Extension & technological needs of south Goa district vegetable growers to accomplishsocio economic development

Abstract :

The objective of the present study is to elaborate amatrix for assessing the socio economic development for vegetable cultivators. To measurethis prospect, a questionnaire was constructed upand used as provision for face-to-face interviews piloted at the level of the South Goa district. Along with sustainability approach, acquaintance objectives of present study were to determine the extension & technological needs of vegetable growers in South Goa.The findings showed relations between different components of the dimensions deliberated, revealing their synergy in farm activity, laterally with the manifestation of certainvariances inthe levels of socio economic dimensions and sub-dimensions, which vary as a function of the precise types of vegetable production (conventional, ecologic, natural, mixed). Knowledge desires to be conveyed by vegetable growers have frequently been implicit as extension needs.Nevertheless, the obligation of extension services is more than just providing information about agricultural inputs and its supply chain. It was evident from the study that the foremostrestraints like dearth of technical knowledge on IPM and INM, deficiency of innovativeness, absence of entrepreneurial ability, deprived marketing and storage services, less opportunity for post-harvest technologies, lack of operative supervision and monitoring by extension personnel were confronted by the vegetable growers of south Goa.

Key words: Extension needs, technological needs, socio economic aspects

1. Introduction:

India is next only to China in area and total production of vegetables with an average productivity of 212.91 million tonnes / ha (Ministry of Agriculture & Farmers Welfare). It occupies prime position in the production of cauliflower, second in onion and third in cabbage in the world. However, there is huge scope to further boost the production by increasing the productivity per unit area of land with the help of improved technologies. Agriculture has been and continues to be the principal engine of economic growth in India as it sustains over 70% of its population and contributes around 20% to its GDP. It employs about 70% of the workforce and contributes about 18% to the national GDP.

Vegetables play a vital role in providing the essential nutrients, vitamins, minerals and fibre, which is not present in good quantities in starchy staple foods. Of late, the country has witnessed tremendous progress in vegetable production, especially after the green revolution period. The major vegetable growing states in India are West Bengal, Uttar Pradesh, Bihar, Andhra Pradesh, Gujarat, Karnataka and Tamil Nadu. During the last decade, it has been noticed that among all horticultural crops (fruits & vegetables) there has been a significant increase in productivities of vegetable crops.

Public agriculture extension systems often fail due to inadequate consultation with farmers about their information needs or poor understanding of their information search behaviour. Besides, the time, place, source or the method used by extension agents do not suit the timing or preferences

of the farmers, and that could be one of the reasons why people hold a negative attitude towards extension agent, system and the services. Therefore, the extension strategies and approaches are supposed to be designed and developed keeping in view the desired extension needs of the farmers in mind.

Technological change has been the major driving force for increasing agricultural productivity and promoting agriculture development. Any development intervention for rural people should be compatible with their existing livelihood strategies and ability to adapt. Due to the horticulture sector's significant contribution to the state's GDP, it requires special attention in order to achieve higher levels of rural prosperity. In India more than 40 different kinds of vegetables belonging to different groups, viz., solanaceous, cucurbitaceous, leguminous, cruciferous (cole crops), root crops and leafy vegetables are being grown in tropical, subtropical and temperate regions. India, with its wide diversity of climate and soil, has vast potential for growing different types of vegetables round the year. Subsequently, a composite "extension needs index" & "technology needs index"was developed by the researcher formeasuring extension& technological needs of the targetrespondents.

2. Materials and methods

The research was conducted in the south Goa district, a Western state of India.The state's budgetprincipally depends on agriculture besides tourism and mining. The foremost cropsgrown in Goa are plantation crops, cash crops and Vegetables. Rice farming is reasonably common which nourishes the population of the state. The study locale preferred were purposively selected district - South Goa, the highest vegetable producing district (10.26 t/ha ICAR -CCARI)in the state of Goa. Further, fourtalukas were selected from the district and each block, two villages were selected purposively. A representative sample of 240 farmers, who were involved in vegetable cultivation, was selected randomly from eachvillage. The analytical research design was adopted for this study. Then, a comprehensiveand meticulous interview schedule was developed for collecting pertinent information from the respondents. Data collected was coded, classified, organized and was evaluated using Statistical Package for the Social Sciences (SPSS) by the study objectives. Descriptive and inferential analytical techniques were used to achieve the study objectives

3. Result & discussion

The selected vegetable growers were requested to specify the socio economic eminence through a designed schedule and the information composed by interrogating the particular growers and presented them to recognize the individual's socio economic characteristics and the extension – technological needs. The findings obtained from the existingresearch as well as pertinentconfab have been conceded under following heads.

