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ADOPTION PATTERN OF VEGETABLE CULTIVATION PRACTICES IN RIVER BED AREAS

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Abstract

The adoption of any innovation depends upon the availability of technological inputs and other required resources. An attempt has been made to know the major practices of vegetable cultivation and their adoption level by the vegetable growers. The present study was conducted during the 2015 in Bilaspur district of Chhattisgarh State by incorporating, 3 blocks namely; Gorella, Bilha and Kota selected purposively because of maximum area under river bank area. From each selected block, 12 villages and from each selected village, 10 nearby farmers were selected (12 × 10 = 120) as respondents. The data were collected with the help of well structured pretested interview schedule through personal interview. Cent per cent of vegetable growing respondents were cultivating tomato, cauliflower, cabbage, bitter gourd and cluster bean on their less than 35 per cent cropped area. These finding, clearly indicates that during *Kharif* season, farmers were not growing vegetable may be due to flooding in river bed areas and poor drainage system in the fields. The study indicates that majority of the respondent (78.03%) were getting seed of vegetable from the market and 12.87 per cent respondent were got the seed from seed companies. Most of all vegetables were grows by line sowing method. Chemical fertilizers, fertilizers are mostly used in all the vegetables. Most of the vegetables were damaged by aphid and fruit borer.

Key words : Vegetable production, major practices and adoption.

Introduction

Chhattisgarh is blessed with fertile plains because of its natural drainage system. There is abundant water required for farming in Chhattisgarh. Chhattisgarh State has four main drainage system *viz*., Ganga, Godavari and Narmada, Brahamini and Mahanadi. Under the Mahanadi, Shivnath, Arpa, Indravati, Sabri, Leelagr, Hasdeo, Perry and Sondur major rivers. Mahanadi river is the lifeline of Chhattisgarh. Along Mahanadi and its tributaries 58.48 per cent of the entire state's water withdraws.

Chhattisgarh stands 15th among all the states of India for vegetable cultivation. Chhattisgarh produce 5.94 m MT of horticultural produce from an area of 0.59 m. ha and accounts for 2.47 per cent of horticultural production in the country. The total area of vegetable crops in the state was recorded about 4 lakh ha with production of 54.4 lakh MT during 2013-14.

Arpa river is one of the vital strongholds of Bilaspur district in Chhattisgarh, India. It is originated from Khondari-Khongsara, at Pendra (tehsil) in Bilaspur district, where two other rivers namely Maniyari and Sonkachar nadi merges with each other and finally gives the birth of Arpa river. The origin point of Arpa is rocky. River Kharang is a major tributary of Arpa river. The length of Arpa is approximately 147 km on average water flow is 400 m cube/s. River catchment area is 2022 km^2. The water flows from north-west to south direction. Except rainy season, it is faces scarcity of water. During rainy season its water level raises 2-3 m up and in summer season, it moves 5 m down. The river bed is mostly sandy with a thickness of about 1.5 m and few rock exposures at some places. The Arpa river watershed is wide in north and narrow in south like the South American Island.

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Materials and Methods

Location of the study

The study will be conducted in the purposively selected Bilaspur district of Chhattisgarh State, because Arpa covers maximum distance in Bilaspur district. Bilaspur district is having 7 blocks, out of which the Arpa river flows in 3 blocks namely Gorella, Belha and Kota. Out of which Belha and Kota blocks were selected

Table 1 : Area allocated for cultivation of different vegetable.

