Received : 12.08.2023 | Accepted : 28.09.2023 | Online published : 01.10.2023
https://doi.org/10.54986/irjee/2023/oct_dec/1-6
IRJEE SOCIETY OF EXTENSION EDUCATION

RESEARCH ARTICLE

Vegetable Seedlings Based Agri-Entrepreneurship Development

Jitendra Kumar Chauhan[1], Kohima Noopur[2], Shivraj Singh Panwar[3] and Lalit Kumar[4]

1. Professor, Ext. Edu., COF, CAU, Agartala, Tripura.
2. SRF, ICAR-IIFSRR, Modipuram, Meerut, UP.
3. Emilio Aguinaldo, Medical College, Philippines
4. Fertilizer Association of India, New Delhi, India

Corresponding author e-mail: jkcagra@gmail.com

ABSTRACT

Vegetable are a potent source of food and nutritional security contributing 60.8 per cent share in the food basket in India. Vegetables are grown from landless to large land holdings, but the availability of quality seedlings especially to small, marginal and landless holdings is a question necessitating the need to train and establish vegetable seedling growers in the form of entrepreneurs. An extensive survey was undertaken in the western plain zone of UP followed by group discussions and selection of entrepreneurs. For this purpose, 03 farmers volunteered to take the assignment by sparing 500 m2 areas nearer to their house. A plan of 8 vegetables was drawn and implemented to provide year-round vegetable seedlings. It was observed that April, May, and June were the months where seedling requirement was very less, while remaining month's seedlings were required in large quantities. The monthly income of Rs 74794, Rs. 78388, Rs 77115 and Rs. 74745 was higher during October, November, December, and January, respectively. In April lowest income of Rs. 7018 was realized. Among the crops, onion seedlings registered the highest tomato equivalent plant as well as income per square meter area. The seedlings production system in only 500 m2 generates 300 man-days of job opportunities. The gross income of Rs.4,88,483 was earned while the cost of cultivation was Rs. 1,74,437 and 54,459/ with professional and family farming mode, respectively registering net income of Rs. 3,14,045 and Rs. 4,34,024 in the same order. Likewise, per day income was Rs. 860 and Rs. 1189, respectively. The results indicated that a family farming mode of vegetable seedling raising could earn Rs.1189 per day and can provide year-round jobs to the family members at the household level.

***Key words**: Vegetable nursery; Seedling; Entrepreneur; Income; B:C Ratio; Family farming.*

Agriculture is the prime mover of India's economy as major expenditure of about 45 per cent of the total is spent on food. The creation of awareness and change of food habit, vegetables and fruits have become part of daily diet and hence playing major role in food and nutritional security (*Panwar et al., 2019a*). The horticulture sector is contributing around 30.4 per cent of the country GDP from 13.1 per cent area (*Anonymous, 2023*). The production of vegetables has reached to 200.45 million tons during 2022, still we are facing nutritional insecurity at household level. This situation needs to intensify and diversify our production system with use of improved technology such as protected cultivation (*Singh et al.,2017*), newly released varieties, production technology, manure and fertilizers as well as crop protection measures (*Noopur et al., 2021a*).

India is blessed with a number of agro-climatic conditions and traditionally growing wide range of horticultural crops. Among them, vegetables having largest share (60.8 %) contribute to the food basket of the country. This production is restricted to regional and seasonal basis with less use of available technology leading to low yield and inconsistent supply in the market. Vegetables are highly remunerative and provide quick return, besides providing nutrients such as carbohydrates, proteins, minerals, fiber, vitamins etc. (*Kumar et al., 2022* and *Noopur et al., 2023a*). Generally the vegetables are growing in small, marginal and large land holdings. India has a large population having no land is classified as land less people. But some lands less people do have 100-500 sq meter area in and around their home. This piece of land are used as home garden by having backyard

poultry, milch animal, 2-3 fruit plants and a number of vegetables (*Walia et al., 2022*) behaving like vertical cropping system (*Panwar et al., 2019*) and production can be improved through demonstration of technology to the farmers (*Noopur et al., 2021a*). If this piece of land is converted into kitchen garden, food and nutritional security at house hold level can be ensured to the family. However, a number of constraints have been reported by *Noopur et al.* (*2023b*). Keeping this in view, kitchen garden concept was introduced by ICAR-IIFSR as a component of farming system for which seedlings are required at appropriate time and place for economic and social transformation and an instrument for taping entrepreneurial talent.

