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IMPACT OF LARGE SCALE DEMONSTRATION ON COMMERCIAL VEGETABLE PRODUCTION

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Abstract: The diversity in the agro- environmental conditions in Uttarakhand provides suitability for growing off-season vegetables in the hills and potential for high production of these crops can definitely work for satisfying the demand and supply in the market of plain areas. The average productivity of vegetables in Uttarakhand is low and can be increased with new technological interventions. The hill farmers are not coming forward on a large scale vegetable production because of several constraints like scattered and fragment land holdings, non-availability of market and transport system, seasonal & localized nature of vegetables, lack of knowledge about scientific agricultural practices to be followed in vegetable production, unavailability of quality seeds etc. To encourage the vegetables production in the district with focus on stability and sustainability demonstrations were conducted during 2018-19 and 2019-20 in rainfed farming system. Mainly, brinjal, garden pea, radish, tomato, garlic, spinach, cucumber, cauliflower were included in the demonstration. The modern tools of PRA and SSI methodology were used to select and identify innovative farmers in the distt. Selective groups were trained on various aspects of farm trainings at village levels. The demonstrations were conducted in 3.67 ha area of farmer's field using seven vegetable crops on 90 demonstration units in different villages viz. Kalsi, Kotha Taarli, Dobri and Sorna. The latest technologies (Improved seeds, vermin compost, insecticides/pesticides, cultural techniques- line sowing, weeding etc.) for vegetable production were applied in the demonstrations. The analysis of farmer's field soils was conducted and accordingly fertilizer's dose recommendations were imparted to targeted farmers. In general, soils of demonstrated regions were acidic with low nitrogen and phosphorus level. Advance trainings have positive effect in adoption of production technology with highest level of adoption 80% in the village. The data on net returns and B:C was analyzed. In rainy season, brinjal, resulted in highest yield and maximum benefit cost ratio was (290 q/ha, 5.62) followed by cauliflower (250 q/ha, 3.38), spinach (228 q/ha, 3.03), cucumber (150 q/ha, 2.71) and radish (205 q/ha, 2.27) over the local practices. Thus, promoting vegetable cultivation can be an important tool to increase the income of small farmers and generate additional income and fetch the market needs.

Index Terms **– Large scale vegetable production, Profitability, Adoption of technology, B:C ratio**

I. INTRODUCTION

Agriculture is the mainstay of majority of farmers and it is women dominant, fragile ecosystem as well as rain fed farming system of North West Himalayan region. Subsistence agriculture is becoming increasingly unsustainable both economically and ecologically (Badhani, 1998). Old and traditional agriculture practices viz. use of local varieties, wooden implements and low level of production management practices are becoming less productive (Annonymous, 2006). Unlike other farming system, coarse millet based integrated farming system is in practice in Garhwal region of Uttarakhand for time immemorial. It is realized that enterprise based transformation of agriculture with promotion of entrepreneurs in this sector is essential. The diversity in agro-environmental conditions provides suitability for growing varieties of vegetables in the hill slopes and high production of these crops can definitely work for poverty alleviation and reducing malnutrition (ICAR, 2010). The hill slopes are very much productive for growing vegetables at a large scale. The season of vegetable production in hills coincide with off season in plains, thereby fetching higher economic returns (Kumar & Sharma, 2007). The International studies envisaged more or higher income of 350 percent higher net returns in vegetable production in comparison to paddy in resource poor regions of world (IFPRI, 1998). The scattered and low land holdings enforce for commercial production in hilly regions to plain area and fetches high prices. The hilly farmers have not come forward on a large scale vegetable production because of several reasons like seasonal & localized nature of vegetables, extremely perishable nature, lack of knowledge about scientific agricultural practices to be followed in vegetable production, unavailability of quality seeds etc. (Tewari, 1990). Farmers do not adopt technologies unless practice on field itself resulting in wider gap in technology generation and technology transfer. The technologies generated at the research station of SAU or ICAR stations were thrust upon the farmers in the technology transfer programme. It is paramount importance to involve farmers at all stages of development and provide a complete capsule of technology packages to farmers (Das & Willey, 1991).

