Costs and Returns of Potato Cultivation in Kannauj District of Uttar Pradesh

Abstract

In the present paper, an attempt has been made to examine various Potato cultivation in different categories of the farmers. Economic analysis of potato cultivation in Kannauj district of Uttar Pradesh.Hundred Sample farmers i.e. Marginal(61), Small(29), and Medium(10), where interviewed form 5 village Kannauj block of Kannauj district. Data was analyzed and found that Average holding Size 1.41 ha,Varying from 0.80 to 3.91 ha. Cropping intensity of sample farms was to 227.45 percent which was found highest on Marginal farms 255.26 percent followed by Small 220.48 percent and Medium 201.48 percent respectively. On an Average cost of cultivation was rupees 92294.88 per/ha. The gross & Net income on over all farms where found to be rupees 181012.50 and 88717.62 per ha respectively. The input and output ratio was found to be 1:1.96 On cost C_3 In the study was characterized by decreasing return to scale.

Keywords:-, Farm Structure, Cropping Pattern, Cropping Intensity, Cost & Return etc.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is fourth most important food crop after rice, wheat and maize. It occupies a pro-eminent place amongst the crops and acknowledge as the “king of vegetables” due to its great utility. It provides considerable dry matter (20 g/ 100g) per unit. It is a rich source of carbohydrates (22.6 g/ 100g), starch (16.3 g/ 100 g) and proteins (1.6 g/ 100g). Potato also provides raw material for processing industries. It can fulfil the requirement of food for human consumption to a greater extent and consumed by majority of the people of the world. It is one of the most remunerative and profitable crop for the farmers due to its higher yield potential within a limited time. We have different potato varieties such as Kufri Jyoti, Kufri Chipsona-1,2, Kufri Louvkar, Kufri Sinduriare cultivated by farmers. However, Kufri Chandramukhi, Kufri Jyoti, Kufri LavkarKufriSinduri Kufri Chipsona-1, Kufri Chipsona-2, Kufri Chipsona-3 varieties has been recommended for cultivation.(**Mishra *et al.*, 2020**).

The potato is revered as a source of power worldwide, with a 54.23 million tonne fresh weight production from 2.25 million hectares, it is the third-most significant food crop in the world after rice and wheat (2020–2021). A crop that has traditionally been "the poor man's friend" is the potato. Over 300 years have passed since the cultivation of potatoes began in our nation. It has become one of the most widely grown crops in this nation for vegetables.

The potato crop is believed to have originated in Peru, South America and was introduced to other parts of the world through war expeditions, shipment, and transportation. Today, there are more than 5000 varieties of potatoes present in different parts of the world, with the majority of them mostly confined to South America. Potatoes are popular in Pakistan and other parts of the world due to their nutrient capacity, potential for diverse uses in both raw and processed form, and easy availability for low-income consumers. They are rich in water, carbohydrates, vitamins, minerals, proteins, and fats, accounting for 390 Kj per 100 g of baked potato (**Shakya *et al.*, 2024**).

South America is known to be native of potato. In 1537, the spaniards first come into contact with potato in one of the villages of Andes. In Europe, potato was introduced between 1580 A.D. to 1585 A.D. in Spain, Portugal, Italy, France, Belgium and Germany. In India it was introduced by the Portuguese sailors during early 17th century and its cultivation was spread to North India during the British period.

The production of potatoes in Uttar Pradesh totals 15811.31 tonnes and is farmed on an area of 620.44 hectares. The state's economy and the farmers' well-being are both significantly impacted by it. There is still a significant difference between the actual (21-27 t/ha) and potential yields (40–45 t/ha), even though the state's productivity in producing potatoes is third only behind Gujrat and West Bengal. (Agricultural statistics at a Glance 2021)

In India, potato is cultivated in almost all states under diverse agro-climatic conditions. About 85 per cent of potatoes are cultivated in Indogangetic plains of North India. The state of Uttar Pradesh, West Bengal, Punjab, Bihar and Gujarat accounted for more than 80 per cent share in total production. Potato production in India 53387.35 tonnes in (2021). with an area of 2202.15 hectares.