The concept of kitchen gardening was accepted by the farmers of Western plain zone of UP, but there was a problem of getting desired quantity of vegetable seedlings. The growing vegetable seedling by marginal and landless farmers was not possible because all farmers were not in a position to raise vegetable seedlings. At the same time there are numbers of educated unemployed youth searching for an opportunity to earn from the limited land or lease land. Becoming an entrepreneur in a society generally depends on social, economic, religious and psychological factors of the society (*Chauhan and Saikia, 2021*). It is a dynamic process of having income and innovative response to environment *(Rao and Mehta, 1978*). Hence, it was planned to make entrepreneur in raising vegetable seedlings only.

METHODOLOGY

Entrepreneurship development in raising vegetable nursery was initiated in two villages of Muzaffarnagar and one village in Meerut district of western plain zone of UP during 2020-21 to 2021-22. The climate of the study area varied with mean monthly maximum temperature between 15.5^{0}C (December) to 39^{0}C (May), while minimum temperature was 4.9^{0}C (January) to 25.6^{0}C (May) with an average rainfall of 780.6 mm of which 70 per cent was received during July to September. December to March were the dry months required extra water for the nursery plants. Three villages were selected and farmers were interviewed for nursery-based entrepreneurship development. One farmer from each village was ready for establishing small entrepreneurship by sparing 500 sq meter area nearer to their house. After survey and finalization, technology in terms of nursery raising (Production, protection and marketing) was discussed. The vegetable crops were finalized based on the outcome of the survey regarding vegetable grown in nearby area and assessed the requirement of vegetable nursery seedlings for easy marketing of seedlings. The details of the farmers are in Table 1.

These farmers were provided half quantity of required seed for the vegetables i.e. cauliflower (*Brassica oleracea* var. botrytis) var. Pusa Deepali, cabbage (*Brassica oleracea* var. capitata) var. Pusa Mukta, broccoli (*Brassica oleracea* var *italica*) var. Palam Vichitra, onion (*Allium cepa*) var. Pusa Ridhi, tomato (*Solanum lycopersicum*) var. Arka Rakshak, brinjal (*Solanum melongena*) var. Pusa Kranti , chilli (*Capsicum frutescens*) var. Punjab Red and papaya (*Carica papaya* L.) var. Pusa Nanha for raising seedlings. The remaining half quantity was arranged by farmers itself. This was done for developing self belongingness and to have active participation of the farmers. Initially the plot was ploughed and applied with 10t FYM which was uniformly spread in entire plot area and incorporated into the soil by ploughing and planking. This was followed by preparation of beds of 50 and 100 sq meter size. In all the nursery beds, raised beds of 10 × 1.5 × 0.5 meter was made and well pulverized. Between two beds an area of 75 cm wide was left fallow for doing nursery operations and irrigating the raised beds. At the time of sowing, treated seed were sown as per plan (Table 1) during specific month by making lines of 1-2 cm deep 10 cm apart and treated seeds with Thiram @ 2 g/kg seed and *Trichoderma Viride* @ 4 g/kg was placed and covered with small part of soil followed by mulching with dried paddy straw and light sprinkled irrigation to moisten the surface soil of the beds as adopted by *Chikkeri et al.* (*2023*).

The area allocation for different vegetable crops was calculated based on the seedlings requirement in the locality for specific month of the year (Table 2). It was observed that in western plain zone of UP most of the vegetable nursery plants are required during January, February and August to December.

Table 1. Details of the farmers under study

Farmer's name	Village and District	Land (m^2)	Soil pH	Soil carbon (%)
Arjun Kumar	Megha Khari, Muzffannagar	500	6.7	0.4
Brahmpal	Nangli Mahasingh, Muzffannagar	500	6.5	0.5
Sohanvir Singh	Sandan, Meerut	500	7.1	0.4

Table 2. Monthly crop plan and area sown in vegetable nursery

Crop	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Area
Cauliflower							100	200	100				400
Cabbage	100	50						100	50	50	50		400
Broccoli									50	150	50		250
Onion									300	300	300	300	1200
Tomato	100	100						200			100	100	600
Brinjal	100	100	100			100	100						500
Chilli	200	200				100	100					100	700
Papaya			400	100		300							800

Table 3. Area sown, seedling number and total amount received.