Table -1: Socio demographic characteristics of the respondents (n-240)

Variables	No. of participants	
Age (in years)	**Frequency (F)**	**Percentage (%)**
Up to 35 years	48	20.00
36 to 55 years	164	68.33

55 years and above	28	11.66
Education		
Illiterate	07	02.91
Primary level	82	34.16
Middle level	97	40.41
High School	36	15.00
College and above	18	07.50
Land holding (ha)		
Landless	25	10.41
Marginal (< 1.0 ha)	126	52.50
Small (1.0-2.0 ha)	48	20.00
Semi Medium (2.0-4.0 ha)	19	07.91
Medium (4.0-10.0 ha)	13	05.41
Large (> 10.0 ha)	09	03.75
Occupation		
Agriculture and allied sector	137	57.08
Skilled workers	46	19.16
Unskilled and Daily wages	23	09.58
Other	34	14.16
Farming experience (in years)		
Low (less than 3 years)	24	10.00
Medium (3 to 5 years)	168	70.00
High (more than 5 years)	48	20.00
Extension contact		
Low	62	25.83
Medium	149	62.08
High	29	12.08
Economic Motivation		
Low	30	12.50
Medium	159	66.25
High	51	21.25
Average annual income(Rs.)		
Up to 25000/-	29	12.08
25001/- to 50000/-	58	24.16
50000 /- to 100000/-	126	52.50
Above 1.0 lakh	27	11.25

The socio-demographic particulars of the research participants are given in Table 1. The mainstream of the respondents (68.33 %) were in the age group of 36-55 years in the range of minimum of 28 years and a maximum of 65 years. Mainstream of the respondents were up tomiddle level educated (40.41%) followed by primary level (34.16 %). This was due to that the certain study area was far-flungsettlements and the respondents don't have consciousness about education and most of the population does not have access to schooling with very poor financial status. According to the land holding most of the respondents (52.50%) were marginal farmers followed by small farmers with agriculture and allied sector (57.08 per cent) as their primary

occupation for livelihood. Majority (70 %) of the respondents had three to five years of farming experience followed by (20%) high farming experience. Majority of the respondents (62.08 %) were medium level of extension contact and economic motivation (66.25 %). Among the respondents (52.50 %) were found to have annual income within the range 50000 to 100000, as they were mostly small and marginal farmers and their primary occupation was agriculture and allied sectors only without any other source of family income.

3.1 Extension Needs of Vegetable Growers

The accompanied emphasis of the study was to conclude the extension needs of the vegetable cultivators as they are not generallypontificated by the prevailing extension system. Additionally, in numerousresearches, information needs have repeatedly been referred to as extension needs. In this study, it was hypothesized as a multi-modal context which embraced of six diverse components, viz. (i) Anticipated information requirements (related to agriculture and livestock), (ii) Preferred source of information, (iii) Desired frequency of communication, (iv) Desired abode of communication, (v) Preferred extension teaching method and (vii) Gender predilection of Extension Personnel.

3.1.1 Anticipated information requirements (related to agriculture and livestock),

Information irregularity at farm level has been recognized as one of the serious issue upsetting agriculture productivity and production efficiency. Farmers' entailgen at different stages of farming, and the researcher anticipated to find out at which stage of farming, they necessitateadded information than at other stages. Information needs related to agriculture were classified under six sub-heads (stages), i.e. information requirements related to (a) Pre-sowing stage (b) Sowing stage (c) Growing stage (d) Harvesting stage (e) Post Harvest stage (f) Government policies and schemes. The results achieved are given in the following Table 2.

