



# Adoption Pattern and Economic Impact of Potato Variety Kufri Khyati in Uttar Pradesh

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## ABSTRACT

The present study was undertaken to determine the adoption intensity and economic impact of short duration and high yielding potato variety Kufri Khyati, in Uttar Pradesh, the highest potato producing state of India. Ex post facto research design was used and data were collected from 96 farmers using a structured interview schedule. Analysis of data revealed that Kufri Pukhraj (33.1%) followed by Kufri Chipsona-1, Kufri Khyati, and Kufri Bahar were the most popular varieties in the study area. To find out the economic impact of Kufri Khyati, its cost of cultivation, gross as well as net return were calculated and compared with Kufri Pukhraj. It was found that cost of cultivation of K. Khyati was slightly higher than that of Kufri Pukhraj. However, due to more yield and higher selling price, gross as well as the net return was higher for Kufri Khyati than prevailing variety Kufri Pukhraj. The net return of Kufri Khyati was nearly 21 per cent higher than that of Kufri Pukhraj.

**Keywords:** Adoption pattern, Kufri Khyati, Economic impact, Profitability, Constraint analysis

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## INTRODUCTION

Potato is the most important vegetable crop of India. It holds promise for food and nutritional security to ever-increasing human population due to its inherent efficiency in the production of high dry matter, energy and edible protein per unit area and per unit time. Potato (*Solanum tuberosum* L.) is the most consumed food crop worldwide next to wheat and rice (Visser *et al.*, 2009). As per estimates, India produced a record 48.6 million tonnes of potato during 2016-17. Uttar Pradesh (UP) is the highest potato producing state of the country. The state produced almost 15.54 Mt of potato, thus contributing nearly 32.0 per cent of total potato production in the country (DAC & FW, 2018). India would require 125 Mt of potato from an area of 3.62 million ha with an average productivity of 34.5 t/ha during the year 2050 (CPRI Vision 2050). Increasing potato productivity from current 22 t/ha to 34.5 t/ha would be a huge challenge. Being the highest potato producing state of India, UP will play a very important role in achieving the target of higher productivity of potato. Several factors play their role in increasing crop yield which includes soil condition, climate, fertilization, irrigation, use of quality seed, adoption of new technologies etc. Use of good quality seed is one of the most important pre-requisite for achieving higher yield in potato which is a vegetatively propagated crop. The final quality and quantity of potato yield are determined by the quality of the potato seed tuber used at the time of planting (Struik and Wiersema, 1999). Similarly, use of improved variety is also very important for higher productivity in potato.

Since its inception in 1949, ICAR-Central Potato Research Institute (CPRI), Shimla developed and released 52 potato varieties suitable for varied agro-ecologies of India. Varieties with early or medium maturity, fast bulking, insensitive to

photoperiod, slow rate of degeneration, high productivity, good storability at ambient temperature and resistant to late blight are suitable for cultivation in Uttar Pradesh. Early maturing varieties of potato are preferred in many parts of UP. Kufri Pukhraj developed and released by CPRI in 1998, Shimla became very popular because of its high yield and short duration. Later on, due to its poor storability, need for a new short duration variety was felt among breeders. As a result, Kufri Khyati, a high yielding, early maturing, white tuber potato variety having moderate resistance to late blight and suitable for cultivation in plains of India was released by CPRI during 2008. The specific areas for its adaptation were Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, West Bengal, Gujarat, Madhya Pradesh, Odisha and Chattisgarh (Kumar *et al.*, 2014). The important characteristics of both Kufri Khyati and Kufri Pukhraj are compared in Table 1.

It can be observed that Kufri Khyati has a better storability as compared to Kufri Pukhraj. Therefore, those farmers who want to keep their potatoes for a longer duration started to grow Kufri Khyati in place of Kufri Pukhraj. Since its release, Kufri Khyati is being popularized among farmers through front line demonstrations and other extension activities. As a result, it is now adopted by many farmers in different districts of UP. It's been eight years now since its release. A need was felt to study the economic impact of this variety on farmer's income. Therefore, this study was conducted to assess the adoption level of Kufri Khyati among farmers and its economic impact on farmer's profitability.

## MATERIALS AND METHODS

The current study was undertaken in Uttar Pradesh, which is the largest potato producing state of India and also the best representative of Indian potato production scenario (Pandey *et al.*, 2005). Four districts namely Meerut, Hapur, Sambal, and Bulandshahar were selected for farmer's field survey during

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Characteristics	Kufri Khyati	Kufri Pukhraj
Year of release	2008	1998
Tuber colour	White-creamy	Yellow
Tuber shape	Ovoid with medium to deep eyes	Ovoid with shallow-medium eyes
Flesh colour	White creamy	Light yellow
Maturity	Early	Early to medium
Storability	Good	Medium
Late blight resistance	Field resistance to late blight	Moderately resistance to late blight
Average yield potential	25 -30 t/ha	35 -40 t/ha
Adaptability	North Indian Plains	North Indian Plains and plateau region
Special attributes	Early bulker, suitable for high cropping intensity	Early bulker, suitable for low input ecosystem

the year 2016-17. A total of 24 farmers were selected from each district making the total sample size of 96 farmers. Purposive sampling was done to select those farmers who were growing potato variety Kufri Khyati. Ex post facto research design was used. Personal interview method was adopted for collecting required information from respondents. Specifically designed and pre-tested interview schedule was used for collecting information on different variables.

