

Constraints Analysis in Adoption of Vegetable Production Technologies for Livelihood Perspective of Tribal Farmers in North Sikkim

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ABSTRACT

In Sikkim mostly farmers prefer to grow vegetables round the year as it gives better and quick return as compared to other crops under organic condition. In spite of the conducive environment for vegetable cultivation, the vegetable growers of North district of Sikkim are facing various type of constraints in adoption of scientific vegetable production technologies, hence the study entitled “Constraints analysis in adoption of vegetable production technologies among tribal farmers of North Sikkim : A livelihood perspective” was conducted in twelve vegetable growing villages of North Sikkim district covering 120 respondents comprising of marginal, small, medium and large farmers (10 from each village). With the help of a pre- tested interview schedule, a survey was conducted to collect relevant data and then appropriate statistical procedure was employed to analyse the data for assessing the effect of different constraints like socio-personal, socio-economic, organizational, and technological in the adoption component. The study revealed that mean score for all these constraints were higher among small farmers as compared to marginal, medium and large farmers for vegetable production in north district.

Key words: Organic condition; Environment; Vegetable cultivation; Vegetable growers;

The sustainable rural livelihood implies that any developmental intervention for the rural people should be congruent with their existing livelihood strategies and ability to adapt. Sikkim, the 22nd State of Indian Union is based upon an agrarian economy. More than 64 per cent of the population depends on agriculture for their livelihood. Agricultural land in Sikkim is estimated to be around 1, 09,000 hectares, i.e. 15.36 percent of the total geographical area. Sikkim has a net cultivable area of about 79,000 hectare (11.13 %); with irrigated area of 15 per cent of the total operational holdings of 110000 hectare. Due to the overwhelming contribution of horticulture sector to the state's GDP, this sector, therefore, needs priority attention for higher levels of rural prosperity.

Vegetables provide essential vitamins (A, B, C & D), minerals (Fe, Ca), fibres etc for maintaining a good health. The daily requirement of vegetables in human diet in India is 300g/day/person but we are able to produce only 245g/day/person still short of 55g/day/person. 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. However, a planned development in the field of vegetable production is very much essential to improve the nutritional security for masses. India, with its wide diversity of climate and soil, has vast potential for growing different types of vegetables like potato, tomato, onion, brinjal, cabbage, cauliflower, okra and peas round the year. The most important aspect of vegetable cultivation is that it absorbs woman labour to a greater extent compared to their crops. It is not out of place to mention that in many cases housewives entirely manage the vegetable production system up to harvesting and marketing. Smallholders dominate both Indian agriculture and vegetable production. Across all production sectors, more than 80per cent of farms of are <2 ha, and on average, 0.6 ha. Income from staple crops is inadequate, so farmers supplement with off-farm and non-farm income, and increasingly

grow high-value crops such as vegetables (*Birthal and Joshi, 2007*).

Since Sikkim enjoys as much as 8 agro- climatic zones with varied distribution of rainfall and soil texture, hence there is enough scope to grow a variety of vegetables throughout the year in four different districts with different topographic features. India contributes about 13 per cent to the world vegetable production and occupies first position in the production of cauliflower, second in onion and third in cabbage in the global scenario. India is next to China in the world in production and area coverage under vegetables.

As per the Human Development Report – 2001, in Sikkim, diversification in the land use pattern has to be taken into account for both food security and livelihood sustainability. The limitations of terraced farming in terms of productivity and the dearth of land for cultivation highlight the constraints faced by farming community for livelihood security. Under these conditions innovative scientific technologies in the potential sectors like horticulture and floriculture can be identified and explore the most pressing constraints and best possible opportunities for the growth of farming sector. Keeping this in mind, the present study has been undertaken to find out the constraints faced by the vegetable growers of the North Sikkim district, the most undeveloped district of Sikkim but known for its hot biodiversity, dominated with *lepcha* tribes, in respect of their adoption of scientific vegetable production technology with the following objectives:

1. To study the socio-economic characteristics of the respondents in the context of scientific vegetable cultivation.
2. To assess the factors of various constraints faced by the vegetable growers of North Sikkim district for scientific vegetable cultivation.
3. To find out the strategies for researchers to increase the production and productivity of vegetables in the state.