The potato crop covers 39,779 hectares in the Kannauj district of Uttar Pradesh, and its production was 254.28 q/ha. and 293.71 q/ha was the total production. (Meaning and number division Kannauj, 2020–21). With this background the study was conducted with the following;

1. To study the farm structure, cropping pattern and cropping intensity on sample farms.
2. To workout the costs and returns and input-output relationship of potato on different size group of farms.

Materials and Methods

a) Sampling design: Multi-stage stratified cum purposive random sampling design was used to select district, block, village and cultivators in the ultimate stage of study.

b) Selection of the district: The study was purposively undertaken in kannauj district in order to avoid operational inconvenience of the investigator.

c) Selection of block: Kannauj block was randomly chosen for the study out of the district's 8 blocks.

d) Selection of villages: A list of all the villages falling under kannaujblock were prepared and arranged in ascending order to the area covered under crop hence forth. Out of the which 5 villages were selected randomly from this list

e) Selection of farmers: A Separate listsof Potato growers of selected villages was prepared along with their size of holding and further it was grouped into three categories i.e.

1. Marginal farmer below 1 ha
2. Small farmer 1-2 ha and
3. Medium farmer 2 ha and above

From these lists a sample of 100 respondents were drawn following the proportionate allocation to the different categories.

f) Period of Study: The data was collected for the agricultural year 2021-2022.

g) Method of enquiry: For the interpretation of data the following analytical tools were used:

(i) Analysis of data:

Both the tabular and functional analysis was used. Weighted Average was worked out for interpretation of data with the help of following formula (**Kushwaha *et al.*, 2019;Kumar *et al.*, 2022; Yadav *et al.*, 2024**).

$$\text{Weighted Average} = \frac{\Sigma WiXi}{\Sigma Wi}$$

Where,

X-variable, W= Weights of variable

(ii) Cropping intensity (C.I.):

$$\text{C.I.} = \frac{\text{Total crooped area}}{\text{Net cultivated area}} \times 100$$

(iii) Measures of Cost Concepts:

Cost A_1 = this gives the total cash expenses incurred by the grower. It includes the following items(**Ahongsanbam*et al.*, 2020 and Kumar*et al.*, 2022**).

1. Cost of hired labour
2. Cost of bullock labour and tractor charges
3. Cost of planting materials
4. Cost of manures, fertilizers and plant protection chemicals
5. Irrigation charges
6. Interest on working capital
7. Land revenue
8. Depreciation on fixed capital

Cost A_2 = Cost A_1 + rent paid for leased in land

Cost B_1 = Cost A_1/A_2 + interest on fixed capital + rental value of owned capital assets (Excluding Land)

Cost B_2 =Cost B_1 + Rental Value of owned land (Net land Revenue)+ rent paid for leased in land

Cost C_1 = Cost B_1+ imputed value of family labour

Cost C_2 = Cost B_2 **+** imputed value of family labour

Cost C_3 = Cost C_2 + 10 per cent of the managerial cost

(iv) Measures of Farm Profit:

Gross Income = Yield in quintal × Price per quintal

Net Income = Gross Income – Cost C

Farm Business Income = Gross Income - Cost A1/A2

Family labour income = Gross Income - Cost B

Farm investment income = Farm Business Income – imputed value of family laobour

(Or)

= Net Income + imputed Rental value of owned land+ Interest on owned fixed capital invested

Benefit - cost ratio = Cost C_3 / Gross Income

Results and Discussion:-

Average size of holding of sample farms: The study covers a sample of 100 farmers, which are divided in three size groups, namely marginal (below-1ha), small (1-2ha) and medium (2-4ha). It is clear from the Table 1 that net cultivated area of sample farms (34.54) per cent, (37.75) per cent, and (27.71) per cent at the gross cropped area marginal, small, and medium farms, respectively. The average size of holding of marginal, small and medium farms comes to 0.80, 1.84 and 3.91 hectare, respectively. On an overall, average size of holding was estimated 1.41 hectares.