Table 2. Distribution of vegetable growers based on information needs (N=240)

Sr. No.	Anticipated information requirements	Most Needed		Needed		Not needed	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Pre-sowing stage	136	56.66	77	32.08	27	11.25
2	Sowing stage	72	30.00	95	39.58	73	30.41
3	Growing stage	113	47.08	98	40.83	29	12.08
4	Harvesting stage	48	20.00	74	30.83	118	49.16
5	Post-Harvest stage	125	52.08	87	36.25	28	11.66
6	Government policies and schemes	230	95.83	10	04.16	00	00.00

It is apparent from the above table that preponderance of the respondents i.e. 56.66 per cent conveyed the need for information related to pre-sowing stage, which was apparent as ‘most needed’ trailed by ‘post-harvesting stage’ by 52.08 per cent of the respondents and ‘growing stage’ with 47.08per cent and. Meaningfully, 95.83 % of the respondents articulated that they required information about government policies and schemes allied to agriculture. Further, about 49.16 per cent of the respondent deliberated information associated to harvesting stage as ‘not much needed’ and 30.83 per cent considered it as "needed" and only 20.00 % of the respondents considered it as "most needed". Meghwal, P. K., Jadav, N.B. (2021)found that 78.0 per cent of the total respondents needed information about right planting time, 69.20 per cent of them needed information on planting spacing, 60 per cent needed information on pesticides, 49.20 per cent on herbicides while 12.50 per cent needed information on the use of fertilizer.

3.1.2 Preferred source of information

It indicates the preferences of vegetable growers about various sources of information, i.e. how/ from whom they would like to receive the information about agriculture. The findings regarding vegetable growers’ preference of source of information have been presented in Table 3.

Table 3. Distribution of vegetable growers based on the preferredsource of information (N=240)

Sr. No.	Preferred source	Frequency	Percentage
1	Friends and relatives	71	29.58
2	Govt. Departments (Agri., AH etc.)	33	13.75
3	Local/opinion leaders	25	10.41
4	Elderly people	15	06.25
5	Extension Personnel	19	07.91
6	Mass media&internet sources	28	11.66
7	Agricultural exhibitions	16	06.66
8	Study tours & visits	09	03.75
9	Progressive farmers	18	07.75
10	Programmes attended	06	02.50

A large mainstream of vegetable growers (29.58 %) expressed their preference for ‘friends and relatives' to receive agriculture-related information trailed by ‘Govt. Departments (Agri., AH etc.)' (13.75 %), mass media & internet sources (11.66 %), local leader (10.41 %), extension personnel (07.91 %) and agricultural exhibitions (06.66%). The findings are supported by Rawal and Ansari (2021) who found that 88.33 per cent of vegetable growers seek information from their friends and relatives.

3.1.3 Desired frequency of communication

The researcher required to discover out how often vegetable growers would like to collect information about agriculture. The findings are presented in Table 4.

Table 4. Distribution of vegetable growers based on the desired frequency of communication (n=240)

Sr. No.	frequency of communication	Frequency	Percentage
1	Daily	18	07.50
2	Weekly	23	09.58
3	Fortnightly	67	27.91
4	Monthly	86	35.83
5	Yearly	40	16.66
6	Un intended	06	02.50

A review of the findings are presented in Table 4 reiterates that majority of the respondents(35.83 %) stated their desire to have interaction with information providers (i.e. extension agents) on 'monthly' basis and 27.91 per cent wanted to have it on 'fortnightly' basis; however, only 07.50 per cent of the vegetable growers wanted to have interaction with extension agent(s) on 'daily' source.

3.1.4Desired abode of communication

As vegetable growers are overburdened with work, place of contact with extension agent also matters a lot to them. Results obtained are given in Table 5.