METHODOLOGY

The study was carried out in the Dzongu block of North Sikkim district of Sikkim comprising of 12 vegetable growing villages. The villages covered under the study were “*Tingvong, Kusung, Passingdang, Lingthem, Lingdong, Burfok, Hee-Gyathang, Sudur, Bringbong, Sangdong, Gor and Shagyong*”. The village selection was made through purposive random

sampling method. The sample of respondents were taken from all the categories of farmers comprising of marginal (<1ha), small (1-2 ha) Medium (2-5 ha) and large farmers (>5ha). The selection of sample based on the criteria that farmers having aptitude for year round vegetable cultivation with market oriented behaviour to earn their livelihood can be considered as respondents for the study. Ten vegetable growers from each village having preference for vegetable cultivation were selected through purposive random sampling technique to constitute a total sample size of the study comprised of 120 (12 × 10 nos.). The constraints faced by vegetable growers differ from individual to individual depending upon their socio-economic status, communication behaviour, livelihood requirement, scopes and opportunities of marketing etc. The constraints were classified into three categories namely socio-economic, organizational and technological constraints measured with the help of a 5 points continuum scale as Strongly Agreed Farmers (5), Agreed Farmers (4), Neutral Farmers (3), Disagreed Farmers (2) and Strongly Disagreed Farmers (1) and accordingly each respondent were given score as per their preference to various constraints and mean weighted score was worked out for each statement under above mentioned five categories. The index values of observations were measured with the help of mean score figure. The data were collected through personal interview method using a pretested semi-structured interview schedule. The statistical analysis was done by following the statistical tools like frequency, mean, rank analysis and correlation – regression analysis etc.

RESULTS AND DISCUSSION

As far as the study is concerned, the result (Table 1) showed that highest proportion (49.17%) of the respondents was in young age group (≤ 40 years) as compared to 35.83 per cent belonged to middle age group and only 15.00 per cent in old age category. This led to a conclusion that maximum of the young respondents opt for vegetable cultivation which may be due to its better return as compared to other crops.

In regard to educational status of the respondents it varies from illiterate to graduate and above with a mean 8.32, standard deviation 5.05 and coefficient of variation 76.46 per cent (Table 1) and the result revealed that maximum of the vegetable growing farmers (51.68 %) are confined to a education level up to secondary followed by higher secondary (21.67%). An educated

Table 1. Distribution of category of respondents according to socio economic status (N=120)

| Variables | Category | No. | % | Mean | S.D. | CV % |
|-----------------------------|-------------------------------|-----|-------|-------|-------|--------|
| Age (in years) | Young (? 40) | 59 | 49.17 | 41.24 | 11.84 | 27.54 |
| | Middle aged (> 40 to ? 55) | 43 | 35.83 | | | |
| | Old aged (>55) | 18 | 15.00 | | | |
| Education | Illiterate (nil) | 8 | 6.68 | 8.32 | 5.05 | 76.46 |
| | Primary (Class: 1-5) | 14 | 11.67 | | | |
| | Secondary (Cl. 6-10) | 62 | 51.68 | | | |
| | High Secondary (Cl. 11-12) | 26 | 21.67 | | | |
| | Graduate and above | 18 | 15.00 | | | |
| Land holding(ha) | Joint family | 99 | 82.5 | 1.93 | 2.88 | 158.69 |
| | Marginal farmers (<1 ha) | 26 | 22.66 | | | |
| | Small farmers (1-2 ha) | 48 | 40.00 | | | |
| | Medium farmers (2-5 ha) | 37 | 30.83 | | | |
| | Large farmers (>5 ha) | 09 | 7.60 | | | |
| Annual income (Rs/Annum) | Poor (up to 30,000/-) | 12 | 10.00 | 62.58 | 55.42 | 68.88 |
| | Low (>30,000/-60,000/-) | 52 | 43.34 | | | |
| | Medium(>60,000-1,00,000/-) | 41 | 34.17 | | | |
| | High (>1,00,000 – 5,00,000/-) | 11 | 9.16 | | | |
| | Very high (>5,00,000) | 4 | 3.33 | | | |
| Extension agency contact | Low | 56 | 46.67 | 49.23 | 6.87 | 72.41 |
| | Moderate | 48 | 40.00 | | | |
| | High | 16 | 13.33 | | | |

