Research Article

Indian Journal of Extension Education
Vol. 57, No. 4 (October–December), 2021, (1-6)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Gender Mapping in Vegetable Cultivation in Sangrur and Patiala districts of Punjab

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ARTICLE INFO

Keywords: Gender mapping, Vegetable cultivation, Cultivators, Labourers, Participation, Women

http://doi.org/10.48165/IJEE.2021.57401

ABSTRACT

The present study was undertaken to investigate gender participation in vegetable cultivation in Sangrur and Patiala districts of Punjab. Male and female labourers as well as cultivators were selected randomly as respondents. The results of the study show that participation of men was significantly more in procurement of inputs, nursery management and land preparation. Among various intercultural operations, hoeing and weeding was performed more by female while irrigation, earthing and thinning by male. In all plant protection measures and fertilizer application, participation of male was high while harvesting was majorly female's job. In marketing of vegetables, participation of males was much higher than females whose participation was reported negligible. The study recommends that extension trainings should select trainees depending upon the gender mapping in vegetable cultivation so that both men and women could perform their roles in agriculture efficiently and thus increase their family income.

INTRODUCTION

Agriculture in India is the key industry and in recent times with implementation and initiatives of various government policies, NGO's and private agencies immense growth is recorded in this industry. The Punjab, popularly known as granary/food basket of India contributes 12 per cent of total agriculture production in India. The state has 62.5 per cent people who live in villages and their livelihood depends upon agriculture. Horticulture is one of the fastest growing sectors of agriculture. The area as well as production under various horticulture items including fruits, vegetables, flowers and spices has been increasing every year. This scenario signifies that vegetable cultivation in Punjab has a vast potential of improving the economic status of farming families including women folk that is engaged equally along with their male counterparts in activities involved in its cultivation. But the irony is that women have been over looked by agriculturalists and policy makers – it has been more convenient to label men as farmers and women as child raisers and cooks. Therefore, they are neglected as receivers of extension trainings in agriculture. In truth, women are involved in all aspects of agriculture, from crop selection to land preparation, to seed selection, planting, weeding, pest control, harvesting, crop storage, handling, marketing, and processing. However, their participation varies in different parts of the country.

Manjari (2014) reported that the nature and extent of women's involvement in agriculture varies greatly from region to region. But regardless of these variations, there is hardly any activity in agriculture except ploughing in which women are not actively involved. She further pointed that majority of the farm women were involved in almost all the activities of vegetable cultivation, their participation was found less in activities like seed selection, irrigation, procurement of inputs and plant protection. Around 60 per cent of the agricultural activities like sowing of seeds, transplantation of saplings, winnowing, storage of grain etc. are handled almost exclusively by women. Tripathi et al., (2015) revealed that participation of women was high in vegetable cultivation as compared to fruits and flower crops. If we talk particularly about vegetable production, women perform a variety of tasks both in cultivation as well as marketing along with their male counterparts. Practices related to vegetable cultivation have

Received 03-03-2021; Accepted 21-08-2021

now been considered as a family enterprise in which husband and wife participate to share work and pleasure both. However, there is a need to study the nature of gender desegregated participation so that extension programs which are being organized to update the farmers in vegetable cultivation may include women also as their beneficiaries. Keeping this in view, the current study was conducted in Punjab state to map gender desegregated vegetable cultivation operations performed by cultivators and labourers.

METHODOLOGY

The study was conducted in Punjab state. Two vegetable growing districts of Punjab state namely Patiala and Sangrur were purposively selected. On the basis of higher concentration of vegetable cultivators, a cluster of villages from each district was selected. A stratified multistage random sampling design was followed to select the study area and respondents. Inclusion of both labourers as well as cultivators is significant to understand the gender disaggregated participation, therefore both were selected as respondents. The inclusion of both labourers and cultivators become necessity in states like Punjab where women participation in agriculture is largely as labourers. From each selected cluster, 40 labourers and 30 cultivators were selected randomly as respondents. There was equal participation of male and female in labourers i.e. 20 male and 20 female from each cluster. Thus a total of 80 labourers were part of the study. From cultivators, 20 male and 10 female were selected from each cluster. The reason for less representation of female cultivators was their poor representation in agriculture in Punjab. This was based on prior visits in the selected areas and the existing literature which shows that female cultivators are comparatively very less in Punjab. Thus cultivators for the current study were 60. On the whole, the sample for the current study comprised of 140 respondents [2 districts x (30 cultivators + 40 labourers)].

