P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 10; October 2025; Page No. 27-29

Received: 20-07-2025
Accepted: 24-08-2025

Indexed Journal
Peer Reviewed Journal

# A study to identify the constraints of potato cultivation with apical root cuttings seed technology

**[1]Chandana Basavaraja Moolimane, [2]G Basavaraj, [1]Aishwarya SP, [3]Sushma Purada and [1]Shreedevi R**

[1]Ph.D. Student, Department of Agricultural Economics, University of Agricultural Sciences, Bangalore, Karnataka, India

[2]Associate Professor, Department of Agricultural Economics, University of Agricultural Sciences, Dharwad, Karnataka, India

[3]Ph.D. Student, Institute of Agribusiness Management, University of Agricultural Sciences, Bangalore, Karnataka, India

**DOI:** https://www.doi.org/10.33545/26180723.2025.v8.i10a.2510

**Corresponding Author:** Chandana Basavaraja Moolimane

**Abstract**

The area under potato cultivation in Karnataka has reduced due to the outbreak of diseases, poor access and poor seed quality and high seed price. Apical Root Cuttings (ARC), a vegetative propagation technique, facilitates rapid multiplication, producing numerous high-quality seedlings at affordable prices. The present study identifies the constraints of potato cultivation with Apical Root Seed Technology. The major constraint faced by ARC practicing farmers was inadequate storage and warehouse facilities followed by high mortality of planting material. Majority of the farmers adopted the ARC method of potato cultivation mainly due to double benefit that means potato produced through ARC method can be used as both seed potato, ware potato and other reason was to meet own seed requirement. The adoption of ARC technology was mainly influenced by land holding, income from other crops and family size.

**Keywords:** Apical root cutting, constraints, Garette ranking poor seed quality

## Introduction

Horticulture combines the realms of science and art to foster the growth, development, and yield of horticultural crops. It plays a pivotal role in ensuring nutritional well-being, reducing poverty, and securing food supplies. Moreover, it serves as a crucial source of financial stability for farmers. Fruits, vegetables, flowers, and herbs, known as high-value crops, consistently yield greater profits compared to other field crops. By embracing horticulture, agriculture can diversify its economic prospects. Given India's diverse agro-climatic conditions, a wide range of vegetable crops can be cultivated, presenting a remarkable opportunity for the country to emerge as a major producer of fruits, vegetables, and various other crops (Sinha & Singh, 2019) [7].

Tuber crops hold significant importance in human societies, ranking as the third most essential food source following cereals and grain legumes. They serve as either a primary dietary staple or a substantial complement to the diet for approximately 20 per cent of the global population. Tuber crops play a crucial role in offering abundant and affordable food and energy, particularly benefiting economically disadvantaged communities. Most tuber crops demonstrate the ability to yield economically viable harvests in diverse challenging soil and environmental conditions. Tuber crops hold immense significance in seasonal agricultural practices due to their ability to generate the highest daily dry matter per unit area. This makes them highly efficient and biologically effective as valuable food sources (Mahesh.,2023) [4].

Potato (*Solanum tuberosum* L.) is one of the most important root vegetables in the world and is cultivated as a rabi crop in hilly regions and as a kharif crop in the tropical and subtropical regions and is suitable for cultivation in wide range of soils (Sandu *et al*., 2018) [6]. Tuber crops hold immense significance in seasonal agricultural practices due to their ability to generate the highest daily dry matter per unit area and hence makes them highly efficient and biologically effective as valuable food sources (Mahesh, 2023) [4].

A total of 376 MT of potatoes were produced worldwide during 2021-22, with China (94 MT) and India (54 MT) being the largest potato producing countries. Of the 28.08 million hectares of total horticultural crops in India, the area under potato cultivation in India was 22.03 lakh hectares with a production of 342.33 MT (15.59 per cent of total horticultural production) during the year 2021-22. In India, Uttar Pradesh (6.22 lakh ha), West Bengal (4.47 lakh ha) and Bihar (3.30 lakh ha) were the top three states which occupied greater share in area under potato cultivation (NHB, 2021) [8].

Hassan, Chikkaballapur, Kolar and Chikkamagaluru are the leading potato producing districts in Karnataka state, which together contributes about 70 per cent to the state's output (Anonymous, 2022) [1].