Table 5. Distribution of vegetable growers based on the desired abode of communication (n=240)

Sr. No.	Abode of communication	Frequency	Percentage
1	Home	30	12.50
2	Farm	107	44.58
3	Office of extension personnel	22	09.16
4	Telecommunication	63	26.25
5	Other	18	07.50

Anenormous majority of vegetable growers (44.58 %) considered their farm/field as the anticipated place of communication, followed by 26.25 per cent of respondents who stated that telecommunication as the desired way whereas 12.50 per cent of them talked about their 'Home' as the desired place of contact.
Waghmod etal. (2020) found that the formats that most respondents reported as best for them were: On farm demonstrations (80%), and Learning from home (74%).

3.1.5 Preferred Extension Teaching Method

The findings acquired in respect of vegetable growers' preference about extension teaching methods are given in the following Table 6.

Table 6. Distribution of vegetable growers based on the Preferred Extension Teaching Method (n=240)

Sr. No.	Preferred Extension Teaching Method	Frequency	Percentage
1	Farm and home visit	83	34.58

2	Group discussion	69	28.75
3	Demonstrations	30	12.50
4	Training	24	10.00
5	Study tours & visits	07	02.91
6	Pre-recorded videos	05	02.08
7	Written means	09	03.75
8	Visual aid (Exhibits, charts etc.)	13	05.41

Majority of the respondents (34.58%) considered ‘Farm and Home visit' as the preferred extension method for getting information from extension personnelwhile28.75 per cent preferred ‘group discussion. ‘Demonstrations’ and ‘training’ were considered by the respondents as the preferred method only by 12.50 per cent and 10 per cent respectively. The findings are supported by Sahu et al.(2019) who reported that the farm visit was the most preferred extension teaching method (50%).

3.1.6 Gender predilection of Extension Personnel

It was in this perspective that the existing research proposed to find out the predilection of vegetable growers about the gender of extension agents. The results obtained are given in Table 7.

Table 7. Distribution of vegetable growers based on the Gender preference of Extension Personnel (n=240)

Sr. No.	Gender predilection	Frequency	Percentage
1	Female	68	28.33
2	Male	74	30.83
3	Gender of extension agent doesn’t matter	98	40.83

About 40.83 per cent of the respondents conveyed that it doesn't matter if the extension agent is either male or female. However, 30.83 respondents preferred male extension agent for receiving information while 28.33 per cent preferred female extension agents. The study findings are similar to Ruzzante & Bilton (2020) who found that to the majority of the respondent's gender of the extension functionaries didn't matter.

3.2 Relationship between selected socio- economic characteristics of vegetable growers and their extension needs

The study also examined the relationship between selected socio personal characteristics of vegetable growers and their extension needs. The variables included were: Age, Education, Caste, Income, Gender, Farming experience, Information seeking behaviour, Information sharing behaviour and Extension agency contact. The findings are presented in Table 8.

Table 8: Influence of socio-economic variables on extension & technological need of vegetable growers

Sr.No.	Characteristics of vegetable grower	r - value
1	Age	0.123**

2	Gender	0.065
3	Caste	-0.079
4	Landholding	0.356**
5	Education	0.284**
6	Farming experience	0.351**
7	Contact with extension agency	-0.079
8	Information seeking behaviour	0.193*
9	Information sharing behaviour	0.119
10	Media exposure	0.246**
11	Income	0.259**

**Significant at P <0.01% level; ** Significant at P=0.05% level; NS- non significant*

It is evident from the above table that age,landholding, education, farming experience,information-seeking behaviour, media exposureand income were found to have a significantrelationship with the extension needs ofvegetable growers. But, gender, caste andinformation sharing behaviour were found to benot related to the extension needs of vegetablegrowers. Further, gender and contact withextension agency displayed a negative (but notsignificant) correlation with extension needs ofvegetable growers.

3.3 Multiple regression analysis of extension & technological needs of the vegetable growers

Further, multiple correlation analysis was also done to find out the contribution of profile characteristics of vegetable growers in determining their extension needs. The results obtained are given in the following Table 9. The results of multiple regression analysis revealed that ten independent variables contributed differentially towards extension needs of vegetable growers. It is evident that age, gender, income, media exposure, extension agency contact, and information-seeking behaviour were found to be negatively related whereas caste, education, farming experience and information sharing behaviour were positively related with extension needs of the vegetable growers (dependent variable).