The vegetable cultivation operations were studied under different heads such as procurement of inputs, nursery management and land preparation, intercultural operations, plant protection measures, harvesting and post harvesting handling. For each operation respondents were asked to select who perform that operation. Multiple responses were sought.

RESULT AND DISCUSSION

Gender comparison for Procurement of inputs

Table 1 showcases the information regarding participation of male and female cultivators as well as labourers in procurement of various inputs. The data reveals that a large percentage of the male cultivators participated in procurement of seeds (43.00%) and fertilizers (40.00%) while a smaller number of female cultivators (30.00% each) were involved in procurement of seeds and fertilizers. However, the difference in their participation in procurement of both, seeds and fertilizers were found to be non-significant. Regarding procurement of insecticides/pesticides, tools and implements and machinery more than one- third of male cultivators (38.00%, 35.00% and 35.00% respectively) participated, while female cultivators' participation was very less, only 15.00 per cent, 10.00 per cent and 5.00 per cent. The difference between the male and female cultivators in the procurement of insecticides was found to be significant (z=2.6; $p \leq 0.01$), while for other two inputs it was significant (z=2.06, 2.53; $p \leq 0.05$).

Among labourers, majority of both male (95.00%) as well as female (88.00%) labourers procured seeds from market themselves. Similarly, almost all the male labourers (93.00%) procured fertilizer themselves, while only 63.00 per cent of female labourers procure fertilizers. The difference between the two was significant (z=3.21, $p<0.01$). Similarly, participation of male labourers was high (72.50%) in procurement of insecticides/pesticides while only 20.00 per cent of female labourers were involved in its procurement. Statistically here also the difference between male and female labourers was significant (z=4.71; $p \leq 0.01$). Cent per cent of the male labourers were involved in procurement of tools and implements for vegetable cultivation. While only 10.00 per cent of female labourers procured tools themselves. Statistically, the difference between them was significant (z=8.09; $p \leq 0.01$). None of the male and female labourers procured machinery themselves. However, they shared that they accompanied cultivators for such work.

Overall, majority of male (69.00%) and female (68.00%) were involved in procurement of seeds. Similarly, 66.00 per cent of male and 52.00 per cent of female procured fertilizer themselves and statistically this difference was significant (z=1.74; $p \leq 0.05$). Around sixty-one per cent of the male respondents procure insecticides while only 18.30 per cent of female are involved in its procurement. The difference was significant (z=5.08; $p \leq 0.01$). Majority (68.00%) of the male respondents procured tools and implements while only 10.00 per cent of the female respondents procured tools for vegetable cultivation. The difference was statistically significant (z=6.80; $p \leq 0.01$). Thirty-five per cent of the male respondents procured machinery for vegetable cultivation while negligible percentage of women respondents (5.00%) procured machinery themselves. The z value (3.00; $p \leq 0.01$) was significant. So, it can

Table 1. Gender mapping in various activities related to procurement of inputs for vegetable cultivation (n=140)

Activities related to procurement of inputs	Cultivator (60)				z value	Labourer (80)				z value	Total				z value
	Male (n_1= 40)		Female (n_2=20)			Male (n_3=40)		Female (n_4=40)			Male (80)		Female (60)		
	f	%	f	%		f	%	f	%		f	%	f	%	
Seeds	17	43	6	30	0.94	38	95	35	88	1.19	55	69.0	41	68.0	0.05
Fertilizers	16	40	6	30	0.76	37	93	25	63	3.21**	53	66.0	31	52.0	1.74*
Insecticides/Pesticides	15	38	3	15	2.63**	29	73	8	20	4.71**	49	61.2	11	18.3	5.08**
Tools and Implements	14	35	2	10	2.06**	40	100	4	10	8.09**	54	68.0	6	10.0	6.80**
Machinery	14	35	1	5.0	2.53**	0	0.0	0	0.0	-	14	35.0	1	5.0	3.00**

Multiple response, ** $p<0.01$, *($p<0.05$

Table 2. Gender mapping in various nursery management and land preparation for vegetable cultivation