Table No. 1: Average size of holding on sample farms under different size group of farms in the study area (ha)

S.No.	Size group of farms	No. of sample farm	total cultivated area	average size of holding
1	Marginal	61	48.00 (34.54)	0.80
2	small	29	53.3 (37.75)	1.84
3	Medium	10	39.80 (27.71)	3.91
Total		100	141.10 (100)	1.41

Per farm investment: Table 2 revealed investment per form on different components of fixed assets under different size group of farms The assets such as farm building, implements and machineries, irrigation structure other implements and livestock on marginal, small and medium farms and overall farms displayed in Table .2. An average investment on overall farms for farm buildings, implements and machineries, irrigation structure, other implements and livestock accounted for 62.10, 25.14, 23.54, 0.24 ,5.08 and 7.44 per cent, respectively of the total farm assets. Per farm value of these assets on different size farms presented in table .2 Total investment on buildings computed to Rs. 175805.00, Rs.243724.00 and Rs.318446.00 on marginal, small and medium farms, respectively. Similarly, in case of implements & machinery, it was found to Rs.51504.00 , Rs. 117200.00 and Rs.195055.00 in case irrigational structure, it was found to Rs.15634.00 , Rs. 18524.00, and Rs.31742.00, in case of other implements it was found to Rs.750.00, Rs.860.00, and Rs.964.00 to the marginal, small and medium farms, respectively. As far as investment on livestock is concerned, it calculated to Rs.15634.00, Rs. 27207.00, and Rs. 31742.00 respectively at marginal, small & medium farms, respectively. Total per farm value on farm assets were found to Rs.266742.00, Rs.407515.00,&Rs. 568859.00marginal, small and medium farms, respectively. It concluded from that investment per farm on buildings, implements & farm machine, irrigation structure, and implement had direct relationship with farm size but in case of livestock, the investment was higher on small farm followed by marginal and medium farms.

Table 2: Per farm investment of various asset of different size group of farms (Value Rs.)

S No.	Particulars	Size Group of Farms			Overall Average
		Marginal(61)	Small(29)	Medium(10)	
A	**Buildings**	**175805.00 (65.91)**	**243724.00 (59.81)**	**318446.00 (55.98)**	**209765.61 (62.10)**
I.	**Residential**	**154705.00 (58.00)**	**223864.00 (54.93)**	**299777.00 (52.70)**	**189268.31 (56.03)**
	a. Kaccha	22650.00 (8.49)	28005.00 (6.87)	16125.00 (2.83)	23550.45 (6.97)
	b. Pakka	132055.00 (49.51)	195859.00 (48.06)	283652.00 (49.86)	165717.86 (49.06)
	Cattle Shed	14650.00 (5.49)	11650.00 (2.86)	9585.00 (1.68)	13273.50 (4.93)