S. no.	Vegetable	Respondents		Allocation of area from total cropped area			
		No.	%	Upto -36%	35%-50%	51-75%	> 75%
1.	Potato	32	26.67	84.38	12.50	3.13	0.00
2.	Okra	34	28.33	97.06	0.00	0.00	2.94
3.	Brinjal	21	17.5	100.00	0.00	0.00	0.00
4.	Spinach	26	21.67	92.31	7.69	0.00	0.00
5.	Tomato	6	5	100.00	0.00	0.00	0.00
6.	Cauliflower	12	10	100.00	0.00	0.00	0.00
7.	Cabbage	7	5.83	100.00	0.00	0.00	0.00
8.	Bitter gourd	7	5.83	100.00	0.00	0.00	0.00
9.	Bottle gourd	13	10.83	92.31	7.69	0.00	0.00
10.	Cowpea	30	25	66.67	33.33	0.00	0.00
11.	Cluster bean	10	8.33	100.00	0.00	0.00	0.00
12.	Chilli	15	12.5	66.67	33.33	0.00	0.00
13.	Cucumber	13	10.83	61.54	30.77	0.00	0.00

Table 2 : Distribution of respondents according to season wise cultivation of major vegetable percent of respondents.

S. no.	Vegetable	Growers		Percentage of respondents (season wise)		
				Kharif	*Rabi*	Summer
		No.	%	%	%	%
1	Potato	32	26.67	0	100	0
2	Okra	34	28.33	0	14.7	85.3
3	Brinjal	21	17.5	0	61.9	14.28
4	Spinach	26	21.67	0	100	0
5	Tomato	6	5	0	100	0
6	Cauliflower	12	10	0	100	0
7	Cabbage	7	5.83	0	100	0
8	Bitter gourd	7	5.83	0	14.2	85.7
9	Bottle gourd	13	10.83	0	7.6	92.3
10	Cowpea	30	25	13.3	53.3	33.3
11	Cluster bean	10	8.33	0	40	60
12	Chilly	15	12.5	0	33.3	66.6
13	Cucumber	13	10.83	0	0	100

Table 3 : Distribution of the respondents according to source of seed.

S. no.	Particular	Frequency*	Percentage
1	Own	11	8.3
2	From Market	103	78.03
3	Seed companies	17	12.87
4	Other	1	0.85

*Data based on multiple responses.

purposively for the study because these blocks have the more area covered by Arpa river. Six villages (located nearby Arpa river) from each selected block were selected randomly. Out of the list of villages located upto 1km. distance from Arpa river. Thus, total 12 sample villages namely Koni, Dhuma, Sendari, Mangla, Barpali, Khonsara, Sukhena, Bhaisajhar, Khodri, Bhanwartonk, Faterkoni, Banjhorka.

Method of data collection

Ten vegetable growing farmers (doing cultivation in and nearby river bed areas) were selected randomly from each selected village as respondents. In this way, a total of 120 vegetable growers were selected for the collection of data. The data were collected personally by the researcher in cooperation with RAEOs and other officials of the district by using pre-tested interview schedule.

Results and Discussion

Area wise vegetable cultivation

The data compiled in table 1 represents the allocation of area for a vegetable by the respondents for cultivating it out of their respective available cropped area. The finding indicates that cent per cent of concerned respondents were growing tomato, cauliflower, cabbage, bitter gourd and cluster bean on their less than 35 per cent cropped area. Similarly, majority of okra, spinach and potato growing respondents were also allocated up to 35 per cent cropped area to these crops. More than 60 per cent of the respondent was reported that they were allocated less than 36 per cent cropped area to chilly, cowpea and cucumber.

Table 4 : Distribution of the respondents according to method of sowing of different vegetables.

S. no.	Vegetables growing respondents			Method of sowing				
		No.	%	Broad casting	Flat bed Method	Dibbling	Transplan-ting	Line Sowing
1.	Potato	32	26.67	0	100	0	0	0
2.	Okra	34	28.33	0	0	0	0	100
3.	Brinjal	21	17.50	0	0	0	100	0
4.	Spinach	26	21.67	100	0	0	0	0
5.	Tomato	6	5.00	0	0	0	100	0
6.	Cauliflower	12	10.00	0	0	0	100	0
7.	Cabbage	7	5.83	0	0	0	100	0
8.	Bitter gourd	7	5.83	0	0	0	0	100
9.	Bottle gourd	13	10.83	0	0	0	0	100
10.	Cowpea	30	25.00	0	0	0	0	100.00
11.	Cluster bean	10	8.33	0	0	80.	0	20.00
12.	Chilli	15	12.50	0	0	0	100	0
13.	cucumber	13	10.83	0	0	0	0	100

Table 5 : Distribution of the respondents according to nutrient application in vegetable crops.