Activities	Cultivator (60)				z value	Labourer (80)				z value	Total				z value
	Male (n_1= 40)		Female (n_2=20)			Male (n_3=40)		Female (n_4=40)			Male (80)		Female (60)		
	f	%	f	%		f	%	f	%		f	%	f	%	
Nursery Management															
Nursery of seedling	16	40	6	30	0.76	36	90	23	58	3.30**	52	65	29	48	1.98**
Seed treatment for sowing	17	43	6	30	0.94	37	93	18	45	4.58**	54	68	24	40	3.24**
Sowing of seed in field	14	35	5	25	0.78	38	95	19	48	4.69**	52	65	24	40	2.94**
Uprooting & Transplanting	16	40	6	30	0.76	36	90	21	53	3.71**	52	65	27	45	2.36**
Land preparation															
Ploughing	15	38	5	25	0.97	40	100	8	20	7.30**	55	69	13	22	5.52**
Layout of the field	15	38	4	20	1.37	40	100	6	15	7.69**	55	69	10	17	6.11**

Multiple response, ** p<0.01, *(p<0.05

be concluded that participation of male was significantly more in procurement of inputs except seeds.

Gender comparison for nursery management and land preparation

Table 2 showcases the information regarding participation of male and female cultivators as well as labourers in procurement of various nursery management and land preparation activities. As far as different operations of nursery management for vegetable cultivation are concerned, around 40 per cent of male cultivators and 30 per cent of female cultivators were involved in nursery raising, seed treatment, sowing of seed and uprooting & transplanting. The difference between male and female participation in nursery management was non–significant. Among labourers, almost all male labourers were involved in all the activities of nursery management while around half of the female labourers reportedly performed operations of nursery management. The difference in participation of male and female labourers in all nursery management activities was significant (z=3.30, 4.58, 4.69 & 3.71; p≤0.01). Overall, around two-third of male respondents performed nursery management activities whereas less than half of the female respondents carried out nursery management activities. The gender difference in participation for all other nursery management activities was significant (z=1.98, 3.24, 2.94, 2.36; p≤0.01). So, it is concluded that participation of male was significantly more in all the activities of nursery management. In contradiction to the current study Anonymous (2008) reported that uprooting/ transplanting of seedlings are performed almost equally by both men and women while Tripathi et al., (2015) conducted study in Jammu district of India and concluded that the participation of rural women was more than 80% in seed sowing and in transplanting of seedling. Sah et al., (2019) conducted an in-depth activity analysis and reported that seed sowing (69%) was performed by women farmers in agriculture. Therefore, it can be inferred that such gender differences can be based upon the region as well as crop sown.

As far as land preparation is concerned, less than 40 per cent of male cultivators reportedly participated in ploughing and laying of the field (38% each). While among female cultivators, one–fourth of the respondents were involved in ploughing of the field. Only one–fifth of the female cultivators prepare layout of the field. The difference between male and female cultivators in layout of the field was non-significant. Among labourers, cent per cent of male labourers were involved in both the activities of land preparation while, less than one–fifth of female labourers (15.00%) performed land preparation activities. There was significant difference in participation of male and female labourers for ploughing (z=7.30; p≥0.01) as well as layout of the field (z=7.69; p≤0.01).

Overall, majority of male participated in ploughing and laying out of field (69.00% each) while, around one–fifth of female performed land preparation activities. Statistically, the difference between male and female for ploughing and layout of the field was significant (z=5.52, 6.11; p≤0.01). Accordingly, it can be determined that involvement of men was more in land preparation activities. The results are in line with Jethi (2008) who reported that land preparation activity is dominantly performed by males.

Gender comparison for intercultural operations

Table 3 shows data with regard to all intercultural operations. Around one–third of the male cultivators participated as 33 per cent of them reported that they do weeding, irrigation, earthing and thinning, while 35 per cent said that they do hoeing. The participation of female cultivators was found more than male

Table 3. Gender mapping in various intercultural operations for vegetable cultivation

Intercultural operations	Cultivator (60)				z value	Labourer (80)				z value	Total				z value
	Male (n_1= 40)		Female (n_2=20)			Male (n_3=40)		Female (n_4=40)			Male (80)		Female (60)		
	f	%	f	%		f	%	f	%		f	%	f	%	
Hoeing	14	35	8	40	0.38	37	93	35	88	0.75	51	64	43	72	0.99
Weeding	13	33	8	40	0.57	37	93	34	85	1.06	50	63	42	70	0.93
Irrigation	13	33	6	30	0.20	38	95	13	33	5.81**	51	64	19	32	3.76**
Earthing	13	33	8	40	0.57	37	93	18	45	4.58**	50	63	26	43	2.25**
Thinning	13	33	8	40	0.57	38	95	17	43	5.07**	51	64	25	42	2.60**

Multiple response, ** p<0.01

cultivators which was 40 per cent for hoeing, weeding, earthing and thinning and 30 per cent for irrigation. Statistically, for all the agronomic practices, the difference in male and female cultivators' participation was non–significant. Although non-significant, the results are in line with Singh and Vinay (2012) who reported that women participate more in majority of intercultural operations.