individual is likely to be more receptive to the modern technologies, because education empowers individuals in terms of decision making, problem solving and change proneness, hence that leads to the understanding that since most of the respondents in the array of the study are having secondary level of education they may be considered as potential adopter of improved vegetable production technologies.

Similarly in case of land holding status, the respondents have been distributed in the category of marginal, small, medium and large farmers with a range of land holding capacity of <1 ha to > 5 ha with an average of 1.93 ha, standard deviation 2.88 and coefficient of variation 158.69 per cent. It was observed that the highest percentage of farmers (40%) were small farmers followed by medium farmers (30.83%) and marginal farmers (22.66%) in addition to a meagre percentage of 7.6 under large farmers as shown in Table 1. The result implied that majority of the respondents were having good land holding capacity, hence as one of the important factor of production (land, labour, organisation & capital) land holding influences many innovative –decision issues and their compatibility and adaptability thus leading to better adoption of

technologies provided other constraints were minimized.

The distribution of the farmers in different categories on the basis of their annual income as shown in Table 1, revealed that the highest proportion (43.34 %) of the respondents belonged to low income group (>30,000/-60,000/-) followed by medium income group (>60,000-1,00,000/-) showing the mean, standard deviation and coefficient of variation as 62.58, 55.42, and 68.88 per cent. The percentage of farmers in the poor, high and very high categories was 10, 9.16 and 3.33 per cent, respectively. Since the greater proportion (77.51%) of the farmers were in low and medium income groups, it is logical to assume that they had limited access to modern high-cost technologies. This is so because income is obviously associated with the purchasing power of an individual.

The observations on extension agency contact which is considered as an important factor that influences some factor of constraints implied that 46.67 per cent of respondents having low and 40 percent having moderate extension agency contact while only 13.33 per cent of them had high contact with an average 49.23, coefficient of variation 72.41 per cent and standard deviation of 6.87. So, it could be concluded that the

majority of the respondents of the study area do not have sufficient information about improved vegetable production technology and there is least chance of getting the latest information leading to low adoption.

The study in Table. 2, revealed that mean score for all these constraints were higher among small farmers as compared to marginal, medium and large

farmers in case of vegetable production in North Sikkim district. 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 of North Sikkim resulting vegetable cultivation as a non-profitable enterprise. Besides it was also observed from the study that

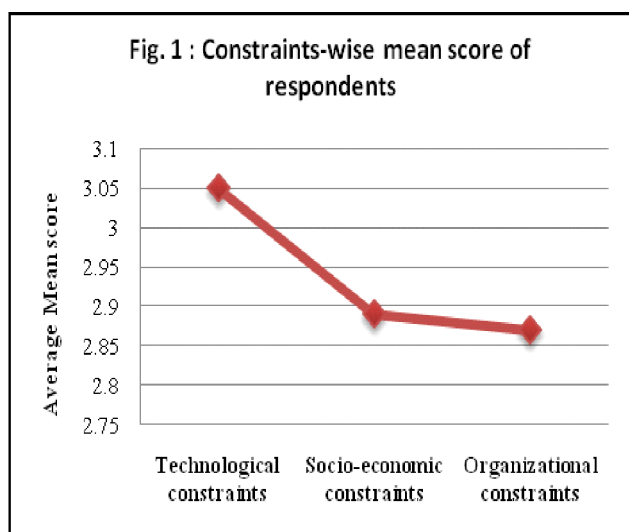
Table 2. Types of major constraints faced by respondents (N=120)