S. no.	Name of vegetable	Growing Respondents		Average nutrient application (kg/ha)		
		F	%	N	P	K
1.	Potato	32	26.67	110.02	70.21	65.01
2.	Okra	34	28.33	95.23	40.54	30.23
3.	Brinjal	21	17.50	100.45	50.72	40.21
4.	Spinach	26	21.67	32.51	30.81	14.34
5.	Tomato	6	5.00	110.11	75.91	60.51
6.	Cauliflower	12	10.00	98.02	62.30	52.51
7.	Cabbage	7	5.83	130.20	60.42	60.45
8.	Bitter gourd	7	5.83	60.12	48.07	50.58
9.	Bottle gourd	13	10.83	50.10	58.14	15.72
10.	Cowpea	30	25.00	40.31	28.20	25.12
11.	Cluster bean	10	8.33	39.02	25.02	22.01
12.	Chilli	15	12.50	115.23	50.21	42.27
13.	Cucumber	13	10.83	46.13	25.83	22.04

Our third of the respondents, who were cultivating chilly and cowpea were also reported that they grow these crops to their 36-50 per cent cropped area. About 30 per cent of cucumber growing farmers were cultivating this crop to their 36-50 per cent cultivating area. Source of the respondents were also used to grow potato, spinach, and bottle gourd up to their half of the cultivation area of vegetables. Single potato and okra growing farmers were also reported that he allocate more than 50 per cent of cropped area to these crops. No other crops were occupied more than 50 per cent of cropped area among its growing farmers.

These finding indicates that the farmers of river bed and nearby vegetable cultivation areas are reluctant to grow mono cropping of vegetable may be because of small size of holding, uncommercial attitude and low investment capacity. Growing several vegetables at a time may also minimize climatic risk and market uncertainity. This will also useful for availability of required vegetable for family consumption. This type of farmer's strategy is very common in almost all part of Chhattisgarh among the vegetable growers.

Season wise vegetable cultivation

It is observed from the data presented in table 2 and represent that all of the growing respondents of potato, spinach, tomato, cauliflower and cabbage were cultivating these crops only in *rabi* season.

Further the finding reveled that okra, brinjal, bitter gourd, bottle gourd, cluster bean and chilies were cultivated on both the *rabi* and summer seasons by a sizeable percentage of respondents. Cowpea was found as the important vegetable, which was cultivated during all the *Kharif*, *rabi* and summer season by 13.3, 53.3 and 33.3 per cent of the respondents, respectively. It was also clear that respondents preferred to cultivated okra, bitter gourd and bottle gourd during summer season. These findings clearly indicates that during *Kharif* season, farmers were not growing vegetable may be due to

Table 6 : Distribution of the respondents according to occurrence of major insect pests on vegetable crops.

S. no.	Vegetable	Growing Respondents		Major insect Pests	Reporting respondents	
		Frequency	Percentage		Frequency	Percentage
1.	Potato	32	26.67	Aphid	20	62.50
				Tube worm	8	25.00
				Beetle	4	12.50
2.	Okra	34	28.33	Fruit Borer	30	88.24
				Jassid	4	11.76
3.	Brinjal	21	17.50	Fruit Borer	21	100.00
4.	Spinach	26	21.67	Aphid	26	100.00
5.	Tomato	6	5.00	Fruit borer	6	100.00
6.	Cauliflower	12	10.00	DBM	8	66.67
				Leaf Webber	4	33.33
7.	Cabbage	7	5.83	Worm	4	57.14
				Loopper	3	42.86
8.	Bitter grourd	7	5.83	Beetle	7	100.00
9.	Bottle grourd	13	10.83	Beetle	6	46.15
				Wine borer	4	30.77
				Aphid	3	23.08
10.	Cowpea	30	25.00	Aphid	20	66.67
				Worm	5	16.67
				Beetle	5	16.67
11.	Cluster bean	10	8.33	Aphid	10	100.00
12.	Chilli	15	12.50	Fruit Borer	10	66.67
				Trips	5	33.33
13.	Cucumber	13	10.83	Aphid	13	100.00