	Go-down	6450.00 (2.42)	8210.00 (2.01)	9084.00 1.60)	7223.80 (2.14)
B	**Implements and machinery**	**51504.00 (19.31)**	**117200.00 (28.76)**	**195055.00 (34.29)**	**84910.94 (25.14)**
B(i)	**Major Implements**	**46546.00 (17.45)**	**111289.00 (27.31)**	**188365.00 (33.11)**	**79503.37 (23.54)**
	tractor	26540.00 (9.95)	85462.00 (20.97)	154602.00 (27.18)	56433.58 (16.71)
	trolley	7265.00 (2.72)	9650.00 (2.37)	11235.00 (1.98)	8353.65 (2.47)
	cultivator	3657.00 (1.37)	4965.00 (1.22)	7251.00 (1.27)	4349.72 (1.30)
	thresher	6520.00 (2.44)	7560.00 (1.86)	9825.00 (1.73)	7152.10 (2.12)
	harrow	2564.00 (0.96)	3652.00 (0.90)	5452.00 (0.96)	3168.32 (0.94)
B(ii)	**Minor Implements**	**4958.00 (1.86)**	**5911.00 (1.45)**	**6690.00 (1.18)**	**5407.57 (1.60)**
	chaff	2653.00 (0.99)	3256.00 (0.80)	3695.00 (0.65)	2932.07 (0.87)
	khurpi	80.00 (0.03)	95.00 (0.02)	110.00 (0.02)	87.35 (0.03)
	kudal	95.00 (0.04)	110.00 (0.03)	125.00 (0.02)	102.35 (0.03)
	sprayer	2130.00 (0.80)	2450.00 (0.21)	2760.00 (0.49)	2285.80 (0.68)
C	**Other implement**	**750.00 (0.28)**	**860.00 (0.21)**	**964.00 (0.17)**	**803.30 (0.24)**
D	**Irrigational**	**15634.00 (5.86)**	**18524.00 (4.55)**	**22652.00 (3.98)**	**17173.90 (5.08)**
E	**Live stock**	**23049.00 (8.64)**	**27207.00 (6.68)**	**31742.00 (5.58)**	**25124.12 (7.44)**
(i)	a. Cow	8056.00 (3.02)	9140.00 (2.24)	9864.00 (1.73)	8551.16 (2.53)
(ii)	b. Buffalo	12542.00 (4.70)	15420.00 (3.78)	18920.00 (3.33)	14014.42 (4.15)
(iii)	c. Goat	2451.00 (0.92)	2647.00 (0.65)	2958.00 (0.52)	2558.54 (0.76)
Grand total		**266742.00**	**407515.00**	**568859.00**	**337777.87**

	(100.00)	**(100.00)**	**(100.00)**	**(100.00)**

Cropping pattern: Cropping pattern shows the area devoted to the various crop during the given period, conventionally in single year It indicates the yearly sequence and spatial arrangement of crops followed in a particular area. The cropping pattern followed by the sample farms on marginal, small and medium farms are presented in Table 3 It revealed that among the various crops grown at the selected medium sample farm, Paddy has covered the maximum area i.e. 1.98 ha 25.13 per cent of total cropped area, Wheat was found as first important crop covering an area of 1.52 ha; 19.29 per cent of total cropped area followed by, Potato.1.06 Maize 0.72, sugarcane 0.39, onina.31, gram,0.25 moong &mentha 0.23,chari 0.22,each,arhar and pea 0.21, 3.03 ha percent mustard 0.19 and per cent. Respectively. Oil crops have also been allotted a considerable area in existing cropping pattern as Rabi crop (Mustard) were sown in 0.19 per cent of total cropped area of medium farm. Similarly at medium sample farm, major area.

Table: 3 Cropping pattern under different size group of farms in the study area (ha.)

S.No.	**Crop**	**Cropping pattern**			**Overall farm**
		Average size of sample farms			
		Marginal (61)	**Small (29)**	**Medium(10)**	
A	**Kharif**	**0.93 (45.59)**	**1.90 (46.91)**	**3.41 (43.27)**	**1.46 (45.50)**
1	paddy	0.63 (30.88)	1.26 (31.11)	1.98 (25.13)	0.95 (49.55)
2	Maize	0.11 (5.39)	0.28 (6.91)	0.56 (7.11)	0.20 (6.37)
3	Arhar	0.08 (3.92)	0.12 (2.96)	0.25 (3.17)	0.11 (3.39)
4	Sugarcane	0.11 (5.39)	0.24 (5.93)	0.62 (7.87)	0.20 (6.20)
B.	**Rabi**	**0.83 (40.69)**	**1.6 (39.51)**	**3.35 (42.51)**	**1.31 (40.70)**
1	Wheat	0.36 (17.65)	0.58 (14.32)	1.52 (19.29)	0.54 (16.83)
2	Potato	0.31 (15.20)	0.62 (15.31)	1.01 (12.82)	0.47 (14.65)
3	gram	0.05 (2.45)	0.14 (3.40)	0.25 (3.17)	0.10 (3.00)
4	musterd	0.05 (2.45)	0.11 (2.72)	0.28 (3.55)	0.09 (2.82)
5	pea	0.06	0.15	0.29	0.11