Among labourers, it was found that most of the male labourers participated in all intercultural operations which was 95 per cent for irrigation and thinning and 93 per cent for weeding, hoeing and earthing. The participation of female labourers was comparatively less. It was 88 per cent for hoeing and 85 per cent for weeding which statistically was non – significant when compared with male labourers. Their participation was less than male labourers in other inter culture operations (irrigation-33%, earthing-45%, thinning-43%) which was statistically different when z test was applied (z=5.81, 4.58, 5.07 respectively; $p \leq 0.01$).

On the whole if we compare the participation of male and female respondents in intercultural operations, the participation of females was more in weeding and hoeing (72% and 70% respectively) than male (64% and 63% respectively). Sah et al., (2019) also reported that weeding (87%) was performed by women farmers.

However, the difference in their participation was non-significant statistically. Further the results shows that the participation of male respondents was significantly more in irrigation, earthing and thinning (64%, 63% and 64%, respectively) as compared to female respondents (32%, 43% and 42%). The results are in line with Jethi (2008) and Manjari (2014). It can be concluded that participation of male farmers was significantly more in intercultural operations like irrigation, earthing and thinning and was significantly less in hoeing and weeding.

Gender comparison for plant protection

Regarding application of manure and fertilizers, one-third of male cultivators (33%) and one fourth female cultivators (25%) were reported to be involved. The difference between their participation was non- significant (Table 4). Almost all the male labourers applied manures and fertilizers in fields (95%), while only 30 per cent of female labourers were involved in its applications. The difference between two was significant (z=6; $p \leq 0.01$). Overall participation of male respondents was almost double (64%) as compared to female respondents (28%) and was statistically significant (z=4.15; $p \leq 0.01$). it can be concluded that the participation of male was significantly more in application of manure and fertilizers. Further in plant protection activities the table shows that there was not much difference in participation of male and female cultivators. Only 35 per cent of male cultivators and 30 per cent of female cultivators prepared solutions for spray, did dusting and protected crops from birds and animals. The gender difference in their participation was non-significant. Thirty per cent of the male cultivators and 25 per cent of the female cultivators were involved in spraying insecticides. Here also the gender difference was non- significant. Further among labourers, the participation of male labourers was high in all plant protection activities. Almost all male labourers were involved in preparing solution and spraying insecticides (98.00%). Only 30 per cent of female labourers prepared solution for spray while 35 per cent did spraying for insecticides. The gender difference in their participation for both activities was found to be significant (z=6.28, 5.91; $p \leq 0.01$). Ninety-three per cent male labourers did dusting and protected crops from birds and animals as compared to less than one-third (30%) and less than one-fourth (23%) of female labourers who were involved in these activities. The difference in their participation was significant (z= 5.74, 6.33; $p \leq 0.01$).

A glance at the pooled results for labourers and cultivators shows that the participation of male respondents was almost double than female respondents. Around two-third of male respondents reported that they prepared solution for spray, did spraying, dusting and protected crops from birds and animals (64%, 64%, 61% and 64%, respectively). However, less than one-third of female respondents were engaged in plant protection activities (30%, 32%, 30%, 25%, respectively). The difference between their participation was significant (z=3.95, 3.76, 3.66, 4.55; $p \leq 0.01$). Therefore, it is put forward that participation of male in all the activities of plant protection was significantly more. The findings are in consonance to Manjari (2014).