flooding in river bed areas and poor drainage system in their fields. Therefore, wide scope exits to exploit the vegetable growing areas during summer season also by providing irrigation because in these areas ground water is easily available.

Seed source of vegetable

The data presented in table 3 indicates that majority of the respondent (78.03%) were getting seed of vegetables from the market and 12.87 per cent respondent were got the seed from seed companies. About 8.3 per cent of the respondents were using their own seed for some of the vegetables. Interestingly very few respondents were reported to use their own seed of vegetables. This may be because of cultivation of hybrid varieties by the farmers for most of the vegetable crops. Galindo (2001) also found similar results.

Sowing method of different vegetable

The data regarding sowing methods adopted by the farmers for different vegetables is presented in table 4.

The findings reveal that most of the respondents of each crop were adopting single method of sowing. Broadcasting method was adopted by all of the spinach growing respondents. Cent per cent of the respondents were using flat bed method for potato cultivation. Similarly, all of the brinjal, tomato, cauliflower, cabbage and chilly growing farmers were adopting transplanting method of sowing. Most of the other vegetables were grown by line sowing method. About 80 per cent of the cluster bean growing farmers were adopted dibbling method. This shows that showing methods are highly crop specific among the vegetable growing farmers of the study area. Basvaprabhu (1997), Dongardive (2002) also noted similar findings.

Application of N, P, K in different vegetable

All of the farmers were using chemical fertilizers for vegetable cultivation. The findings of farmers according to average use of NPK in vegetables are presented in table 5. Regarding the use of nitrogen, data revealed that

Table 7 : Distribution of the respondents according to major Diseases occurred in vegetable crops.

S. no.	Vegetable	Growing Respondents	Major Diseases	Reporting respondents	
				F	%
1.	Potato	32	Early Blight	15	46.88
			Late Blight	8	25.00
			Wilt	9	28.13
2.	Okra	34	Yellow vein Mosaic	34	100.00
3.	Brinjal	21	Damping off	10	47.62
			Little Leaf	11	52.38
4.	Spinach	26	White Rust	26	100.00
5.	Tomato	6	Anthracnose	6	100.00
6.	Cauliflower	12	Bacterial soft rot	8	66.67
			Downy mildew	4	33.33
7.	Cabbage	7	Alternaria Leaf spot	7	100.00
8.	Bitter ground	7	Powdery mildew‘	7	100.00
9.	Bottle ground	13	Anthracnose	6	46.15
			Powdery mildew	7	53.85
10.	Cowpea	30	Rust	10	33.33
			Powdery mildew	7	23.33
			Downy mildew	13	43.33
11.	Cluster bean	10	Rust	10	100.00
12.	Chilli	15	Anthracnose	15	100.00
13.	Cucumber	13	Angular leaf spot	5	38.46
			Bacterial leaf spot	6	46.15
			Fruit rot	2	15.38

cabbage growers were using maximum 130.52 kg/ha followed by potato, tomato, chilly, cauliflower and okra in which about 110, 110, 115, 99 and 96 kg/ha average nitrogen was applied by the respectively growing respondents, respectively.

The minimum use of N was found on spinach with 39 kg/ha. In case of application of phosphorus fertilizers by the respondents the data revealed that highest use of P was recorded in tomato (75.91 kg/ha) followed by potato, cauliflower, cabbage, bottle gourd and chilly in which about 70, 62, 60, 58 and 50 kg/ha, respectively average phosphorus was applied by the growing respondents. It was also found from the table that the use of potassium was highest in potato (65.01 kg/ha) followed by 60, 60, 50, 52 and 42.27 kg/ha applied in tomato, cabbage, bitter gourd, cauliflower and chilli crops, respectively. The minimum use of K is in spinach with an average with an average application of 14.34 Kg/ha. Kushwaha (1998) found similar result.

