

HYBRID VEGETABLE SEED PRODUCTION IN HIMACHAL PRADESH-FARMERS AND CORPORATE PERSPECTIVES

PROJECT REPORT

By

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(A-2010-30-72)**

Submitted to



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in

partial fulfillment of the requirements for the degree

of

**MASTER OF BUSINESS ADMINISTRATION (AGRIBUSINESS)
(SCHOOL OF AGRIBUSINESS MANAGEMENT)**

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*Since my birth to adulthood,
you were there with me...*

*To bolster in all highs n lows
of my life, you were there with
me...,*

*Dear PAPA & MUMMY,
I really owe all my success to you
and thank you for shaping my
future fabulously.*

*Dedicated to the Most
Cherished Persons of my
life.....*

My Parents and Brother

Dr Rajesh Kumar Thakur

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CERTIFICATE – I

This is to certify that the Project entitled, “**Hybrid vegetable seed production in Himachal Pradesh-farmers and corporate perspectives**”, submitted in partial fulfilment of the requirements for the award of the degree of **Master of Business Administration** in the discipline of **Agribusiness Management** to CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, is a bonafide project work carried out by **Savneet Sharma, (A-2010-30-72)** son of Shri Vinod Sharma under my supervision and that no part of this project report has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged.


(Dr. Rajesh Kumar Thakur)
Major Advisor

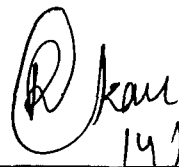
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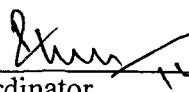
This is to certify that the project entitled, “**Hybrid vegetable seed production in Himachal Pradesh-farmers and corporate perspectives**”, submitted by **Savneet Sharma** (A-2010-30-72) son of Shri Vinod Sharma to CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, in partial fulfillment of the requirements for the degree of **Master of Business Administration** in the discipline of **Agribusiness Management**, has been approved by the Advisory Committee after an oral examination of the student in collaboration with an External Examiner.


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Needless to say, all omissions and errors are mine.

Place: Palampur

Dated: 29th May, 2012

Sauneet Sharma
(Sauneet Sharma)

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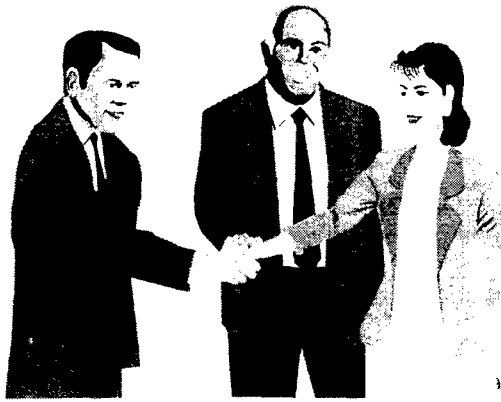
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LIST OF ABBREVIATIONS USED

Sr. no.	Abbreviations	Meaning
1	et al.	et alii (and others)
2	i.e	Id est (that is)
3	P	Pages
4	Kg	Kilogram
5	Lt	Litre
6	etc.	Etcetera
7	%	Per cent
8	/	Per
9	ml	Millilitre
10	Ha	Hectare
11	Gm	Gram

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INTRODUCTION

1. INTRODUCTION

India is predominantly an agricultural country in which the majority of the population is dependent on agriculture for livelihood. Since, independence, large number of initiative has been taken by the central and state governments to improve the status of agriculture through creation of infra-structure and strengthening of research-extension network. In this process the agriculture sector has gone through a lot of transformations after the liberalization and formation of world trade organization. In this era the concept of public-private partnership emerged. The corporate sector has also been promoted for the production/manufacturing of critical agricultural inputs. All these efforts, initiatives, policy interventions etc. pave the way for food sufficiency and diversification of agricultural towards high value crops and nutritional security.

Our country has achieved self-sufficiency and a good degree of stability of food production. However, self-sufficiency in the true sense can be achieved only when each individual in the country is assured of balanced diet. This created an urgent need for providing health security to our population by supplying nutrition through balanced diet. Vegetables form the most important component of a balanced diet. India is the second largest producer of vegetables in the world and accounts for about 15 per cent of the world's production of vegetables. Varied agro-climatic conditions in India make it possible to grow a wide variety of vegetable crops all the year round in one part of the country or another. India can claim to grow the largest number of vegetable crops compared to any other country of the world and as many as 61 annual and 4 perennial vegetable crops are commercially cultivated. These include solanaceous, cucurbitaceous, leguminous, cruciferous (Cole crops), root crops and leafy vegetables. Major vegetable crops grown in the country are tomato, onion, brinjal, cabbage, cauliflower, okra and peas. The current production level is over 90 MT and the total area under vegetable cultivation is around 6.2 million hectares which is about 3 per cent of the total area under cultivation in the country. Vegetable seeds account for about 18 per cent of the total production of certified seeds. Potato, tomato, onion, cabbage and cauliflower account for around 60 per cent of the total vegetable production in the country. Vegetables including

root and tuber crops occupy an important place in diversification of agriculture and have played pivotal role in food and nutritional security of ever growing population of our country.