In order to provide momentum in vegetables production and replication of technology in hills, a complete module of training programme was focused before demonstrating on farmer's field. Area under selected vegetable crops in the district was 2839 ha during the time of demonstration and now area is increased 3759 ha (Deptt of Horticulture, Ranikhet, 2010) in vegetable

production. It is quite plausible that marketing is not a problem for fresh produce in these selected village, due to nearness to consumption center at 15-20 km. Main stockholders of villages were imparted trainings especially for practicing farmers, farm women, rural youth, retired, defense, paramilitary personnel & field level extension functionaries on various crop growing practices. Specific interventions of suitable varieties were given to encourage vegetables production in the district with focus on high productivity and sustainability in existing farming system. The theme of research study was as: i) To study the socio economic status of farmers. ii) To assess potential of vegetable production technologies in district. iii) To educate farmers for vegetable production. iv) To increase farm income through vegetable production for sustainable livelihood. The work on follow up of carried out work was evaluated in 2020-21, there was a 3 times higher adoption of technology with area expansion.

II. RESEARCH METHODOLOGY

The District Dehradun of Uttarakhand lies between $30^0 3'10''$ to $30^0 50'45''$ N latitude and $70^0 8'95''$ to $79^0 2'4''$ E longitude at 600- 2500 m above msl. The distribution of cultivated agricultural land under different altitude ranges is 80 % upto 1300 m, 15 % between 1300-1600 m and 5% above 1600 m. The present study **(**demonstration) was conducted during 2018-19 and 2019-20 in 6.5 ha of land using six Vegetables on 90 demonstration farms in different villages viz and Sorna etc. of the operational area. Method demonstrations were conducted under the Directorate of Extension Education, GBPUA&T, Pantnagar funded by ICAR (through project of Horticulture Technology Mission–demonstration of large scale vegetable production in Uttarakhand). Before proceeding to conduct demonstrations, Participatory Rural Appraisal tools were used to select village, farmers, crops and area in cropping system. The adoption level of farmers was done with use of 7 point scale of adoption and attitude of selected farmers. In the selected village 19 training programme were conducted to provide latest information and technologies to the adopted farmers. Soil sample of selected villages were collected and analysis in KVK lab, accordingly farmers were appraised about the soil status and accordingly, soil amendments were done in rainfed system of distt. In general, soils of the area under study are acidic & totally rainfed (Table 1). The adoption percentage of training is given in Table 5. A questionnaire of SSI information was also filled to know the status of farmers in the area. Attitude test of farmers for vegetable farmers in targeted areas was evaluated (Table 6). Scale of attitude of farmers used for the study (7 point scale) given below:

3- Highly optimist and innovative
2- Optimistic and innovative
1-Optimistic
0-Indifferent
1-Pessimistic and compromising
2- Pessimistic and withdrawing
3- Highly Pessimistic and withdrawing

All the latest technologies for vegetable production were applied in the demonstration plots. The composite sample of soil samples were collected, analysis and interpreted village wise with available NPK, organic carbon, soil acidity and soil conductivity was recorded. The details of the same are given in the Table 1.

Table 1: Soil conditions of the adopted villages

S.No	Village	pH	EC (dSm^2)	OC (%)	N (kg/ha)	K_2O(kg/ha)	P_2O_5(kg/ha)
1	Kalsi	5.8-6.7	0.41	2.2-3.8	168-216	286-315	8.16
2	Kotha	4.96-6.96	0.32-0.91	1.18-4.91	210-246	158-285	8.09
3	Taarli	6.1-7.2	0.21	4.4-5.6	218-262	184-219	9.86
4	Dobri	5.5-7.32	0.03-0.11	6.7-14.2	188-278	202-246	10.3
5	Sorna	5.9-6.4	0.16	3.1-4.1	296-316	296-330	16.10

In demonstration plots, inputs in the form of quality seeds, fertilizer, agrochemicals etc. were provided. The technologies demonstrated (vegetable crops) are mentioned in Table-2

Table 2: Technologies demonstrated under large scale vegetable demonstration

S.No.	Crop	Variety/ Intervention	No. of demonstration	Area (ha)
1	Brinjal	Shyama	20	0.25
2	Garden Pea	PS 10	40	3.00
3	Radish	Mino Early	10	0.25
4	Tomato	Himsohna	20	0.50
5	Garlic	Yamuna safed 1	30	0.10
6	Cucumber	Hybrid 1	5	0.02
7	Cauliflower	Girija	5	0.10
		Total	**90**	**6.0**

In order to get enough results, 90 demonstrations on 3.67 ha area was included in the study. The data on maximum and minimum fruit yield, harvest duration and disease parameters were recorded.