Crop	Area Sown (Sq meter)	Seed Weight used (g)	Total Seeds Sown	Germi nation	Week & unsold seedlings	Plant available for sale	Seedling Rate (Rs/plant)	Tomato Equivalent plant (m^2)	Income (Rs.m^2)
Cauliflower	400	45	13500	90.40	5.26	11510	2.00	23.02	57.55
Cabbage	400	45	13500	91.56	5.92	11588	2.00	23.18	57.94
Broccoli	250	35	11025	90.28	5.53	9387	2.50	37.55	93.87
Onion	1200	1500	600000	85.95	4.68	491433	0.50	81.91	204.76
Tomato	600	60	22800	90.16	5.29	19475	2.50	32.46	81.15
Brinjal	500	60	21000	88.72	6.09	17544	2.00	28.07	70.18
Chilli	700	70	17500	88.74	6.49	14564	2.50	20.81	52.01
Papaya	800	90	9000	84.85	7.34	7056	7.50	26.46	66.15
SE (d)	-	-	-	1.12	0.79	2361.90	-	4.51	11.28
CD =0.05	-	-	-	2.43	NS	5114.86	-	9.775	24.44

Accordingly the nursery plan was finalized with the consultation of the farmers. The seedlings were uprooted and made bundles of 10, 20 and 50 seedling and transported to the nearby market for sale and accordingly based on number of seedlings per bundle, the cost was fixed (Table 3). The nursery, during July to October, was also integrated with vertical cropping with bottle gourd and sponge gourd to get vegetable for home consumption and to increase production per unit area and relative production efficiency (*Panwar et al., 2019*). The bamboo structure was erected at a height of 225 cm above the ground and over the nursery plot. Seeds of bottle gourd, pumpkin (5 each) at a distance of 5.0 meter were sown during April month and climbers were allowed to spread on these structures. This way the seedlings were protected from scorching heat and sunshine during July and August months besides additional income was also realized. Since, we had only three farmers and hence one farmer was considered as one replication for statistical analysis. The data of both years was pooled and average values are given and discussed (Table 2).

RESULTS AND DISCUSSION

The details of seed sown, number of seedlings and other parameters presented in Table 3 revealed that minimum nursery area of 250 m^2 was with broccoli and maximum was with onion (1200 m^2). The area was decided based on the local seedlings requirement. Cole crops were assigned with 400 m^2 area, brinjal 500, tomato 600 m^2 chilli 700 m^2 and papaya was allotted 800 m^2 area. Most of the seedlings were ready for sale after 25-35 days of sowing excepting onion (35-45 days) and papaya (60-75 days). Maximum germination of 91.56 per cent was recorded with cabbage followed by cauliflower (90.40%). The lowest germination of 84.85 per cent was with papaya followed by onion (85.95%). The week or unsold seedlings were not significant however, week and unsold seedling were more with papaya (7.34%) and minimum with onion (4.68%). The onion had more number of seedlings which were significantly higher than seedlings of other vegetable crops. This might be due to low seed test weight accommodated more seedlings per unit area and at the same time onion was sown in lager area i.e.

1200 m^2. *Manjunath et al.* (*2020*) observed in onion 81-92 per cent seed germination. Lowest number of seedlings i.e. 7056 were observed with papaya might be due to poor seed germination (*Bhanuprakash et al., 2009*) and more seed test weight accommodated less seeds resulting in to less number of seedlings. To make uniformity all vegetables seedlings were converted into tomato equivalent seedlings (TES) and income per meter square. Maximum tomato equivalent seedlings were observed with onion which was significantly higher than other TES of others vegetables. Likewise income per square meter was higher with onion (Rs. 204.76 m^2) followed by broccoli (Rs. 93.87 m^2).

A gross income of Rs. 488483 was earned from the sale of seedling of which highest income of Rs. 245716 were recorded with onion due to more number of seedlings grown in larger area as compared to other vegetable crops. On the other hand, low seed test weight made more seeds per gram of onion seed and hence more number of seedlings were available for sale in spite of the fact that 18.09 per cent less seedlings were available for sale. This was followed by earning of Rs. 52917 and Rs.48688 from the sale of papaya and tomato seedlings, respectively.

The objective of this entrepreneur was to provide monthly income to the villagers and hence monthly earning was also studied which indicated that lowest gross income of Rs.7018 was earned during April (Fig 1). The gross income earned during may and June was also not encouraging. After June, the earning starts increasing registering highest income of Rs.78388 during November followed by December month (Rs.77115). January and October months registered comparable more gross income of Rs 74745. The low level of income during April-June was due to no or less demand