| Types with major constraints | S.D.F | D.F | N.F | A.F | S.A.F | MS | Index | Rank |
|--|-----------|-----------|-----------|-----------|-----------|------|-------|------|
| <i>Technical constraints</i> | | | | | | | | |
| Lack of technical know-how | 5 (4.17) | 9(7.50) | 16(13.33) | 58(48.33) | 32(26.67) | 3.01 | 60.2 | VIII |
| Lack of regular soil testing | - | - | - | 89(74.16) | 31(25.83) | 3.14 | 62.84 | II |
| Lack of location specific recommendation | 2(1.67) | 14(11.67) | 21(17.50) | 46(38.30) | 37(30.83) | 2.81 | 56.2 | X |
| Inadequate training programe | 18(15.00) | 27(22.50) | 21(17.50) | 38(31.67) | 16(13.66) | 3.04 | 60.8 | VII |
| Inadequate demo of new tech. | 21(17.50) | 29(24.17) | 18(15.00) | 36(30.00) | 16(13.33) | 3.05 | 60.9 | VI |
| Inadequate soil management | 11(9.16) | 23(19.17) | 26(21.67) | 39(32.50) | 21(17.50) | 2.91 | 58.2 | IX |
| Lack of post harvest tech. | - | 9(7.50) | 14(11.67) | 59(49.17) | 38(31.67) | 3.09 | 61.8 | V |
| Lack of knowledge on conserving of natural resources | - | - | 9(7.50) | 71(59.17) | 40(33.34) | 3.18 | 63.6 | I |
| Lack of mechanization in agril. | - | 2(1.67) | 5(4.17) | 68(56.67) | 45(37.50) | 3.13 | 62.6 | III |
| Poor knowledge of IPM | - | - | 2(1.67) | 65(54.17) | 53(44.14) | 3.12 | 62.4 | IV |
| <i>Socio-economic constraints</i> | | | | | | | | |
| Lack of innovativeness | 12(10) | 18(15) | 15(12.5) | 43(35.83) | 32(26.67) | 3.15 | 63.0 | II |
| Lack of awareness on improved technology/ mass media sources | 51(42.5) | 34(28.34) | 5(4.17) | 18(15.00) | 12(10.00) | 2.93 | 58.6 | V |
| Lack of education | 57(47.50) | 42(35.00) | 6(5.00) | 9(7.50) | 6(5.00) | 2.07 | 41.4 | VIII |
| Non availability of cultivable land | 10(8.34) | 12(10.00) | 11(9.17) | 40(33.33) | 47(39.17) | 2.92 | 58.4 | VI |
| Lack of low responsiveness | 3(2.50) | 5(4.17) | 4(3.33) | 52(43.33) | 56(46.67) | 3.11 | 62.2 | III |
| Lack of entrepreneurial ability | 20(16.67) | 16(13.33) | 6(5.00) | 38(31.67) | 40(33.33) | 3.16 | 63.2 | I |
| Lack of achievement motivation | 24(20.00) | 19(15.83) | 15(12.50) | 30(25.00) | 32(26.67) | 3.02 | 60.4 | IV |
| Poor sources of information | 45(37.50) | 34(28.33) | 12(10.00) | 16(13.33) | 13(10.83) | 2.67 | 53.4 | VII |
| Lack of commitment to farming | 16(13.33) | 12(10.00) | 10(8.34) | 40(33.33) | 42(35.00) | 3.02 | 60.4 | IV |
| <i>Organizational constraints</i> | | | | | | | | |
| Poor linkage with line depts. | 07(5.83) | 13(10.83) | 14(11.67) | 53(44.17) | 33(27.5) | 2.36 | 47.2 | VIII |
| Low credibility of ext. worker | 08(6.67) | 17(14.17) | 11(9.17) | 46(38.33) | 38(31.66) | 3.00 | 60.0 | IV |
| Non availability of agri credit | 09(7.5) | 26(21.67) | 10(8.34) | 29(24.16) | 46(38.33) | 2.33 | 46.6 | IX |
| Non availability of quality inputs | 07(5.83) | 23(19.17) | 12(10.00) | 38(31.66) | 40(33.37) | 2.88 | 57.7 | VII |
| Inadequate marketing net works | - | 3(2.5) | 11(9.17) | 68(56.67) | 38(31.66) | 2.99 | 59.9 | V |
| Lack of effective supervision and monitoring by ext. worker | 2(1.66) | 17(14.17) | 19(15.8) | 57(47.5) | 25(20.83) | 3.08 | 61.6 | III |
| Lack of crop insurance facility | - | 3(2.5) | 14(11.67) | 49(40.83) | 54(45.00) | 3.13 | 62.6 | II |
| Inadequate storage facility | - | 2(1.66) | 31(25.84) | 35(29.16) | 52(43.34) | 3.19 | 63.88 | I |
| Poor transportation | 2(1.67) | 16(13.33) | 23(19.17) | 36(30.00) | 43(35.83) | 2.91 | 58.2 | VI |