Gender comparison for harvesting and post harvesting handling

As far as harvesting is concerned, the participation of male and female was studied for three crops each for rabi and *khraif* season. The table 5 shows that participation of male cultivators in harvesting of peas, potato and carrot (rabi crops) was more than one-third (35%, 43% and 38%) similarly, female cultivators' participation was 35 per cent for peas and 40 per cent each for

Table 4. Gender mapping in various Plant protection activities for vegetable cultivation

Plant protection Activities	Cultivator (60)				z value	Labourer (80)				z value	Total				z value
	Male (n_1= 40)		Female (n_2=20)			Male (n_3=40)		Female (n_4=40)			Male (80)		Female (60)		
	f	%	f	%		f	%	f	%		f	%	f	%	
Application of manures & Fertilizers	13	33	5	25	0.60	38	95	12	30	6.00**	51	64	17	28	4.15**
Preparation of solution for spray	14	35	6	30	0.39	39	98	12	30	6.28**	51	64	18	30	3.95**
Spraying of insecticides	12	30	5	25	0.41	39	98	14	35	5.91**	51	64	19	32	3.76**
Dusting	14	35	6	30	0.39	37	93	12	30	5.74**	49	61	18	30	3.66**
Protection of crop from birds and animals	14	35	6	30	0.39	37	93	9	23	6.33**	51	64	15	25	4.55**

Multiple response, ** p<0.01, *(p<0.05

potato and carrot. The gender difference in harvesting of all selected rabi crops was non–significant. Among labourers, a large number of males were engaged in harvesting of peas, potato and carrot (83%, 80% and 80%, respectively) but participation of female labourers in these activities was comparatively more (95%, 93%, 93% respectively). Statistically, there was no gender difference any labourers in harvesting of rabi crops. Overall, more than half of the male respondents stated that they were involved in harvesting of rabi crops (59%, 61%, 59% for peas, potato and carrot respectively) while three-fourth of the female respondents (75% each) were involved in harvesting of these *rabi* crops. Statistically, female participation was more than male as there was significant difference in harvesting of peas and carrot (z= 2.00, 2.36; $p \leq 0.05$).

In case of *khraif* crops, the participation of male cultivators in harvesting of tomato, brinjal and chillies was 38 per cent each while female cultivators' participation was 40 per cent for each. The gender difference in harvesting of these crops was found to be non- significant. Among labourers, 78 per cent of the male labourers were engaged in harvesting of tomato and 80 per cent each were engaged for brinjal and chillies. On the other hand, almost all female labourers (95% each) participate in the harvesting of these crops. Statistically, there was gender difference in harvesting of all kharif crops (z=2.27, 2.03, 2.03; $p \leq 0.05$). Overall, in the participation of male and female respondents in *khraif* harvesting, the participation of female was more i.e., 77 per cent each in brinjal, tomato and chillies while 59 per cent of the male respondents were engaged in the harvesting of brinjal and chillies and 58 per cent in the tomato. The participation of women was statistically high in harvesting of all *kharif* crops (z=2.36, 2.22, 2.22; $p \leq 0.05$). The results are in line with Jethi (2008); Anonymous (2008); Tripathi (2015); Manjari (2014) & Sah et al., (2019) who concluded that harvesting operations were predominantly performed by farm women. Consequently, in harvesting of *rabi* and *kharif* crops, participation of female was significantly more.

Post-harvest practices like washing, trimming, grading and selling of vegetables were performed by 20 per cent, 35 per cent, 28 per cent, and 40 per cent male cultivators respectively. While 40 per cent of the female cultivators were involved in washing and grading each, 45 per cent of the females in trimming and only 20 per cent of the females were involved in selling of the vegetables. The gender difference was significant for washing while non-significant for trimming, grading and selling of vegetables. The results are in line with Jethi (2008); Singh and Vinay (2012) & Manjari (2014) who also revealed that women participation was more than in grading and cleaning. The reason of high participation of farm women in grading might be because these activities are considered as part of household work. Among labourers, 85.00 per cent of the male labourers were engaged in trimming and grading, 68.00 per cent in washing while almost all of the male labourers (93.00%) were involved in selling of vegetables. On the other hand, almost all female labourers (95.00%) participated in washing, majority (78.00%) of them in trimming and most of them (83.00%) did grading in post harvesting of vegetables. None of the female labourers were involved in selling of the vegetables. The difference of male and female labourers was found to be non- significant for trimming and grading while the difference of male and female participation in washing and selling of vegetables was significant (z=3.15, 8.30; $p \leq 0.01$) where more females were engaged in washing whereas more males were engaged in selling of vegetables. The results are similar to finding of Jethi (2008) and Manjari (2014) who reported that in marketing manual participation of farm women was less.