		(2.94)	(3.70)	(3.68)	(3.40)
C.	**Zaid**	**0.28 (13.73)**	**0.55 (13.58)**	**1.12 (14.21)**	**0.44 (13.79)**
1	Onion	0.05 (2.45)	0.12 (2.96)	0.31 (3.93)	0.10 (3.00)
2	moong	0.08 (2.92)	0.12 (2.96)	0.27 (3.43)	0.11 (3.45)
3	Chari	0.07 (3.43)	0.15 (3.70)	0.22 (2.79)	0.11 (3.37)
4	Mentha	0.08 (3.92)	0.16 (3.95)	0.32 (4.06)	0.13 (3.97)
Gross total		**2.04 (100.00)**	**4.05 (100.00)**	**7.88 (100.00)**	**3.21 (100.00)**

Cropping intensity: Cropping intensity is an index of intensity of land use determined by the number of crops grown in a particular field, during a year. It has been worked out by using the following formula.

$$Croppingintensity = \frac{\text{Gross cropped area}}{\text{Net cultivated area}} \times 100$$

It has been computed for all size groups of farms and is presented in Table 4 The maximum cropping intensity 255.26,at marginal size group of sample farms followed by small 220.48 and medium 201.48 size group of farms. Overall cropping intensity in the study area was found to be 227.45percent. Higher cropping intensity on marginal size of farms shows the awareness of marginal farmer regarding land utilization in most profitable manner.

Table 4 Cropping intensity on different size group of farms in the study area (%)

Farms groups	No of farmers	Average size of holding	Gross cropped area (ha)	Cropping intensity (%)
Marginal	61	0.80	2.04	255.26
Small	29	1.84	4.05	220.48
Medium	10	3.91	7.88	201.48
Overall	100	1.41	3.21	227.45

Structure of cost and Returns:

Cost of cultivation of potato: The per hectare costs of on various input factors in Potato cultivation were worked out and its details are presented in the Table 5 it is evident from table that average cost of cultivation of Potato/ha was Rs.95548.97. Maximum cost of cultivation was associated with medium farms i.e. Rs.99512.78followed by small farms Rs.96312.37and marginal farms Rs.94536.23respectively.

The further distribution of the cost on different operations indicates that maximum expenditure where involved on total human labouri.e(25.30)per cent followed by the expenditure on seed (25.6 per cent), manure and fertilizer (8.9per cent), irrigation (9.4 per cent) machinery (8.1) per cent and plant protection (3.3per cent). Highest cost of cultivation in medium size of farms as compared to the small and marginal farms occurred due to heavy expenditure on human labour and interest on fixed capital. It is present from summary of table that the costs of cultivation increase with increasing size of holding.

Table 5 Per hectare costs of cultivation of Potato on different size group of farms in the study area (Rs.)

S. No.	Particulars	Size group of farms			
		Marginal (61)	**Small (29)**	**Medium (10)**	**Overall average**
1	**Human Labour**	25108.23 (26.6)	22839.43 (23.7)	22513.17 (22.6)	24190.77 (25.3)
a.	Family Labour	16548.23 (17.5)	13200.11 (13.7)	7258.45 (7.3)	14648.30 (15.3)
b.	Hired Labour	8560 (9.1)	9639.32 (10.0)	15254.72 (15.3)	9542.47 (10.0)
2	**Machinery Charges**	7562.01 (8.0)	8058.78 (8.4)	7654.12 (7.7)	7715.28 (8.1)
3	**Seed**	23565.21 (24.9)	25242.32 (26.2)	27680.14 (27.8)	24463.06 (25.6)
4	**Manure and fertilizer**	8246.88 (8.7)	8668.19 (9.0)	9695.52 (9.7)	8513.92 (8.9)
5	**Irrigation**	8869.32 (9.4)	9061.14 (9.4)	9895.11 (9.9)	9027.53 (9.4)
6	**Plant Protection/Intercultural**	2875.85 (3.0)	3865.32 (4.0)	3049.74 (3.1)	3180.19 (3.3)
7	**Total working capital**	76227.5 (80.6)	77735.18 (80.7)	80487.8 (80.9)	77090.76 (80.7)
8	**Interest on working capital**	3049.10	3109.41	3219.51	3083.63