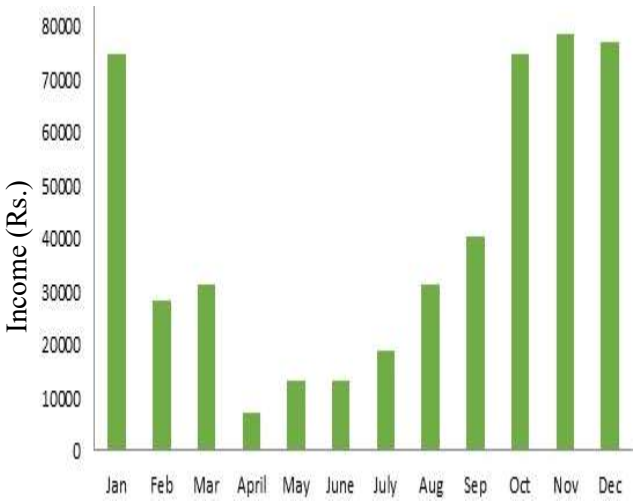

Fig. 1. Monthly income from sale of seedlings

of vegetable seedlings necessitating the need to think alternatives of earning during these months. *Panwar et al.* (*2021*) reported less income during February and October when farm is taken in to farming system mode.

Economics of entrepreneurship : Crop wise economics was calculated based on 300 man days generated on the plot by raising seedlings. The cost of cultivation was affected by cost of seed cost of Cabbage and cauliflower (Rs.75000/kg), broccoli (Rs.125000/kg), onion (Rs.25000/kg), tomato, brinjal and chilli (Rs.75000/kg), and for papaya (Rs.350000/kg) and labour cost. The cost of cultivation was Rs. 174437 of which highest cost was estimated with onion followed by papaya and tomato. The net return was Rs. 314046 of which maximum net return of Rs.207460 and lowest was with cauliflower. The B:C ratio of the entrepreneur was 2.80, but maximum with B:C ratio of 6.42 was estimated with onion followed by tomato, brinjal and broccoli. The lowest B:C ratio was estimated with papaya (Table 4).

Table 4. Economics of seedling entrepreneur

Crops	Economics with hired labour				Economics with family labour			
	Gross Income	Cost	Net return	B:C Ratio	Gross Income	Cost	Net return	B:C ratio
Cabbage	23020	12852	10168	1.79	23020	2957	20063	7.79
Cauliflower	23176	13752	9424	1.69	23176	3857	19319	6.01
Broccoli	23468	9745	13723	2.41	23468	3561	19908	6.59
Onion	245716	38256	207460	6.42	245716	8571	237146	28.67
Tomato	48688	21528	27160	2.26	48688	6685	42002	7.28
Brinjal	35088	16284	18804	2.15	35088	3915	31172	8.96
Chillies	36410	23716	12694	1.54	36410	6400	30011	5.69
Papaya	52917	38304	14613	1.38	52917	18514	34403	2.86
Total	488483	174437	314046	2.80	488483	54459	434024	8.97

Likewise, this entrepreneur was considered as family business model in which family members contributed whole activities and cost of labour were not counted. As family business is considered when more than one family member actively owned and/or manages it. Hence the cost of cultivation for raising vegetable seedlings reduced from Rs. 174437 to Rs. 54459 resulting into enhancement of net return to the tune of Rs. 434024. The highest B:C ratio was 28.67 with onion while lowest was with papaya (2.86) indicated family farming model is more remunerative, besides utilization of family labour in income enhancement at household level. The observations are in consonance with the findings of *Saxena et al.* (*2003*). The per day household income of Rs. 860 was estimated with professional model while in case of family farming model it was Rs.1189/day. But in both the cases 300 man days employment generated in the village will be helpful in checking migration from village to cities. Because migration is very much associated with poverty, unemployment, seasonality of job and low work opportunities (*Krishna et al., 2022*). The nursery seedlings production and marketing can be undertaken by women. And women may get 300 man days employment on their own plot. At the same time, women entrepreneur may be considered as contributor for social progress and sustained economics of the household (*Chauhan and Saikia, 2022*).

CONCLUSION

Vegetable seedlings raising for commercial purpose is a promising enterprise need to convert in the form of entrepreneur. Even in 500 m^2 area it can generate 300-man days employment at household level in the village itself and may help in checking migration, besides empowering women. The 500 m^2 land provided net income of Rs.314046 and Rs.434024 with commercial and family farming mode. When family farming mode is applied the B:C ratio increased up to 8.97, however, under professional system it was 2.80 only. Hence family farming mode of vegetable seedling production for marketing can be adopted in rural areas to provide healthy seedlings to the vegetable growers, besides it contributes in poverty alleviation, nutritional security, generating income and on-farm employment opportunities.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

REFERENCES

Annonymous. (2023). India's horticulture sector holds untapped potential despite challenges. The Economic Times, April 2023.

Bhanupraksh, K.; Yogeesha, H.S.; Arun, M.N. and Naik, L.B. (2009). Effect of priming and ageing on seed germination and vigour in papaya (*Carica papaya*). *Indian J. Agril. Sci.* **79** (4) : 295-7.