In total, lesser number of male respondents were engaged in post harvesting handling practices i.e. washing (44.00%), trimming (60.00%), grading (56.00%) as compared to the female respondents (77.00%, 67.00% and 68.00%, respectively). Sixty-six per cent of male respondents sold vegetables in market but very less participation (7.00%) by females in selling of vegetables was found. The difference between male and female respondents was found to be non-significant for trimming and grading of vegetables and significant in washing and selling of vegetables in market (z=3.90, 7.10; $p \leq 0.01$). The results are in line with various studies which concluded that women are more involved in post-harvest activities in comparison to other horticulture activities (AICRP Report 2008; AICRP Report, 2012). So, it can be concluded that involvement of females was significantly more in postharvest handling practices except selling of vegetables.

Table 5. Gender mapping in harvesting and Post harvesting handling of vegetables

Activities	Cultivator (60)				z value	Labourer (80)				z value	Total				z value
	Male (n_1= 40)		Female (n_2=20)			Male (n_3=40)		Female (n_4=40)			Male (80)		Female (60)		
	f	%	f	%		f	%	f	%		f	%	f	%	
Rabi Crops															
Pea	14	35	7	35	0.00	33	83	38	95	1.77*	47	59	45	75	2.00**
Potato	17	43	8	40	0.19	32	80	37	93	1.62	49	61	45	75	1.71*
Carrot	15	38	8	40	0.19	32	80	37	93	1.62	47	59	45	75	2.36**
Kharif crops															
Tomato	15	38	8	40	0.19	31	78	38	95	2.27**	46	58	46	77	2.36**
Brinjal	15	38	8	40	0.19	32	80	38	95	2.03**	47	59	46	77	2.22**
Chillies	15	38	8	40	0.19	32	80	38	95	2.03**	47	59	46	77	2.22**
Post–harvest handling															
Washing	8	20	8	40	1.65*	27	68	38	95	3.15**	35	44	46	77	3.90**
Trimming	14	35	9	45	0.75	34	85	31	78	0.86	48	60	40	67	0.81
Grading	11	28	8	40	0.98	34	85	33	83	0.30	45	56	41	68	1.45
Selling of the vegetables	16	40	4	20	1.55	37	93	0	0	8.30**	53	66	4	7	7.10**

Multiple response, ** p<0.01, *(p<0.05

CONCLUSION

Involvement of both male and female in vegetable production has also been reported by many researchers the world over. Infact, both men and women work in vegetable cultivation though their involvement differs in different parts of the country. In order to increase production, development of farm innovations alone will not work, transfer of technology from the research system to end term users i.e., farmers and farm women, both is necessary. For this it is of paramount importance to identify the correct end user. The current study concludes that participation of male was significantly more in preparatory activities. Their participation was significantly more in procurement of inputs except seeds procurement, all activities of nursery management and land preparation as compared to female. In various intercultural operations, participation of women was found to be more in hoeing and weeding as compared to men. While in irrigation, earthing and thinning, male participation was significantly more. In all plant protection measures and fertilizer application, participation of male was significantly higher than their female counterparts. Contrarily, participation of women in harvesting of all *rabi* and *kharif* vegetables was significantly more than males. Among post- harvest handling practices, participation of female was significantly higher in washing and grading. In marketing of vegetables, participation of males was much higher than females whose participation was reported negligible. So, it is recommended that extension services have been devoted to farmers hence, Agricultural extension functionaries should ensure capacity building and skill up gradation of farm women in those operations where their participation is more. The rural women many times could not attend the trainings due to gender constraints. In such situations, media can play an important role. Rani and Lal (2019) reported that media increased the knowledge of rural women in activities related to vegetable cultivation. Uma et al., (2015) added that the policy planning should try to make communication networking more stable and efficient to increase the smooth flow of information regarding new vegetable cultivation practices. Involvement of communication stars in formal training on vegetable cultivation at suitable time and place should be promoted so that women can support their family economy with their knowledge, skill and attitude also.

The current study found that participation of women in operations like hoeing and weeding, harvesting of vegetables and post-harvest handling was higher than male counterparts. Hence, there is need to organise trainings for women in these areas. Extension agents should recognise farm women as potential trainees of these agricultural activities so that they could contribute more to family income and agriculture economics at broader level. Further there is need to sensitize rural masses to send farm women in such trainings.

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