Occurrence of major insect pests in vegetables

The findings related to the occurrence of insect-pests are presented in the table 6.

The data revealed that majority of the respondents (62.50%) perceived that aphid was the major insect followed by tubeworm (25%) and beetle (12.50%) in potato. Majority of okra (88.24%) growing respondents reported that fruit borer was the major insect followed by jassid (11.76%). Fruit borer and aphid were the always occurred insects of brinjal and spinach, respectively. All of the tomato growing respondents were found fruit borer as important pest. Cauliflower growing respondents reported that their area was affected by the DBM (66.67%) and by the leaf webber (33.33%). In cabbage, majority of the respondents (57.14%) perceived that worm was the major insect-pest followed by looper (42.86%). Mostly occurred major insects were beetle in bitter gourd. The percentage of bottle gourd growing farmers who perceived that beetle, wine borer and aphid

Table 8 : Distribution of the respondents according technical constraints faced by respondents in vegetable cultivation.

S. no.	Technical constraints	Frequency*	Percentage
1.	Low knowledge about recent practices	88	73.33
2.	Low selling price of vegetable	92	76.67
3.	Unavailabity of required input	62	51.67
4.	Non availability of required implement	17	14.17

* Data based on multiple responses

was important pest was reported by 46.15, 30.77 and 23.08 per cent, respectively. In cowpea most important insect were aphid, followed by worm and beetle as reported by 66.67, 16.67 and 16.67 per cent respondents, respectively. In cluster bean and cucumber, cent per cent of the respondents perceived that aphid was the major insect pest. Main insect affecting chilly were, fruit borer and thrips as reported by 66.67 and 33.33 per cent of the respondents, respectively. In all aphid and fruit borers were the most important insect pest occurring in most of the vegetable crops. Mewara (2007) noted similar result in his findings.

Occurrence of disease

Diseases are also one of the major biotic factors, which affect the productivity of crops in general and vegetable crops in particular. Occurrence of diseases as reported by the respondents was considered for the study.

The findings related to the occurrence of diseases are presented in the table 7. The data revealed that majority of the respondents (46.88%) perceived that early Blight was the major disease followed by wilt (28.13%) and late blight (25%) in potato. In okra, cent per cent of the respondents perceived that yellow vein mosaic was the major disease. Majority of (52.38%) brinjal growing respondents reported that little leaf was the major disease followed by Damping off (47.62%). White Rust and Anthracnose were the always occurred diseases in spinach and tomato, respectively. Cauliflower growing respondents were reported that their area was affected by bacterial soft rot and by the downy mildew. All of the cabbage and bitter gourd growing respondents were found that their crops were affected by the alternaria leaf spot and powdery mildew, respectively. The per cent of bottle gourd growing farmers, who perceived that anthracnose and powdery mildew was important disease were (46.15%) and (53.85%) respectively. In cowpea, mostly important disease was downy mildew, rust and powdery mildew as reported by 43.33, 33.33 and 23.33 per cent respondents, respectively.

In cluster bean and chilly cent per cent of the respondents perceived that rust and anthracnose was the major disease. Main affecting diseases in cucumber were bacterial leaf spot, angular leaf spot and fruit rot as reported by 46.15, 38.46 and 15.38 per cent of the respondents, respectively.

Technical constraints in vegetable cultivation

The constraints as perceived by vegetable growing farmers pertaining of vegetables are presented given in table 8. The findings revealed that majority of the (73.33%) respondents perceived that low selling price was the major technical constraint in vegetable production. Many of them perceived that lack of knowledge about recent practices, unavailability of required input and non availability of implements were the various technical constraints in vegetable cultivation.

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