		(3.2)	(3.2)	(3.2)	(3.2)
9	**Rental value of land**	6000 (6.3)	6000 (6.2)	6000 (6.0)	6000.00 (6.3)
10	**Interest on fixed capital**	665.43 (0.7)	712.11 (0.7)	758.85 (0.8)	688.31 (0.7)
11	**Sub total**	85942.03 (90.1)	87556.70 (90.9)	90466.16 (90.9)	86862.70 (90.9)
12	**Managerial Cost@10% of sub-total**	8594.20 (9.1)	8755.67 (9.1)	9046.62 (9.1)	8686.27 (9.1)
Grand total		**94536.23 (100)**	**96312.37 (100)**	**99512.78 (100)**	**95548.97 (100)**

Table 6 Per hectare costs and return of the Potato production in the study area (Rs.)

S. No.	**Particulars**	**Size group of farms**			
		Marginal (61)	**Small (29)**	**Medium (10)**	**Overall average**
1	**Cost A_1/A_2**	62728.37	67644.48	76448.86	65526.09
2	**Cost B_1**	63393.80	68356.59	77207.71	66214.40
3	**Cost B_2**	64059.23	74356.59	83207.71	68960.31
4	**Cost C_1**	79942.03	81556.70	84466.16	80862.70
5	**Cost C_2**	80607.46	87556.70	90466.16	83608.61
6	**Cost C_3**	89201.66	96312.37	99512.78	92294.88
7	**Yield l/ha.**	235	250	255	241.35
8	**Gross Income**	176250	187500	191250	181012.50
9	**Net return over cost C_3**	87048.34	91187.63	91737.22	88717.62
10	**Family Income**	112190.77	113143.41	108042.29	112052.19
11	**Farm Business Income**	113521.63	119855.52	114801.14	115486.41
13	**Cost of production (q/ha.)**	379.58	385.25	390.25	382.29
14	**Input- output ratio**				
a	**on the basis of Cost A1**	1:2.81	1:2.77	1:2.50	1:2.77
b	**On the basis of cost B1**	1:2.78	1:2.74	1:2.48	1:2.74

c	**On the basis of Cost B2**	1:2.75	1:2.52	1:2.30	1:2.64
d	**On the basis of Cost C1**	1:2.20	1:2.30	1:2.26	1:2.24
e	**On the basis of Cost C2**	1:2.19	1:2.14	1:2.11	1:2.17
f	**On the basis of Cost C3**	1:1.98	1:1.95	1:1.92	1:1.96

Conclusion:

The sample of 100 farmers of the selected block was considered to study and resulted in the average size of holding as 0.84, 1.84 and 3.91 hectares in respect of marginal, small and medium farms, respectively. Overall farms per farm investment to total assets on a farm building, implements and machinery and livestock accounted for 62.10, 25.14 and 7.44 per cent, respectively.

The cropping pattern of the sample farm for Potato per cent area to the gross cultivated area showed an increasing trend with increasing size of farms. Per farm area for potato 0.31, 0.58 and 1.52 hectare under marginal, small and medium farms, respectively. Cropping intensity was observed as 255.26, 220.48 and 2.1.48 per cent for marginal, small and medium farms, respectively, Intensity of cropping showed a decreasing trend with increasing size of farms except for medium farms.

