions and high inputs. It is important to get a high pod yield in a seed crop to ensure lower seed prices for the farmers and more profit for seed growers. The introduction of new cultivars is still hampered by the extremely low seed replacement rate (SRR). Seeds of groundnut are inherently less viable because of high oil content and more hygroscopic. Additionally, storing groundnut seeds in poor or unfavorable environmental conditions causes a major issue known as seed degradation or deterioration, which is characterized by a loss of viability, vigor, and quality of the seed.

Table 1. Summary of total quality seed production (Rabi 2022-23 and Kharif 2023)

Groundnut Seed	Target (In quintals)	Production (In quintals)
Breeder seed	6766.91	11642.53
Foundation seed	2075.00	2138.43
Certified seed	2563.50	3145.01
Truthfully labelled seed	2283.50	4156.66
Total	13688.91	21082.63

Source: Annual Report (2024)

METHODOLOGY

Gujarat was purposefully selected as it is the state from which 40.5 per cent of the nation's groundnut production comes (Singh and Chand, 2011). Among the total groundnut area under cultivation in Gujarat, on average, from 2019 to 2022, Saurashtra contributed 81.11 per cent of the area and 80.16 per cent of the groundnut production in Gujarat (Directorate of Agriculture, 2023). Hence the study was purposively conducted in the Saurashtra region (latitude 27°N and longitude 71°E). From the Saurashtra region of 11

Map of the study area

districts, three districts were randomly selected. They are Junagadh, Rajkot and Jamnagar. Two mandals from each district were selected randomly from the three districts selected. From each Mandal two villages were selected randomly. Hence from 6 mandals a total of 12 villages were selected. From each village, a random sample of 15 farmers who are groundnut growers were selected. Hence the sample summed up to 180 farmers from all the 12 villages. Perception of SRR was quantified by developing a schedule with both positive and negative statements on a three-point continuum where the overall summated score gives the perception value based on the scale developed by (Kumar and Popat, 2016). Statements were scored as 1,2,3 for strongly agree, Neutral, and Disagree as they are negative statements. The respondents were classified into unfavorable, neutral, and favorable perceptions based on the mean and SD. The extent of SRR was quantified on a three-point continuum based on the period in years in which farmers have changed the seed. Factors affecting the SRR perception and extent of usage were calculated based on the chi-square value. The test statistic of the chi-squared test:

$$\chi 2=\sum(0-E)2E\sim\chi 2$$

with degrees of freedom (r - 1) (c - 1),

O and E represent observed and expected frequency, and r and c are the number of rows and columns of the contingency table.

Fisher's exact test is typically utilized in the analysis of small samples, even though it is applicable for all sample sizes. While the chi-squared test depends on an approximation, Fisher's exact test is one of the precise tests. When more than 20 per cent of cells have projected frequencies less than 5, the approximation strategy is insufficient and Fisher's exact test must be performed.

RESULTS

Perception of farmers towards SRR: Table 2 reveals that a significant proportion of respondents, constituting 37.22 per cent, hold an unfavorable perception of seed replacement rates. Following closely, 33.33 per cent of respondents exhibit a neutral stance, while the remaining 29.45 per cent express a favorable perception toward seed replacement rates.

The weighted mean score for each statement was then interpreted, with lower scores indicating stronger agreement with the negative statements and higher scores indicating stronger disagreement. Table 3 reveals that the weighted mean scores show that farmer perceptions of the Seed Replacement Rate (SRR) vary widely. The lowest score of 1.36 indicates a strong belief regarding the effectiveness of utilizing seeds from the crop from the previous year. Affordability is a major concern; scores of 1.44 and 1.47 suggest that farmers find it difficult to make an annual purchase of new seeds, especially for groundnuts due to their high

Table 2. Distribution of respondents based on perception towards seed replacement rate

Category	No.	%
Unfavourable (Up to 22)	67	37.22
Neutral (23-26)	60	33.33
Favorable (Above 26)	53	29.45
Total	180	100.00
Mean: 24.1 ½, S.D:2.2		

Table 3. Perception of farmers regarding seed replacement rate

Statements	WMS
Some seeds from the previous year's production can be saved for next year and it also gives good yield.	1.36
It is not affordable to take expensive groundnut seeds every year if the weather/rainfall does not produce.	1.44
New seed is not available at the village level and transportation costs are also incurred to procure it from the district.	1.46
Taking new seeds every year is expensive for groundnut crops.	1.47
We believe that seed corporations cannot provide enough seed and private company seed is not reliable.	1.52
We believe that since the seeds we use are producing well in our soil, there is no need to change the seeds.	1.64
I prefer to store fresh groundnut seeds as it costs less to store them than to buy them from outside.	1.65
Since the farm area is small and the seed rate is high, taking expensive seeds every year is not affordable.	1.72
We are afraid that getting a new seed every year from a company or corporation is likely to introduce a mix-up.	1.78
Using the previous year's seed, we can get a quality product as we know the treatment given in the prior year's pest.	1.82
We know that seed rotation increases production even though we use our seeds.	1.91
The yield is better by using the seed produced in the previous year.	2.21

seed rate. Accessibility issues are also notable, with a score of 1.46 highlighting the difficulty in obtaining new seeds at the village level and the associated transportation costs. Distrust in seed corporations and private companies is evident with a score of 1.52. Satisfaction with current seed performance and cost-efficiency of storing seeds scored at 1.64 and 1.65 respectively, further emphasizing the reliance on traditional practices.