III. RESULTS AND DISCUSSION

The perusal of data on conductance of trainings was shown in the table 5. Highest adoption of technology was recorded in village Kalsi with highest adoption of technology with 80%. Kotha village was front runner in adoption of technologies in Dehradun. Off campus trainings during the crop season and regular monthly training among the growers group on nursery management, off season vegetable crop raising etc. were also performed. The group meetings with farmer's associations, organized trainings and field days were conducted to assess the performance of vegetables' demonstrations. These helped in

several ways. **i)** Relatively large number of farmers could be reached in a short period of time **ii)** Adoption of practices could be accomplished at relatively lesser cost, because of involvement of large number of farmers. Distribution of printed folders in local language helped the farmers to know new technologies in a better way and incorporating them in their farming system.

3.1 Yield analysis

1. **Brinjal:** Average yield levels varied from 290q/ha in demonstration plot to 120q/ha in local check resulting in 141% increase in brinjal Variety Shyama. However, while working on brinjal variety Shyama, under the rainfed Mid hills situations of Uttarakhand, Mishra and Uniyal, 2003 found that about 4 quintals of fruits can be harvested from 0.02 ha with a net monetary gain of Rs. 800-1000 i.e. Rs. 40,000 -50,000 per hectare.
2. **Garden Pea:** In vegetable pea GS10, 33% increase in yield was observed with average yield of 60 q/ha in the demonstration and 45 q/ha in local check.
3. **Radish:** A contrasting high percentage increase in yield was recorded in radish and high 12% only with 205q/ha yields in demonstration and 180 q/ha in local checks variety. Uniyal 1999 reported that with all recommended production packages adopted the farmer can earn Rs. 16,500-25,000.00 by growing Mino early variety of radish from one hectare land under rainfed situation during off season. Thus radish, variety Mino early is one of the appropriate enterprises for hill farmers of rainfed situation of small production systems.
4. **Cucumber (Hybrid 1) and Cauliflower (Girija)** noticed 17.6% and 50% respectively increased yield when compared with local checks. Yield improvement to the extent of 212% was observed in cauliflower variety Girija is due to the combined effect of high yielding varieties and advanced production technologies.

As per the feedback of farmers, there was a clear dearth of improved planting material, which impairs their production potential. There was lack of reliable source of agricultural inputs like seeds, fertilizers, pesticides etc. in the area. However since last few years' number of new inputs supply stores has been opened and cooperation stores dealing with agricultural inputs have started functioning. It is a pointer toward to identify some reliable service provider(s) or institute to support and supply authentic input and knowledge to resource poor farmers of state to uplift the socio-economic status of farmers.

The yield levels are around 10t/ha when compared with the national level yield which is 15t/ha. Low production of vegetable is associated with rainfed system, which is compensated with high sale price of produce. In the present set of conditions, only open pollinated varieties were tested and demonstrated to visualize the effect of impact of adopted varieties in the region. No doubt, hybrid out yielded in production to other varieties, but less seed cost, high fertilizer responsive, consumer choice resulted in high price to the farmers. The demonstration of diversification of crops also reduced the inter competition between product and farmers produce. Low incidence of disease is associated with use of non-hybrid varieties in the region. It was visualized through demonstration that balanced application of manure and fertilizers reduced the incidence of pest and disease. With the use of scientific method of cultivation, harvest duration of produce was prolonged resulted in higher yield. This showed that a lot can be done because the state has vast potential for growing a large number of vegetable, particularly the off season vegetables. Thus, promoting vegetable cultivation can be an important tool to increase the income of small farmers and generate additional income.