In India, the seed potato production is largely confined to north India, especially Punjab. The seed growers in Punjab are entrepreneurial, skilled, and have captured India's seed market. Of late, conditions in Punjab are becoming less

suitable for seed production which has resulted in a shift in the time of seed potato planting. The ideal time for planting is in October, however many farmers are not able to take up planting because of delayed paddy cultivation. As a result of this late planting, the crop is more prone to vectors which transmit viruses, resulting in faster degeneration, and therefore less reliable seed coming from Punjab (Das and Sonia., 2019). Hence, there is need to develop non-conventional areas for seed potato production. With ideal conditions for potato cultivation in both *kharif* and *rabi*, Karnataka offers the right conditions to develop the seed potato sector. Adopting the Apical Rooted Cutting (ARC) technology, which is already quite popular in Vietnam, can be a game changer as it enables increased multiplication rate and more rapid seed potato multiplication at a lower price (Mohanty *et al*., 2023) [5].

Apical rooted cuttings (ARC) technology helps to address the issue to production of seed tubers locally with good, potential, adaptable, viable at low-cost. It is in this context, a research study was carried out to study the economics of potato cultivation using ARC technology and conventional methods. The results of the study will be useful for policy makers to formulate effective strategies to increase the productivity of potato and address the issue of timely availability of seed tubers at low cost.

## Methodology

### Sampling Procedure

Purposive and multistage sampling technique was employed to select the study area and random sampling design was used for the selection of farmer respondents. In the first stage, Hassan district was purposively selected for the study as the ARC technology is implemented and adopted by the farmers for potato production. In the second stage, two taluks from Hassan district namely Arasikere and Hassan, were selected. In the third stage, four villages from the Hassan taluk and two villages from Arasikere taluk were chosen. These villages were purposively selected because they exhibited the highest adoption rate of ARC technology. In the fourth stage, from among the selected villages, farmers were randomly selected for detailed data collection using a well-structured pre-tested schedule. To study the comparative economics, data was also collected from randomly selected farmers who were growing potato using conventional seed technology. A total of 100 sample respondents comprising 50 each practicing potato cultivation with apical root cutting seed technology and conventional seed technology method were selected for the study. The primary data was collected from the sample respondents in respect of the cultivation of potato pertaining to the agricultural year 2022-2023.

### Garrett ranking technique

Garrett's ranking technique was used to rank the reasons for adoption and non-adoption of Apical root cutting seed technology of potato cultivation. Eight factors were identified as the major reasons for the adoption of Apical root cutting seed technology of potato cultivation and eight factors for non-adoption of Apical root cutting seed technology in the study area taking into consideration the opinions of the sample farmers and with regard to the various studies undertaken in the field of study (Katyayani *et al*., 2017) [3].

The reasons considered for adoption of Apical root cuttings technology includes to meet own seed requirement, Subsidy from govt for the Apical root cuttings, Easy access to seed material, Disease free seed material, Trust over the Apical root cuttings tuber generation, Cost reduction in production of potato, Double benefit i.e own seed purpose and selling to seed market, 100 per cent plant population can be maintained with ARC plants during climate risk. Each of the sample farmer was asked to rank the above eight factors from rank one to eight. In this analysis, rank one meant most important factor and rank eight meant least important factor.

In case of constraints in practising ARC technology of potato include Poor quality planting material, High cost planting material, non availability of planting material, high mortality of planting material, inadequate storage and warehousing facilities, inadequate transport facilities, susceptible to disease and pests and inadequate access to technical information. Further each of the sample farmers were asked to rank the above four factors from rank one to rank eight. In this analysis, rank one meant most important factor and rank eight meant least important factor (Deka *et al*., 2014) [2].

In the next stage, rank assigned to each factor by each individual was converted into per cent position using the following formula,

$$\text{Per cent position} = \frac{100 * (\text{Rij} - 0.50)}{\text{Nj}}$$

Where,

Rij stands for rank given for the $i^{th}$ factor (i= 1, 2……6)/(i= 1, 2……4) by the j th individual (j = 1, 2,…. 40)

Nj stands for number of factors ranked by j th individual.