A comparative study was conducted to find out the impact of growing Kufri Khyati. Those farmers who were growing potato variety Kufri Khyati were compared to farmers who cultivated Kufri Pukhraj on several economic parameters like the cost of cultivation, gross return, net return, benefit-cost ratio etc. Component wise cost of cultivation for both Kufri Khyati and Kufri Pukhraj were estimated for comparison. The extent of adoption of different varieties was worked out by calculating 'Intensity of adoption' which was defined as the proportionate area under Kufri Khyati at a given time and expressed as a percentage. For this, the methodology adopted by Pandey *et al* in their study of patterns of adoption of improved rice varieties in South Asia was used (Pandey *et al.*, 2012). For analysis of perceived reasons of adoption of Kufri Khyati and constraints in potato production, simple statistical tools like frequency and percentage were used.

## RESULTS AND DISCUSSION

### Intensity of adoption of Kufri Khyati

The variety wise potato area was estimated as proportionate to the total potato area and expressed as a percentage in Fig. 1. It can be seen that in the selected study region, Kufri Pukhraj was still the most important potato variety covering nearly one-third of the total potato area planted by farmers. The new variety Kufri Khyati had an adoption intensity of 19.4 per cent. This suggested that within a short time span of 8 years, this variety has picked up and got popular among farmers. Kufri Bahar, the most popular variety of Uttar Pradesh and Kufri Chipsona 1, processing quality variety of potato also had a significant proportionate area at par with Kufri Khyati (Fig. 1). Kufri Chipsona-1 having significantly high adoption intensity (20%) may be understood from the fact that Merino Group has a potato processing factory in Hapur district near the study

area. Among other varieties having 8.87 per cent area, processing varieties like Kufri Chipsona-3, Kufri Chipsona-4, and Kufri Frysona were more popular among farmers since they were getting a higher price for processing varieties. This result is in confirmation with the findings of a study conducted by Rana *et al* on profitability analysis of Kufri Chipsona-1 variety in Uttar Pradesh (Rana *et al.*, 2009).

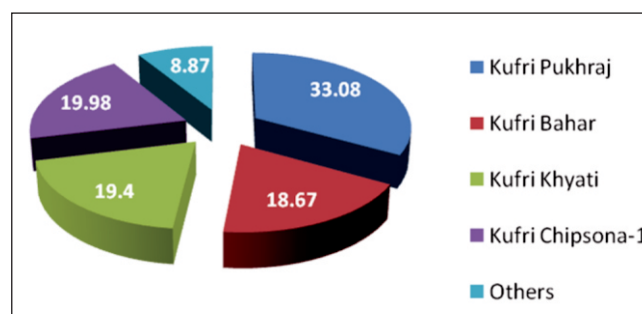


Fig. 1: Percentage area under different potato varieties

### Reasons for adoption of Kufri Khyati

Those farmers who adopted Kufri Khyati were asked about the probable reasons for adoption as an open-ended question. The responses obtained are presented in Table 2 in terms of frequency and percentage.

Table 2: Reasons for the adoption of Kufri Khyati over other prevailing varieties n=48

Perceived reasons for adoption	Frequency	Percentage*
Disease Resistance	12	25.00
Takes less time (60-70 days) in maturing	26	54.17
Good Size and shape	8	16.67
Less cost of cultivation	5	10.42
High Yield	38	79.17
Better keeping quality	15	31.25
Fetches good rates	18	37.50

#### \*Multiple responses

Majority of farmers (79.1%) were of the view that the yield level of Kufri Khyati was higher than other prevailing varieties. More than half of respondents cited 'less time in maturing' as the major reason for the adoption of Kufri Khyati. Other characteristics like 'better keeping quality', 'good

market rate' and 'disease resistance' were also cited as the perceived reasons for adoption of the variety.

#### Cost of cultivation and Economic impact of Kufri Khyati

The component wise variable cost of cultivation was

estimated for Kufri Khyati and compared with other short duration variety Kufri Pukhraj (Table 3). The difference between the cost of cultivation of these two varieties was expressed in percentage.