In the case of potato, the highest cost of cultivation was observed under the marginal size of sample farms mainly due to higher human labour charge. The average, cost of cultivation was worked out to Rs.95548.97 Maximum cost incurred in the potato crop due to human labour having an overall share of 25.30 per cent.

On overall average, gross income was Rs.181012.50, whereas, net income was Rs.87048.34 per hectare. An overall average, farm business income and family labour income were worked out to Rs.115486.41 and Rs.112052.19 per hectare, respectively. The cost of production per quintal of potato was computed to Rs.390.25, Rs.385.25, and Rs.379.58 on

medium, small, and marginal farms, respectively. Input-output ratio related to cost C was highest on marginal farms (1:1.98) followed by small farms (1:1.95), and medium farms (1:1.92).

REFERENCES

1. **Ahongsanbam, D., Hari, N.S., Priyank and Jawla, S.K. (2020)**An Economic Analysis of Potato Cultivation in Central Plain Zone of Punjab, India. *International Journal of Innovative Research In Technology*. **7**(6), 216-220.
2. **Arneja, C. S., Singh, Ramandeep, and Kaur, Gurbinder. (2009)** Constraints in potato cultivation faced by the potato growers, *Agric. Sei Digest*.**29** (2): 51-53.
3. **Bajwa, K.A., Delobel, T., Farrog, K., Hussain, A. Mohammad., M.M. and Hussain, A. (1995)** Cost and benefit differences of potato production in various potato growing areas of Pakistan, Research and Development of potato production of Pakistan, Proceedings of the National Seminar held at NARC, Islamabad, Pakistan, 23-25 April 1995. pp: 251-259.
4. **Ghulghule, J. N. Asmatoddin., M. Thombre., A. P. Birajdar., K. A. (2009)** An economic analysis of potato cultivation in Latur district of Maharashtra. *International Journal of Commerce and Business Management*.**2** (1): 12-14.
5. **Johl, S.S., Shekhawat, K.S., Khurana, S.M.P., Pandey, S.K. and Chandla, V.K. (1994)** The problem crop for market clearance, Journal of the Indian potato association present and future proceeding of the National Symposium held at Modipuram during 1-3 March, 1993-94. pp: 59-63.
6. **Kumar, A., Singh, R., Singh, P.K., Yadav, B. and Choudhri, H. P. S. (2022).**Economic Aspects of Potato Cultivation in Sultanpur District of Uttar Pradesh.*Economic Affairs*. **67**(01):15-18.
7. **Kushwaha, R. R., Kumar, P., Singh, V. K., Singh, A., & Yadav, R. S. (2019).** An economic analysis of potato cultivation: A case study in Kannauj district of Uttar Pradesh. *Journal of Pharmacognosy and Phytochemistry*, *8*(3), 4609-4612.
8. **Mishra, B. K., & Arora, A. (2004).** Optimization of a biological process for treating potato chips industry wastewater using a mixed culture of Aspergillus foetidus and Aspergillus niger. *Bioresource technology*, *94*(1), 9-12.

9. **Mishra, S., Singh, V. K., Choudhri, H. P. S., Mishra, A., & Kumar, N. (2020).** Constraints causing technological gap in Potato production technology in Kannauj district of UP.*The Pharma Innovation Journal* **; 9**(8): 215-218.
10. **Shakya, A K., Supriya, Kushwaha, R.R., Kumar, M., and Pratap, A.** (2024).Estimation of the cost and returns of potato cultivation in Farrukhabad district of Uttar Pradesh.*International Journal of Research in Agronomy:* **7**(3):531-536.
11. **Yadav, R. S., Kushwaha, R. R., Maurya, K., Singh, A. K., Singh, R. K., & Verma, A. K. (2024).**A Study on Costs and Returns of Potato in Azamgarh District of Eastern Uttar Pradesh, India. *Journal of Experimental Agriculture International*, ***46***(5), 825-831.