S.D.F - Strongly Disagreed Farmers, D.F - Disagreed Farmers, N.F - Neutral Farmers, A.F - Agreed Farmers,

S.A.F - Strongly Agreed Farmers, Data within paranthesis indicate percentages

Index = (MS (Mean Score) / 5) *100, where, 5 is the maximum attainable score for each statement



inadequate storage facility, lack of crop insurance, lack of effective supervision and monitoring by extension workers and low credibility of extension workers were some of the major organisational constraints that impedes the vegetables production though government of Sikkim had taken lot of programmes to establish strong linkage with farming community in terms of availability of quality seed and planting materials and other organic inputs provided by line departments.

Out of ten enlisted major constraints under the category of *technical constraints*, it was observed that farmers were very much lacking in knowledge on some important areas that ranked high viz., conservation of natural resources, regular soil testing programmes, mechanization of agriculture and integrated pest and disease management that facilitate the enhancement of vegetable production. But it was also observed that all the type of constraints under the category of technological constraint were more or less responsible as per the ranking hierarchy (Table 2) to hinder the vegetable production.

Nine important socio-economic constraints were identified and ranked which acted as barrier in increasing production and productivity of vegetables. Data from the Table 2 revealed that the farmers/growers were very much lacked in the entrepreneurial ability for taking up any venture in a profitable manner which was followed by the lack of innovativeness and low responsiveness by the farmers. On the other hand, farmers were quite enthusiastic to build up the entrepreneurial ability provide the scopes and opportunities of various agro-preneurship are properly highlighted through capacity building programmes.

Study revealed that the inadequate storage facility for vegetable produces in the area leads to the low adoptability of growing vegetable as ventures. Most of the growers loose their produces even after bumper production of crops. No other constraints are as important as organizational constraint in making farming of Sikkim a profitable enterprise. *Rolle (2006)* indicated fresh produce losses ranged from 10 to 40 per cent globally, with losses in India at the high end. *Chikkasubbanna (2006)* has reviewed some of the issues and priorities for improving the post harvest sector for vegetable handling.

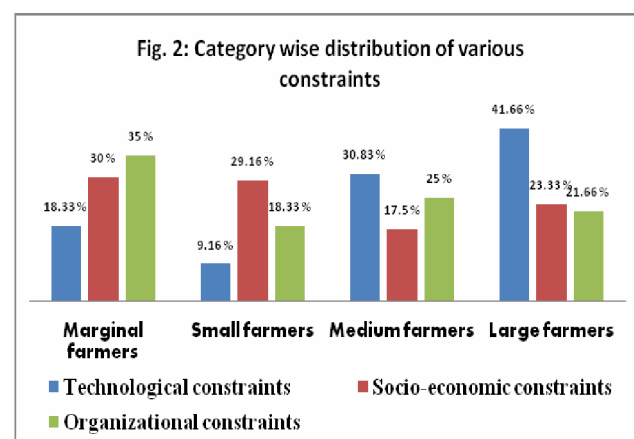
Above all, out of three major classified constraints, the technological constraints was considered to be main impact factor that hinders the adoption of vegetable production technologies in North Sikkim district with highest average mean score of 3.05 where as organisational constraints were found to be placed at lowest average mean score of 2.87.