Table 3: Crop performance and economic analysis of demonstration

S. No.	Crop (Variety)	Area (ha)	Yield (q/ha)		Increase in yield (%)	Average Cost of cultivation (Rs./ha)		Average Gross Return (Rs./ha)		Benefit-Cost Ratio
			Average	Local Check		Demonstration	Local Check	Demonstration	Local Check	
1	Brinjal (Shyama)	0.10	290	120	141.67	51600	49520	290000	120000	5.62
2	Veg. Pea (GS10)	3.00	60	45	33.33	49200	38690	60000	45000	1.21
3	Radish (Mino Early	0.25	205	180	13.89	45250	31680	102500	90000	2.27
4	Tomato (Himsohna)	0.50	328	312	12.50	45120	33470	136800	90000	3.03
5	Garli (Yamuna Safed 1)		51	42	21.43	45500	31480	30600	25200	0.67
6	Cucumber (Hybrid 1)	0.10	150	100	50.00	55200	43680	150000	100000	2.71
7	Cauliflower (Girija)	0.10	250	80	212.50	59000	45980	200000	64000	3.38

3.2 Profitability analysis:

Facts in the Table 4 give an insight into the profitability of the selected vegetables. Hilly system is predominately an organic farming or using minimum use of fertilizers or pesticides. Bhat (2011) compared off season cultivation of vegetables in organic vis a vis inorganic production and reported that high B:C ratio was obtained in inorganic system. The present results are at par with the findings. The results presented in table 4 exhibited that cost of production of cauliflower was highest and found lowest in spinach. This was due to the fact that the cauliflower growing farmers use more pesticides as compared to spinach thereby pointing higher capital intensive and chemical used crop. While analysis, brinjal as offseason production depicted highest

benefit cost ratio (5.62) among all seven tested vegetable crops, this may be due to bumper crop production and less effect of biotic & abiotic effects. The incidence of shoot and fruit borer in brinjal was minimum. The other crops which resulted in higher benefit cost ratio were cauliflower (3.38) followed by spinach (3.03) and cucumber (2.71). These finding were supported by Sharma *et al* (1992) as they worked out that cauliflower, cabbage and peas are the most remunerative crops in the mid hills of Himachal Pradesh. Highest B:C ratio over traditional crop in off-seasonal production are close confirmation with results of earlier report of (Tewari, 1990 and Kediyal et al. 2005).

Table 4: Crop performance and economic analysis before and after intervention

S. No.	Crop (Variety)	Yield (q/ha)		Increase in yield (%)	Average Cost of cultivation (Rs./ha)		Average Gross Return (Rs./ha)		Benefit-Cost Ratio
		Before	After		Before	After	Before	After	
1	Brinjal (PPL)	84	290	245.24	38350.00	51600	42000.00	290000	1.09
2	Veg. Pea (Bounville)	38	60	57.89	18400.00	49200	19000.00	60000	1.03
3	Radish (Local)	142	205	44.37	37300.00	45250	35500.00	102500	0.95
4	Spinach (Local)	125	228	82.40	34700.00	45120	37500.00	136800	1.08
5	Fenugreek (Local)	30	51	70.00	25200.00	45500	9000.00	30600	0.35
6	Cucumber (Local)	85	150	76.47	33600.00	55200	42500.00	150000	1.26
7	Cauliflower (Local)	53	250	50.94	33420.00	59000	21200.00	200000	0.63

The demonstration data on various crops conducted during three years is presented in the Table 3. In the study it was observed that demonstrations were significantly higher in yield (Table 3) and benefit cost ratio (Table 4) than local checks. Number of trainings conducted and percentage adoption in the village is presented in the Table-5. Whereas, Table 6 reveals attitude test of farmers for large scale vegetable production.

Table 5: Number of trainings conducted and percentage adoption in the village

S.No	Village	No. of off campus trainings conducted	No. of beneficiaries attended the trainings	No of farmers adopted the techniques	% Adoption
1	Kalsi	4	102	82	80%
2	Kotha	5	120	90	75%
3	Taarli,	5	116	75	64%
4	Dobri	3	145	106	74%
5	Sorna	2	62	38	60%
	Total	**19**	**545**		

The data on various grow parameters were collected and evaluated for yield and disease response in the field. The demonstration was consistent supervision. Minimum pest and disease losses were recorded below threshold level (10%) in the field. All prophylactic spray of pesticides was recommended during the course of investigations. Soil of the area was found acidic and accordingly, fertilizers application was applied recorded acidic soils which were found suitable for vegetable production.

The decision of adoption of technology depends upon sole factor profitability (Pichop and Mndiga, 2007). In the adopted village, concerted efforts were made to disseminate technology and adoption of same be maximized. Majority of youths come forward to take vegetable production in the adopted village with maximum rate of 80% in the region. Alternative occupation for livelihood in the surrounding areas are minimum, therefore, vegetable production become a source of income, employment generation and profitability business in the area.