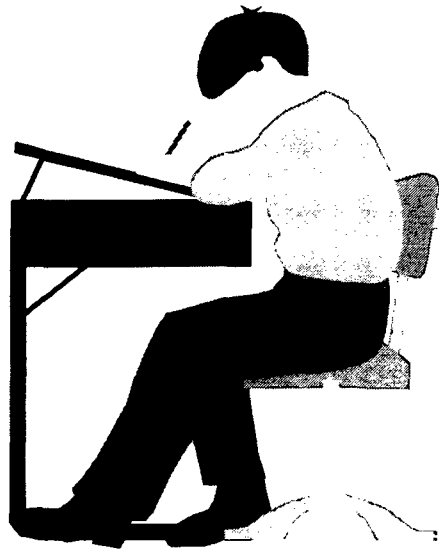
Seed is the basic and most critical input for sustainable agriculture. By and large the response of all other inputs depends on the quality of seeds to a large extent. The private sector has started to play a significant role in the seed industry over the last few years especially in case of vegetable seeds. At present, a large number of companies engaged in seed production or seed trade to fulfil the requirement of farming community. The main focus of private seed companies has been on the high value low volume seeds. But low value high volume seeds of cereals, pulses and oilseeds is still dominated by the public sector seed corporations. The demand for quality seeds and planting material is met by the public and corporate sector.

India has been endowed with diverse agro-climatic and soil conditions which provide congenial conditions for the production of high value crops and seeds. Vegetable seed production under open and protected condition has emerged as a solution by the corporate and public sector to fulfil the growing demands of seed in the country. Seed being the most important input for vegetable production, therefore, it must have attributes of better quality seed possessing genetic characters, resistance to insect pest and diseases, high production potentials, free from foreign materials to address the growing demand for food in the country. Keeping in view the increasing demand of quality seed, huge investment in form of research and development by public and corporate sector has been done. As result the technology for seed production is changing from self-pollinated era to hybrid seed production techniques.

From last two decades the companies are focusing on hybrid seed production technology. In the modern era, biotechnology is also emerging as one of the viable option for seed production keeping in view the requirement of the farmers. Both the private and public sectors are investing heavily in the field seed production technology. Thus there is a need to study the seed production technology adopted by the corporate sector. Accordingly in the present study an attempt will made to study the hybrid seed production scenario and perceptions of farmers and corporate companies associated with hybrid seed production in the state.

Seed has been an important agricultural commodity since the first crop plant was domesticated by pre-historic man. For thousands of years, man cleaned seed of his food crops by winnowing. This is still an important process, but it is no longer adequate to supply the kind of seed needed by farmer. Indian seed industry seems to be on a high growth track. Indian hybrid seeds are in more than 65 countries including our neighbour Pakistan, where the exports are estimated at \$ 12-15 million in 2005-06. The total export from India, officially are however recorded only at 11.5 million in 2004-05. If the seed replacement ratio can be accelerated at desired rate of 25 per cent, then the market may touch a figure of Rs. 10,000 crore by 2008-09. The hand of regional and seasonal players if estimated, the market is well over Rs. 75,000 crores. The share of hybrid vegetables in respective total cropped area ranges around 28.3 per cent in tomato, 22.9 per cent in cabbage, 1.7 per cent in cauliflower. Through hybrid seeds average productivity has been increased in tomato by 49.7 per cent, cabbage (55.7 per cent) and cauliflower (49.4 per cent). The agro-climatic conditions of H.P. are widely suited for the production of vegetables as an off-season vegetables which can be exported to the plains in order to fetch good premium prices as some vegetables such as Tomato, Capsicum, French bean, Cabbage, Cauliflower, Peas and Cucumber etc., the present studies were planned with the following objectives:

- i. To examine the hybrid vegetable seed production scenario in Himachal Pradesh.
- ii. To study farmers and corporate perceptions for the hybrid vegetable seed production.
- iii. To highlight the problems associated with the hybrid vegetable seed production in the state.