Chauhan, J.K. and Saikia, P. (2021). Barriers of women entrepreneurship in North Eastern Region of India. *Indian Res. J. Ext. Edu*., **21** (2&3) : 172-175.

Chauhan, J.K. and Saikia, P. (2022). Effect of entrepreneurship on women entrepreneurs. *Indian Res. J. Ext. Edu*., **22** (1) : 155-159.

Chikkeri, S.C.; Kumar, S.; Samnotra, R.K.; Diksha, L. and Noopur, K. (2023). Evaluation of tomato (*Solanum lycopersicum* L.) genotypes for growth, yield attributes and yield under subtropical region of Jammu, The Pharma Innovation J., **12** (6) : 3036-3038.

Krishna, P.; Kumar, A. and Smitha, K.P. (2022). Push and pull factors influencing migration among tribal agricultural labourers : A critical gender analysis. *Indian Res. J. Ext. Edu*., **22** (5) : 13-17, Spl e-Issue .

Kumar, R.; Rajasree, V.; Praneetha, S.; Kohli, S.; Noopur, K.; Sheikh, A.; Hameedi, A.; Tripura, U.; Sheera, A. and Nesar, N.A. (2022). Breeding pumpkin (*Cucurbita moschata* Duch. Ex Poir) for high β-carotene content through high performance liquid chromatography analysis. *AMA.*,**53** (03): 6781-6789.

Manjunath, V.B.; Biradarpatil, N.K.; Hosamani, J. and Biradar, M.S. (2020). Accelerated ageing for prediction of storability in onion (*Allium cepa* L.). *Intl. J. curr. Micro. Appl. Sci*. **9** (3) : 3163-72.

Noopur, K.; Babu, S. and Somasundaram, E. (2021a). On-farm assessment of french bean (*Phaseolus vulgaris* L.) cultivars for seed production in the Nilgiri hills. *Indian.J. Hill. Farm*. 34 (1):158-161.

Noopur, K., Ansari, M.A. and Panwar, A.S. (2021b). Self-reliant in year round vegetable production and consumption through Kitchen garden model in Indo Gangetic Plains: *Indian J. Agri. Sci.* **91**(12): 1773-7.

Noopur, K.; Samnotra, R.K. and Kumar, S. (2023a). Influence of okra (Ablemoschus esculentus (L) Moench) genotypes on growth, yield and biochemical traits. *Ind. J. Agric. Sci*. **93** (1): 57-61.

Noopur, K; Chauhan, J.K.; Walia, S.S.; Verma, M.R.; Dhar, U.; Choudhary, S. and Chikkeri, S.S. (2023b). Constraints in vegetable production in India: A review. *Indian Res. J. Ext. Edu.* **3**(3): 14-19.

Panwar, A.S.; Babu,S.; Noopur, K.; Tahsildar, M.; Kumar, S. and Singh, S. (2019). Vertical cropping to enhance productivity and profitability of dry terraces in NE Indian Himalayas. *Indian J. Agri. Sci*., **12**: 2020-2024.

Panwar, A.S.; Ravisankar, N.; Singh, R.; Prusty, A.K.; Shamim, M.; Ansari, M.A. and Noopur, K. (2021). Potential integrated farming system modules for divers' ecosystems of India. *Indian J. of.Agro*., **66** (5th IAC Spl. issue): S15-S32

Rao, T.V. and Mehta, P. (1978). Psychological factors in entrepreneurship. (Eds) U Pareek and T.V.Rao. Developing entrepreneurship: A handbook, Learning system, New Delhi.

Saxena, D.C.; Singh, N.P.; Satpathy, K.K.; Panwar, A.S. and Singh, J.L. (2003). Sustainable farming system for hill agriculture. In Approaches for increasing agricultural productivity in hill and mountain eco-system. (Eds) B.P. Bhatt, K.M. Bujarbaruah, Y.P. Sharma and Patiram. ICAR Research Complex for NEH Region, Barapani, Meghalaya, PP 73-86.

Singh, A.K.; Sabir, N. and Noopur, K. (2017). Horticulture based plasticulture cum covered cultivation for livelihood security. *Indian Horti.*, **62**(5):68–74.

Walia, S.S.; Babu, S.; Gill, R.S.; Kaur, T.; Noopur, K.; Panwar, A.S.; Yadav, D.K.; Ansari, M.A.; Ravishankar, N.; Kumar, S.; Kaur, K. and Ansari, M.H. (2022). Designing resource-efficient and environmentally safe cropping systems for sustainable energy use and economic returns in Indo-gangetic plains, India. *Sustainability*, **14**(21), 14636.

• • • • •