The experiences of studies villages suggested that sustainability of mountainous agriculture can be ensured with adoption of off-season vegetable production. The ecological system of Uttarakhand is fragile and highly sensitive to any developmental activity that is not designed in consideration to ecology and social fabric. Technology centered, market based, holistic systems approach needs to be developed and implemented in matrix mode in partnership of state agencies, industry, R&D institutions and people's organizations for necessary turn-around and to achieve faster rate of development. It would be feasible if the farmer gets substantially higher returns from his land and labour through higher productivity and value addition.

Table 6: Attitude test of farmers for large scale vegetable production

S.No.	Crop	Number	Percentage
1	Highly optimist and innovative	15	16.67
2	Optimistic and innovative	45	50.00
3	Optimistic	23	25.56
4	Indifferent	02	02.22
5	Pessimistic and compromising	18	20.00
6	Pessimistic and withdrawing	05	5.56
7	Highly Pessimistic and withdrawing	05	5.56
	Total	**90**	**100**

3.3 Conclusions:

Vegetable production in this area can further be enhanced with strengthening of technological invention, adoption of innovative technologies, local market and increase in research and extension activities are not commensurate with rate of expansion in the field. Replacement of traditional varieties with high yielding varieties with supplementation of latest agro techniques of production was mantra for success. It is becoming a saga of success in the area and has proved profitable and replicated in the district. Vegetable production can be increase in area in Dehradun by the use of high yielding varieties. Such varieties were recognized by high yield potential, short duration, disease and insect pest resistance and responds to fertilizer application.

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REFERENCES

[1] Annonymous, 2006. Annual Progress report of College of Forestry and Hill Agriculture, Ranichauri GB Pant University of Agriculture and Technology, Pantnagar.

[2] Badhani ,K.N. (1998). Enterprise based transformation of Hill Agriculture. MEI 98/5. International Centre for Integrated Mountain Development (ICIMOD). Kathmandu. Nepal.

[3] Bhat. J.C.2011. Achieving higher productivity in major hill crops through technological interventions. In: Keynote address: National symposium on technological interventions for sustainable agriculture. 32-39 pp

[4] Das, P.K and Willey, R.W. 1991.: A Farmer- Participatory Approach to the Development of Improved, Sustainable Technologies for the Resource – poor Rainfed Areas of the Eastern Plateau of India. Extension Strategies for Rainfed Agriculture. Ed. Indian Society of Extension Education. New Delhi. India. Pp 199-205.

[5] Department of Horticulture, 2010. Statically outline of Uttrakhand.

[6] ICAR (2010).State Specific Technological Interventions for higher Agricultural Growth. pp 117.

[7] IFPRI, 1998. Commercial vegetable & polyculture fish production in Bangladesh: Their Impact on income, household resource allocation and nutrition. Vol 1, Washington D.C. IFPRI. pp 76-79.

[8]Kediyal, V.K.(2005). Offseason vegetable production in Tehri Garhwal: An Impact assessment. KVK Science Journal:1(1):49-57.

[9] Kumar, S. and Sharma, G.2007. Market–led extension strategies for promoting vegetable cultivation in Uttarakhand. Agriculture Extension Review. Jan-June, 2001: 8-13.

[10] Mishra, A. C. and Uniyal, S.P.2003. Cultivation practices for brinjal cv. Pant Samrat under rainfed Mid Hill situation of Uttaranchal. Indian Farmers Digest. March 2003. pp 23-25.

[11] Pichop, G.N. and Mndiga, H. S. (2007). Essentials of modern marketing management & supply chain systems for vegetable seed companies. Technical Bulletin no. 39. AVRDC- The World Vegetable Center, Shanhua, Taiwan. AVRDC. 20 p.

[12] Sharma, A.K., Moorti, T.V. and Oberoi, R.C.1992. Economics of vegetable farming in mid hills of H.P. Department of Agri- economics, HPKV, Palampur, H.P., India

[13] Tewari, S.C.1990. Role of off-season vegetables in the development of hill agriculture of Himachal Pradesh. MFP series 8. International centre for Integrated Mountain Development (ICIMOD). Kathmandu. Nepal.

[14] Uniyal, S. P. 1999. Radish: A promising crop for small production system of western Himalayan Region. IFD. Vol 32 (1): Nov. 1999: 24-26.