REVIEW
OF
LITERATURE

Arizona (1944) revealed that the production of certain vegetable seeds, the general need for phosphorus (P) applications at the time of planting followed by sufficient Nitrogen (N) side dressings to give satisfactory vegetative growth. Adequate water supply was also identified as an important factor at the time of flowering and seed formation. Both fertilizing and seeding were done in one operation for better performance.

Shoemaker (1947) described the theory, practical and cases in the field vegetable and seed production technology in his book which are useful for teaching of students, vegetables growers and vegetable seed producers with respect soil, water and insect pest management. The technologies related to perennial vegetable crops, corn, roots, legumes, bulbs, salads, greens, Coles, potato, sweet potato, solanaceous fruits, vine crops (the cucurbits) and miscellaneous, including mushrooms and herbs were discussed in detail.

Hill (1948) conducted a study on the seed production of European and indigenous vegetables in the tropics was sent out by the Commonwealth Bureau of Horticulture and Plantation Crops in October 1944 to various agricultural authorities in different regions of the tropics, at the request of the East African Standing Agricultural Research Committee. The present publication summarizes the replies to the detailed questionnaire circulated, together with some additional information derived from other sources. It also includes a bibliography of 41 references, and appendices listing some vegetable varieties of temperate origin which are grown in several tropical countries of the British Commonwealth, the chief indigenous and naturalized plants used as vegetables in various tropical regions, relevant meteorological data for Kenya, India and Mauritius, and a list of countries to which the questionnaire was sent. The investigations have led to some very important conclusions, as follows. (1) The evidence collected shows that, by using the wide range of altitudes available, seed of many so-called European or temperate region vegetables can be produced successfully in several tropical regions; apart from the standpoint of the tropical agriculturist, this knowledge is of value to plant breeders and seeds men in temperate regions who could accelerate the seed production of new varieties by (i) using crops in the tropics during the temperate region winter, thereby saving a season, and (ii) growing biennials in the tropics, where they will seed in about a year. (2)

In the Kenya highlands, where the day length is about 12 hours throughout the year, every kind of vegetable so far tested, including long-day type, can be induced to flower and set seed by planting at high elevations, up to 10,000 ft. above sea level; this suggests that some accepted theories concerning the minimum photo-period essential to induce seeding in certain long-day plants may need reconsideration (3) It is pointed out that comparatively few locally acclimatized varieties of temperate vegetables have been developed in the tropics, whereas the converse process of adapting tropical and sub-tropical crops to temperate zones has, on the other hand, progressed. The possible use of tropical varieties of so-called European vegetables, e.g. peas, beans and cucurbits, by breeders in the temperate countries, and the use by breeders in the tropics of temperate varieties to introduce improved eating qualities into certain tropical vegetables, e.g. cucurbits, are suggested. (4) Attention is drawn to the need for research into (i) methods of storing roots and tubers in the tropics, particularly the potato, (ii) the improvement of indigenous and acclimatized vegetables of the tropics by breeding and selection, (iii) the breeding and selection of tropical varieties of the principal vegetables of temperate countries, particularly root crops rich in sugar and carotene, (iv) the unexplained sterility and low fertility of some temperate vegetable varieties in the tropics, and (v) the pollination and necessary spatial isolation of vegetable seed crops raised in the tropics. (5) Legislation would appear to be needed in many tropical countries to ensure testing of seed offered for sale. The methods of seed storage used by seed merchants also appear to require considerable improvement. (6) Investigations into production of temperate region vegetable seeds have been discontinued in most tropical countries now that imported seed is again available. In East Africa the successful war-time investigations into vegetable seed production has been largely instrumental in initiating what appears to be a promising export seed industry. There is a growing demand for vegetables of the temperate regions, e.g. cabbage, pea and carrot, among the indigenous peoples of the tropics which should lead to a growing demand for good cheap seed, preferably locally produced.

North and Jullian (1949) described the seed production trials of the following vegetables are reported: dwarf and runner beans for both green pod and haricot production; winged bean (*Psophocarpustetragonolobus*); cowpea; broad bean; pea; lettuce; Chinese cabbage (*Brassica campestris* var *spekinensis* and *chinensis*); Chinese

kale (*Brassica* species); cauliflower; cabbage; carrot; parsnip; Chinese radish (*Raphanussativus* var. *hortensis*); radish; leek; salsify; beet root; tomato; sweet pepper (*Capsicum annuum* var. *grossum*); and squash.

Nihsi (1955) explained the economic status of F1 seed production of tomatoes, eggplant, cucumber and water melon and the causes of the success of F1 seed in Japan were analysed. Commercial methods of seed production and their efficiency were also described and fundamental research relevant to simplification of procedures of F1 seed production of various vegetables is surveyed. Problems requiring attention if the F1 seed industry is to be extended in old and new crops were indicated.