The data presented in Fig.2 revealed that most of the large farmers (41.66%) are facing the technological constraints and maximum of marginal farmers (35%) do have the organisational constraints in adoption of vegetable production technology. This may be because

Table 3. Constraints-wise mean score of respondents according to land holding status (N=120)

| Type of constraints | Category wise respondents | | | | Mean score |
|------------------------|---------------------------|---------------|---------------|---------------|------------|
| | Marginal | Small | Medium | Large | |
| Techno. constraints | 22 (18.33) | 11 (9.15) | 37 (30.83) | 50 (41.66) | 3.05 |
| Socio-eco. constraints | 36 (30.00) | 35 (29.16) | 21 (17.50) | 28 (23.33) | 2.89 |
| Org. constraints | 42 (35.00) | 22 (18.33) | 30 (25.00) | 26 (21.66) | 2.87 |

(Figures in parentheses indicate percentage)



of the fact that the marginal farmers are neither aware of the modern technology due to lack of information source nor have the interest to take up some technologies like soil testing, post harvesting and farm mechanization due to small land holdings and less family requirement. Among the beneficiaries the marginal farmers' category have shown maximum percentage (30.00%) of socio-economic constraints as compared to other categories with a mean score of 2.89. But the trend of mean score value indicates that mostly the farmers are facing the technical constraints with highest mean value of 3.05 in respect of adoption of improved vegetable production technology.

Table 4. Categorization of respondents according to level of constraints (N=120)

| Constraints wise category | No. | % |
|---------------------------|-----|-------|
| Low < (mean-SD) | 28 | 23.33 |
| Medium (mean-SD) | 68 | 56.67 |
| High > (mean+SD) | 24 | 20.00 |

A significant percentage (56.67%) of the beneficiaries have faced the medium level of constraints in respect of all the three sectors of major constraints viz., technological, socio-economic and organizational (Table 4). The low (23.33%) and high (20.00%) level of constraints are being perceived by the rest of the farm beneficiaries.

CONCLUSION

On the basis of above results and discussion, it is evident from the study that the major constraints like lack of regular soil testing, lack of mechanization in agriculture, poor knowledge of IPM, lack of innovativeness, lack of entrepreneurial ability, lack of low responsiveness, absence of storage facilities, post harvest technologies and lack of effective supervision and monitoring by extension workers are faced by the growers. The study has confirmed that inadequate marketing networks, inadequate soil management, lack of awareness on improved technologies, lack of achievement motivation, poor sources of information and lack of commitment to farming as enterprise are also contributing to low production. Thus there is a need to organize awareness and training programmes, timely soil testing for acidic soil management, and introduction of post harvest technologies to encourage the farmers for vegetable production so that the farmers become more economically independent. Moreover it will improve nutritional status of farm family thus indirectly better the socio-economic status of them. Based on these training needs of farmers; public and private organizations may organize various training cum awareness programmes.

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REFERENCES

- Birthal, P. and Joshi P.K. 2007. Institutional innovations for improving smallholder participation in high-value agriculture: a case of fruit and vegetable growers associations in India. *Quarterly J. of International Agriculture*, **46** (1) : 49-67.
- Chikkasubbanna, V. 2006. India (2). In: R.S. Rolle (ed.). *Postharvest Management of Fruit and Vegetables in the Asia-Pacific Region*. Tokyo and Rome: Asian Productivity Organization (APO) and FAO. pp. 144-153.
- Rolle, R.S. 2006. Improving postharvest management and marketing in the Asia-Pacific region: Issues and challenges. In: R.S. Rolle (ed.). *Postharvest management of fruit and vegetables in the Asia-Pacific region*. Tokyo and Rome: Asian Productivity Organization (APO) and FAO. pp.23-31.

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