Table 9. Multiple regression analysis of extension & technological needs of the vegetable growers

Sr. No.	Independent variable	Regression coefficient value (β)	Standard error	t-value
1	Age	-0.790	0.152	-0.542
2	Gender	-0.996	1.456	-0.624
3	Caste	0.566	1.201	0.523
4	Landholding	-0.235	1.226	-0.468
5	Education	0.894	0.993	0.895
6	Farming experience	0.169	0.176	0.623
7	Contact with extension agency	-0.156	0.366	-0.569
8	Information seeking behaviour	-0.269	0.569	-0.398
9	Information sharing behaviour	0.368	1.256	-0.274
10	Media exposure	0.262	0.662	0.846
11	Income	0.182	0.197	0.788

R^2 = 0.735; $\beta_{\circ}$= 43.984; f cal = 0.367; Dependent Variable: Extension & technological needs of vegetable growers

The value of the coefficient of determination (R2) was 0.617 which means that 61% of the variation in the dependent variable was contributed by all the independent variables put together. The remaining variations in the dependent variable may be due to other variables not included in the study or by extraneous or intervening variables.
Nevertheless, the high value of R2 indicates that the researcher has accounted for the major components/ factors which determine the extension needs of the vegetable growers.

3.4Technological Needs

In innovation-diffusion process the aspects like suitability and compatibility, budget of technology, accessibility of inputs and monetary factors of farmers and marketing services and incremental return from the technology are at the individual level in determining adoption decisions. Farmers have a number of contests when it emanates to accepting new technologies and advances. The magnitude to which the farmer finds the new technology complex and challenging to understand, the simplicity with which the outcomes of an adoption can be perceived, the financial cost, the farmer's views and attitudes about the technology, the farmer's level of motivation the farmer's perception of the new technology's relevance and the farmer's approaches toward risk and change are amid the factors acknowledged. (Waghmod et al.2020). Despite rapid area expansion and acceptance of vegetable cultivation by the farmers, there exist needs in between yield at farmer’s field and the potential yield. Such needs require systematic investigation to draw a conclusion on asuitable strategy and for evolution of a proper policy .It is therefore highly imperative to analysetechnological needs perceived by the farmers to realize the available potential production and income.

Table 10. Distribution of vegetable growers based on the technological needs (n=240)

Sr. No.	Technological need / aspect	Strongly agreed		Agreed		Disagreed	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Scientific knowledge on package and practices	87	36.25	105	43.75	48	20.00
2	suitable location specific technology	149	62.08	70	29.16	21	08.75
3	development programme	117	48.75	90	37.50	33	13.75
4	technology demonstration	183	76.25	57	23.75	00	00.00
5	knowledge in integrated nutrient management	128	53.33	99	41.25	13	54.16
6	knowledge in integrated plant protection management	138	57.50	93	38.75	09	03.75
7	knowledge on post harvest management	134	55.83	62	25.83	44	18.33
8	farm mechanisation	105	43.75	117	48.75	18	07.50

Majority of the respondents (76.25 per cent) stated that technology demonstration is much required followed by suitable location specific technology need to be designed, knowledge in integrated plant protection management (57.50 per cent), knowledge on post-harvest management (55.83 per cent) and nutrient management (53.33 per cent). Similar finding were reported by Pandit & Basak (2013).