Once the per cent positions were found, the per cent position of each rank was converted to scores by referring to table given in Garrett and Woodsworth (1969). Then the scores for each factor were summed over the number of sample farmers who ranked that factor. In this way, total scores were arrived at for each of the reasons and mean scores were calculated by dividing the total score by the number of respondents, who gave ranks. Finally, overall ranking of the reasons was done by assigning rank 1, 2, 3,….6/1, 2, 3,….4 in the descending order of the mean scores.

## Results and Discussion

### Constraints faced by ARC farmers and reasons for adoption of ARC method of potato cultivation

The farmers adopting ARC method of potato cultivation were asked on the information pertaining to the constraints faced by them in practising ARC method of potato cultivation. The constraints were rank ordered and the order of preference was converted into numerical scores (Table 1). The problems are ranked based on their Garett scores and ranks, with a higher score indicated a more severe constraint.

The most significant obstacle, as indicated by the highest Garett score of 73.36 was for inadequate storage and warehousing facilities for storage of generation 1 seeds. This could imply that the availability of cold storages was limited in surrounding area of study. The second and third

biggest challenges were related to planting material. With Garett scores of 69.78 and 67.86, high mortality of planting material and poor-quality planting material suggested that there are substantial issues with the survival rate and quality of the planting material, impacting the overall crop yield and quality. Non-availability of planting material and high cost of planting material were next in line, scoring 53.06 and 52.04 respectively. This indicated that not only there was lack of sufficient planting material, but it was also expensive, adding to the cost of cultivation. These constraints were followed by susceptible to disease and pests, inadequate access to technical information and low selling price in market with garret scores of 48.90, 35.92 and 31.08 respectively.

In conclusion, the findings presents a comprehensive view of the hurdles in the implementation of the ARC method of potato cultivation, which seem to encompass both pre-harvest and post-harvest issues, market factors, and information accessibility.

The most significant constraint was inadequate storage and warehousing facilities. Hence, the hypothesis stating that procurement of seedling of ARC technology was the primary constraints for potato production was rejected.

**Table 1:** Constraints faced by sample respondents in adoption of ARC method of potato cultivation (n=50)

| Sl. No. | Particulars | Garett score | Garett rank |
|---|---|---|---|
| 1 | Inadequate storage and warehousing facilities | 73.36 | I |
| 2 | High mortality of planting material | 69.78 | II |
| 3 | Poor quality planting material | 67.86 | III |
| 4 | Non availability of planting material | 53.06 | IV |
| 5 | High cost of planting material | 52.04 | V |
| 6 | Susceptible to disease and pests | 48.90 | VI |
| 7 | Inadequate access to technical information | 35.92 | VII |
| 8 | Low selling price in the market | 31.08 | VIII |

## Conclusion

The major constraint faced by ARC practicing farmers was inadequate storage and warehouse facilities followed by high mortality of planting material. Majority of the farmers adopted the ARC method for potato cultivation mainly due to double benefit that means potato produced through ARC method can be used as both seed potato and ware potato and other reason was to meet own seed requirement. The adoption of ARC technology was mainly influenced by land holding, income from other crops and family size.

## References

1. Anonymous. Directorate of Economics and Statistics. Department of Agriculture and Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India; 2022.
2. Deka CK, Mukhopadhyay SB, Kumar S. Constraints in potato cultivation in Assam: farmer's experiences. Int J Agric Sci. 2014;10(2):488-492.
3. Katayani D, Awasthi N, Pandey R, Sachan K. Constraints faced by potato growers involved in potato cultivation activities. Int J Sci Res. 2017;6(1):1143-1145.
4. Mahesh P. Analysis of global and national scenario of tuber crops production: trends and prospects. J Manag Econ. 2023;3(7):1-3.
5. Mohanty S, Baruah S, Reddy R. Apical rooted cuttings for cheaper potato seeds. Research Brief 04. Lima (Peru): International Potato Center; 2020. p. 1-4.
6. Sandhu SK, Kingra PK, Kaur S. Effect of climate change on productivity and disease scenario of potato. J Agric Phys. 2018;18(2):141-157.
7. Sinha AK, Singh SK. Economics of potato production in northern hills of Chhattisgarh. Econ Aff. 2019;64(1):1-7.
8. National Horticulture Board. www.nhb.gov.in