The extent of Seed Replacement rate: Table 4 reveals the majority 54.44 per cent of the respondents had replaced seed every 3-5 years followed by 30.00 per cent of the respondents who had replaced seed every 2 years. While around 15.56 per cent of the respondents had no replacement of seed from 5 years. It indicates that most of the farmers replace seeds every 3-5 years which is not ideally recommended, providing these farmers with subsidized seeds or increasing the availability and affordability can help them to change seeds every 2 years.

Table 4. Distribution of respondents based on the extent of seed replacement rate

Category	No.	%
Replaced seed every 2 years	54	30.00
Replaced seed for every 3-5 years	98	54.44
No replacement of seed from 5 years	28	15.56
Total	180	100.00

Table 5. Relationship between the SRR and socio-personal variables

Variables	Test	Test stat	Sig.
Perception of SRR			
Education level	χ^2	9.06*	0.05
Occupation	p Test	13.05**	0.00
Access to Credit	χ^2	12.36**	0.01
Extent of the Seed Replacement rate			
Income	χ^2	10.05*	0.03
Size of land holding	χ^2	14.38**	0.00
Risk Orientation	χ^2	11.32*	0.02
Innovativeness	p	18.06**	0.00
Training received	χ^2	8.19**	0.01
Extension contacts	χ^2	10.06*	0.03
Awareness	χ^2	9.08*	0.05

* Significant at 0.05 level of significance, ** Significant at 0.01 level of significance, (Fisher's Exact Test=p)

Table 6. Relationship between Extent of SRR and Perception of SRR

Relationship	Test	Test stat	Sig.
The extent of SRR × Perception of SRR	χ^2	18.47**	0.00

** Significant at 0.05 level of significance,*
*** Significant at 0.01 level of significance*

Relationship between the SRR and socio-personal variables: Table 5 reveals the relationship between perception towards SRR and socio-personal variables. Among all the variables, education (9.06*) had a positive and significant relationship with perception of SRR at a 5 per cent significance level and variables such as occupation (12.36**) and access to credit (13.05**) had a positive and highly significant relationship with perception of SRR at 1 per cent significance level. It suggests that farmers' education, occupation, and credit facilities are the factors that have to be targeted in any intervention to develop a favorable perception regarding the seed replacement rate of farmers. Out of the 14 variables income (10.05*), risk orientation (11.32*), extension contact (10.06*), and awareness (9.08*) had a positive and significant relationship with the extent of SRR at a 5 per cent significance level and variables such as size of land holding (14.38**), innovativeness (18.06**) and training received (8.19**) had positive and highly significant relationship with extent of SRR at 1 per cent significance level.

Relationship between Extent of SRR and Perception of SRR : Table 6 reveals that there is a positive and highly significant relationship between perception towards SRR and the extent of SRR at a 1 per cent significance level with a chi-square value of 18.47 **.

DISCUSSION

The majority of farmers, 37.22 per cent, fall into the unfavorable category of perception, which indicates a significant portion of the farming community holds negative perceptions or reservations about the SRR, majorly due to economic constraints, lack of awareness, or distrust in the efficacy of new seeds. A considerable 33.33 per cent of farmers hold a neutral stance, suggesting uncertainty about the benefits and practices of SRR. This group may benefit from targeted informational and support programs to shift their perceptions positively. Lastly, 29.45 per cent of farmers exhibit favorable perceptions, reflecting a positive perception towards adopting SRR practices. The study by (Desai *et al.,* 2024) also stated that the pre-test training program results showed that the farm