**Table 3:** Variable cost of potato cultivation for Kufri Khyati *vis a vis* Kufri Pukhraj N=96

Cost Components (Rs/ha)	Kufri Khyati (n= 48)	Kufri Pukhraj (n=48)	Difference* (%)
Cost of labour#	47484.32	50868.06	7.12
Seed cost	54682.29	44625.00	18.39
Fertilizers and manure	35215.94	35991.11	2.20
Insecticides and pesticides	8533.07	4609.03	45.99
Irrigation charges	1821.62	2061.11	13:15
<b>Total variable cost of cultivation</b>	<b>147737.20</b>	<b>138154.30</b>	<b>6.49</b>

# = Includes machine, family and hired labour,

\* = Kufri Khyati over Kufri Pukhraj

The results revealed that variable cost of cultivation of Kufri Khyati was 6.5 per cent higher than Kufri Pukhraj. The higher cost in case of Kufri Khyati was mostly due to high expenditure on purchase of seed and other inputs like insecticides and pesticides. Being a new variety, cost of seed for Kufri Khyati was considerably higher (18.4%) as compared to Kufri Pukhraj. There was not much difference among other cost components. Therefore, the total cost of cultivation for

Kufri Khyati (Rs 147737.2 per ha) was slightly higher than that of Kufri Pukhraj (Rs 138154.30 per ha).

The economic parameters like Gross return, Net return, Benefit-Cost (BC) ratio and cost of production per quintal was also estimated for both these varieties and the findings are presented in Table 4.

**Table 4:** Economic profitability analysis of potato variety Kufri Khyati *vis a vis* Kufri Pukhraj

Particulars	Kufri Khyati	Kufri Pukhraj	Difference* (%)
Average yield (t/ha)	31.22	30.60	2.00
Average selling price (Rs/t)	9587.5	8425.0	12.13
Gross return (Rs/ha)	299360.10	257805.00	13.88
Net return (Rs/ha)	151622.90	119650.70	21.09
Benefit Cost ratio at variable cost of cultivation	2.02	1.86	7.92
Variable cost of production (Rs/t)	4731.5	4514.8	4.58

\* = Kufri Khyati over Kufri Pukhraj

The variable cost of production per tonne of potato for Kufri Khyati was nearly 4.6 per cent higher than Kufri Pukhraj while the cost of cultivation was 6.5 per cent higher for Kufri Khyati. This difference in cost of cultivation and cost of production was due to a slightly higher yield of Kufri Khyati (2%) over Kufri Pukhraj. The gross return per hectare from Kufri Khyati was 13.88 per cent more than Kufri Pukhraj while net income was 21.09 per cent higher. The higher return was due to higher yield as well as higher price fetched by Kufri Khyati in the market as compared to Kufri Pukhraj. Thus, it can be seen that Kufri Khyati provides a significantly high return to farmers as compared to Kufri Pukhraj. This result was further confirmed by the fact that BC ratio of Kufri Khyati was 2.02 while for Kufri Pukhraj it was 1.86. Thus, growing Kufri Khyati was more profitable to farmers than growing Kufri Pukhraj.

#### Constraints in potato cultivation and marketing

The constraints faced by potato growers in potato cultivation in selected districts of UP were analyzed and presented in Table 5. A majority of farmers (31.3%) reported 'Inadequate availability of quality potato seed' as the major problem in

potato production. 'Higher charges for cold storage' was a second most important constraint of the study area as reported by 27.1 per cent of farmers. Among marketing constraints, 'price fluctuation of potato' and 'lack of marketing infrastructure' were reported as major problems by farmers of the study area.

**Table 5:** Constraints faced by farmers in potato cultivation and marketing N=96

Constraints	Frequency	Percentage*
Higher charges for cold storage	26	27.1
Shortage of fertilizers on time	24	24.0
Inadequate availability of quality potato seed	29	31.3
Lack of cold storage facilities	17	17.7
Fluctuation of price of potato in market	18	18.8
Higher incidence of diseases	20	20.8
Lack of marketing infrastructure	15	15.6

## CONCLUSION

This study examined the extent of adoption and impact of potato variety Kufri Khyati on farmer's profitability. It was observed that Kufri Pukhraj is still the most popular potato variety of the region while new variety Kufri Khyati also had a considerable area under cultivation. It showed that since release, Kufri Khyati is becoming popular among farmers due to its market value and good storability quality. To further enhance the adoption intensity of this variety, more extension activities like frontline demonstration, field day, awareness programmes etc should be organized. The results also showed the higher profitability of Kufri Khyati over traditional early variety Kufri Pukhraj. Since the adequate seed was not available, efforts may be made by Govt. agencies in the area to

provide the quality seed of Kufri Khyati to farmers at an affordable price. In order to negate the problem of price fluctuation of potato in the market, farmers may be advised to store potato in cold storage during glut and later on sell them at the appropriate time. These measures will definitely enhance the socio-economic status of farmers in the study area.

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