Table 11. Distribution of vegetable growers based on the socio economic needs (n=240)

Sr. No.	Socio-economic aspect	Strongly agreed		Agreed		Disagreed	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Awareness on improved technology / mass media exposure	137	57.08	73	30.41	30	12.50
2	Innovativeness	197	82.08	43	17.91	00	00
3	Education	106	44.16	129	53.75	05	02.08
4	Suitable cultivable land	101	42.08	93	38.75	46	19.16
5	Cost of seed and other inputs	169	70.41	46	19.16	25	10.41
6	Responsiveness	76	31.66	143	59.58	21	08.75
7	Entrepreneurship ability	168	70.00	68	28.33	04	01.66
8	Achievement motivation	152	63.33	79	32.91	09	03.75
9	Source of information	67	27.91	102	42.50	71	29.58

The results of present study concluded that Innovativeness (82.08), cost of seed and other inputs (70.41 per cent), entrepreneurship ability (70 per cent), achievement motivation (63.33 per cent) and awareness on improved technology / mass media exposure (57.08 per cent) were important technical needs pertaining to adoption of improved technologies. (Sohi et al . 2021) stated that , the high production costs of horticulture crops was the major constraint followed by poor follow up of activities by the extension personnel and less subsidies are the major constraints expressed by the National Horticulture Mission beneficiaries.

Table 12. Distribution of vegetable growers based on the organizational needs (n=240)

Sr. No.	Organizational needs	Strongly agreed		Agreed		Disagreed	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Linkage with line departments	98	40.83	117	48.75	25	10.41
2	Credibility of the extension workers	75	31.25	137	57.08	28	11.66
3	Availability of credit facility	159	66.25	76	31.66	05	02.08
4	Availability of	152	63.33	79	32.91	09	03.75

	quality input						
5	Marketing network	210	87.50	27	11.25	03	01.25
6	Price at the time of harvest of vegetables/ market surplus	192	80.00	49	20.41	01	00.41
7	Effective supervision by the extension workers	65	27.08	116	48.33	59	24.58
8	Crop insurance facility	76	31.66	149	62.08	15	06.25
9	Storage facility	199	82.91	33	13.75	08	03.33
10	Transportation facility	229	95.41	11	04.58	00	00.00

From the above table 12 it was concluded that majority of the respondents stated transportation facility (95.41 per cent), marketing network (87.50 per cent), storage facility (82.91 per cent) and price at the time of harvest of vegetables/ market surplus (80 per cent) were important organizational needs. The optimisticoutcome of credit on technology adoption is dependable with former theoretical and empirical work and access to credit is a variable factor that has received increased empirical attention in recent years. Market price is a key determinant of sustained adoption is the profitability of agricultural enterprises. The results of present study concluded that stratefy for marketing , credit and storage facility was considered as the major needs, while current advance technologies were also serious requirement pertaining technical guidance . The findings are in corroborated with the findings of (Pandit and Basak , 2013) and (Sohi et al. 2021) .It is also evident from the study that among the three major types of constraints identified, technological and socio-economic constraints were mostly faced by the vegetable growers. Similar findings were reported by Joshi et al. (2006).

4. Conclusion

The research was steered to conclude the extension & technological needs of vegetable growers in South Goa. The research outcomesspecified that the majority of therespondents expressed ‘high’ extension needsindicating that the extension system has not beenable to encounter the anticipations of vegetablegrowers. Whileoperative extension system subsists but farmers’ extension needs are not beingaddressedappropriately and satisfactorily. Of the sixcomponents of extension needs as hypothesized by the researcher, ‘preferred extension teaching method ' and desired abode of communication ' were particularreasonably moreimperative than further components such as the desired source of information, anticipated frequency of contact, gender preference of extension agent, and anticipated information needs.This means that extension

scientists andresearchers must contributerequired importance to thelearning environment of the vegetable growers.

The researchconclusions may help the extensionscientists, extension workers, governmentadministrators and policymakers to develop apolicy framework for establishing an applicable extension system which also satisfies the previouslyoverlooked extension needs of vegetablegrowers whose contribution in Goa'sagriculture is substantial and noted for enhancing agricultureproductivity and production efficiency. It will likewise support policymakers develop appropriate extensionservices delivery system as per the requirementsof target respondents.