women knew less about new technologies in groundnut production systems before the training programs. This suggests that targeted training and awareness initiatives for farmers in the neutral category have the potential to shift their perceptions toward a more favorable outlook. Implementing such programs could contribute to an overall increase in the favorable perception of seed replacement rates among the farming community. These results indicate that better-educated farmers, those with different occupational backgrounds, and those with access to credit are more likely to have favorable perceptions of SRR, highlighting the need for targeted educational and financial support programs. Most respondents 54.44 per cent stated they changed their seeds every three to five years, compared to 30.00 per cent who changed them every two years and 15.56 per cent who hadn't changed any in more than five years. This pattern implies that most farmers are not replacing their seeds as often as is desired, which might affect agricultural yields and productivity. Economic limitations and restricted availability of new seeds are identified as important barriers to the majority's low replacement of seeds. It is imperative to either increase the affordability and accessibility of high-quality seeds or offer farmers subsidized seeds to address this problem. These findings suggest that higher income, larger landholdings, greater risk orientation, innovativeness, training, extension contacts, and awareness are positively associated with increased seed replacement rates, highlighting the importance of comprehensive strategies that encompass financial, educational, and extension support to enhance seed replacement practices among farmers. The results are in line with the study by (Jalu *et al.,* 2022) which revealed a positive and significant association between the extent of adoption of recommended groundnut production technologies and size of land holding, annual income, mass media exposure, extension contact, innovativeness, scientific orientation, risk orientation, economic motivation, and yield index in demonstrator farmers. The results also confirm and are consistent with previous studies (Singh *et al.,* 2015) in which the results of the correlation analysis showed that knowledge and adoption levels of sustainable groundnut production were significantly positively correlated with social factors such as land ownership, socioeconomic status, education, family education, economic motivation, source of information used, change proneness, and attitude towards sustainable groundnut production. A study by (Swami and Verma, 2022) also stated that there was a significant association found between education, mass media exposure, extension agency contact, information-seeking behaviour, and information-sharing behavior with the knowledge level of the respondents regarding demonstrated groundnut production technologies

CONCLUSION

The analysis of the Seed Replacement Rate revealed that while a considerable proportion of farmers acknowledged the benefits of using seeds produced in the previous year, a substantial lack of awareness exists regarding the potential negative impacts on yield. Concerns about the cost of acquiring new seeds, fear of seed mix-ups from external sources, and the perceived reliability of private seed companies were identified as barriers to adopting new seeds annually. Affordability, local suitability, and seed knowledge significantly shaped farmers' preferences. It is essential to make new seeds more easily accessible at the village level. A local seed distribution center and cheaper transportation might be established as part of this. To gain farmers' trust, private and corporate seed suppliers must guarantee the quality and dependability of their products. Transparent supply chains and quality assurance systems can be beneficial in this context. The results state the need for collaborative efforts involving agricultural extension services, research institutions, and policymakers to design interventions that promote the availability, accessibility, and affordability of quality seeds of the new varieties to the farming community.

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Authors' contribution: The first and second authors conceptualized, the concept and analyzed the findings of the manuscript. The first and fourth authors collected and analyzed the data. The third author analyzed data and prepared a draft manuscript. The fifth author reviewed and gave necessary technical changes to be done in crop-specific analysis. All authors discussed the results and contributed to the

final manuscript.

The authors approve of the content of the manuscript and agree to be held accountable for the work.

REFERENCES

Annual Report (2022): Glimpses 2021-22 AICRP on Seed (Crops), ICAR- Indian Institute of Seed Science.

Annual Report (2024): Glimpses 2023-24 AICRP on Seed (Crops), ICAR- Indian Institute of Seed Science, Mau, UP

Desai, R.; Chitagubbi, G., and Salunke, R. (2024). Impact of mechanization in groundnut production system for drudgery reduction and to enhance farm income. *Indian Res. J. Ext. Edu*., **24**(2):51-58

Digital Sansad (2023). Retrieved from (25 January 2024 09:50 AM) https://sansad.in/

Directorate of Agriculture (2023). District-wise area, production and yield of important food & non-food crops in Gujarat state, Government of Gujarat.

Jalu, S. N.; Bariya, M.K., and Chandravadia, K.U. (2022). Characteristics of groundnut cultivators and their adoption level on crop production technology. *Indian Res. J. Ext. Edu*., **22**(5), 214-219

Kumar, G.S., and Popat, M. N. (2016). Development of a scale to measure farmers' perceptions of the quality of groundnut. *Indian Res. J. Ext. Edu*., **9**(1):11-13.

Muschick, M. (2009). The evolution of seed testing. In: Proceedings of the second world seed conference. Responding to the challenges of a changing world: The role of new plant varieties and high-quality seed in agriculture. FAO, Rome, Sept. 8-10. pp. 159-165.

Nigam, S.N., Giri, D.Y., and Reddy, A.G.S. (2004). Groundnut seed production manual. Patancheru 502 324, Andhra Pradesh, India: ICRISAT. 32 pp

Oilseeds (2023). Retrieved from https://www.ibef.org/exports/oilseeds-industry-India

Singh H and Chand R. (2011). The Seeds Bill, 2011: Some reflections. Eco. & Poli. Weekly, **XIVI** (51): 22-25

Singh, J. P.; Bangarva, G.S., and Singh, V. (2015). Social aspects of sustainability of groundnut production in semi-arid eastern plains of Rajasthan. *The Indian J. Agril. Sci.*, **85**(9):1229-1233.

Swami, S., and Verma, R. K. (2022). Knowledge level of farmers regarding demonstrated groundnut production technologies. *Indian Res. J. Ext. Edu*., **22**(5), 166-172.

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