Vis-à-vis to technological needs and their logical interpretation, it can be concluded that majority of the vegetable growers tackled medium to high technical needs regarding all the aspects under study. On the heart of above results and discussion, it is apparent from the research that the major need like, knowledge of IPM and INM, requirement of innovativeness, necessity of entrepreneurial ability, requisite of responsiveness, prerequisite of credit facility , essential storage facilities, prerequisite about post-harvest technologies, difficulty faced by vegetable growers in marketing along with appropriate remunerative price of the produce and effective supervision and monitoring by extension workers are requirements by the growers. Thus there is a necessity to consolidate more number of awareness and capability development programmes for farmers, timely awareness for inclusion under crop insurance and introduction of post-harvest technologies to hearten the farmers for vegetable production, so that the farmers become more economically sovereign. Furthermore it will expand nutritional and monetary status of farm family hence indirectly improves the socio-economic status of vegetable growers of the south Goa district.

References

Dash, S.R.. Mishra, P. J., Bar, N., Biswas, K. K . and R. R. Pani. (2022) Constraints Analysis in Adoption of Vegetable Production Technologies in Malkangiri District, Odisha. Journal of Research in Humanities and Social Science Volume 10 ~ Issue 5.

Gatti, R.C. (2016) Trends in human development and environmental protection. Int. J. Environ. Stud., 73, 268–276.

Gopalakrishnan, T. R. (2007). Vegetable Crops. New India Publishing Agency, Pitampura, New Delhi . pp.34

Handbook on Horticulture Statistics (2014). Ministry of Agriculture, Government of India, Department of Agriculture and Cooperation, New Delhi.

Indian Horticulture, Ministry of Agriculture, Government of India; 2017-18.

ICAR – CCARI (2009). Three decades of Research on vegetable crops in Goa.

Jantwal V. (2015)A study on extension needs of farm women and their attitude towards extension services in Kumaon region of Uttarakhand. Unpublished Master's thesis, G. B. Pant University of Agriculture & Technology, Pantnagar-263145 (India);.

Meghwal, P. K., Jadav, N.B. (2021). A Study on the Relationship Between Selected Characteristics of the Farmers and Their Adoption, Journal of Community Mobilization and Sustainable Development , 16 (3): 954-960.

Ministry of Agriculture & Farmers Welfare. (2021).Second advance estimate for the year 2022-2023 released for area and production of horticulture crops.

Organisation for economic co-operation and development (2001). Adoption of technologies for sustainable farming systems Wageningen , workshop proceedings : 7-149

Pandit, J. C. and Basak, N. C. (2013). Constraints faced by the farmers in commercial cultivation of vegetables, J. Bangladesh Agril. Univ. 11(2): 193–198,

Qtaishat T, Sharafat AA. (2012).Attitudes of vegetable farmers towards public agricultural extension services. American Journal of Agricultural and Biological Sciences.7(3):370-377.

Raghuraja, J., Madhumathi, M., Shashikumar, and Sudheendra, M.(2021). Personal Profile, Impact and Constraints of National Horticulture Mission Beneficiaries in Davanagere District of Karnataka, Journal of Community Mobilization and Sustainable development , 16 (3): 810-816

Rawal and Ansari (2019). Extension Needs of Vegetable Growers: A Study in Kumaon Region of Uttarakhand Asian Journal of Agricultural Extension, Economics & Sociology, 36(4): 1-10,; Article no.AJAEES.52262.

Reddy, T.M. and Tirkey, I. (2004). Adoption of improved technologies of vegetable crops in Karnataka. Proceedings on impact of vegetable Research in India. NACEP, New Delhi. pp. 143-150.

Ruzzante, S. and Bilton, A. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature, World Development , Volume (38) : 107384,

Sahu D ., Pyasi V. K. , Agrawal S. K. and Raghuwanshi N. K. (2019). Reasons of adoption and rejection towards recommended production technology among soyabean growers, Journal of Extn. Edn. , XXI (1): 56-59.

Talukder, B.; Blay-Palmer, A.; Vanloon, G.W.; Hipel, K.W. (2020) Towards complexity of agricultural sustainability assessment: Main issues and concerns. Environ. Sustain. India.

Waghmod, Y. J., Hardikar, D. P. and Haldavanekar, P. C. (2020). Adoption of Good Agriculture Practices by Mango Growers. Int.J.Curr.Microbiol.App.Sci. 9(04): 186-203.