Weillbull (1955) Studied the seed storage temperatures of different crops and reported that a temperature of -20° C found to the best temperature for the storage of onion, carrot, celery, parsnip and beet. This temperature was not found suitable in case of parsley which loses its germinative power rapidly at -20 degrees C.

Carlson (1960) studied the depression in yield as a result of inbreeding for four or more generations in 234 inbred lines and reported a reduction of yield to the extent of 40 per cent. Cases are also mentioned in which yield could be increased in spite of inbreeding, but seed set and seed yield were depressed. Crosses between lines have shown marked reciprocal differences in yield, tendency towards bitterness and other characters. Yield and seed production have proved to be correlated with root size, which is a heritable character. Double crosses also appear to be useful in cucumber breeding. In breeding out-door types, it appears that F1 hybrids were generally hardier against unfavourable weather than the parents. Commercial seed production may become practicable through the introduction into Scandinavian material of the gynomonecious character of a Korean form, which continually segregates into monecious and gynecious plants.

De-fellner (1962) explained the general methods of commercial seed production and discussed various types of seed-cleaning machinery which were general used in the cleaning of seeds.

Patel and Gabani (1973) reported that large quantity of hybrid bajra seeds remained unsold with Gujarat state co-operative marketing society each year between 1966 and 1970. This was mainly due to the weak extension efforts and lack of adequate and timely supply of complementary inputs.

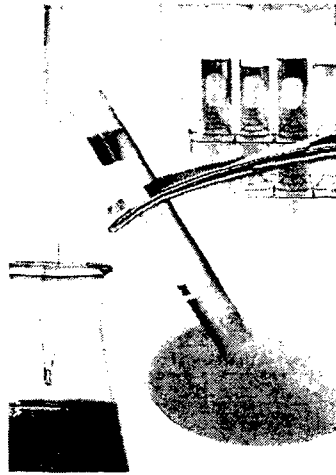
Nagaraja (1998) examined the market structure, market share and market potential for sunflower seeds in Raichur district of Karnataka. Theil's entropy index of 0.4638 suggested that sunflower seed market was moderately concentrated with few suppliers dominating the trade. The market share of individual brands and their switching pattern indicated that local un-branded seeds had the major share. A very high degree of brand switching was noticed among the different varieties of seeds.

Prakash (2002) in his article "Moving towards Integrated Seed Supply System in India", reported the increased use of Information Technology in seed sector promotion. It was mentioned that there company websites give updates on prevailing availability, domestic and global prices, local and global demand, acceptable condition of trade and related aspects.

Tay (2006) revealed the genetically controlled and hand pollinated system of F1 vegetable seed production, as well as the distribution and development of F1 vegetable seed production in the world. The study concluded that stress should be given on the F1 hybrid seed production of tomato in Taiwan.

Dar and Sharma (2009) investigated the hybrid vegetable seed production in India. The status of breeding based on genetic male sterility, nuclear cytoplasmic male sterility, functional male sterility and self-incompatibility mechanisms and factors affecting economic hybrid vegetable seed production in the region were discussed.

Hansra and Perumal (2010) analysed the pattern of seed production and extent of use of technology by seed companies it was found that the private *seed production* firms were putting-forth intensive extension effort in Hi-tech practices in vegetable seed propagation by using largely cultured sophisticated computer applications. Farmers under contract farming experiencing hi-tech agricultural applications in *producing* vegetables seed more effectively and efficiently which earlier they were usually reluctant to risk their limited capital by adopting a new *technology*, unless the chance of success were *high*



MATERIALS AND METHODS

3. MATERIALS AND METHODS

Science is a systematized body of knowledge. It is marked by careful, accurate classification of facts, discovery of facts and discovery of scientific laws by creative imagination and self-criticism to arrive at logical conclusions. The reliability and validity of research findings depend mainly upon the methodological framework employed. Therefore, the present chapter has been planned to elaborate methodological procedure adopted and various analytical techniques employed in achieving the set objectives of the present study. The detail of methodological frame work of the study has been explained in the following sub-heads

3.1 Selection of the study area

3.2 Sampling design

3.3 Data collection

3.3.1 Primary Data

3.3.2 Secondary Data

3.4 Analytical tools and techniques

3.1 Selection of study area

Himachal Pradesh has varied type of agro-ecological conditions which suits for the production of wide range of crops including seed production activities of various crops. Hybrid vegetable seed production activity has been initiated by major seed companies like Rashi Seeds, Namdhari seeds, Durga Seeds, Nun Hems, Indo American, RK Seeds etc. in Solan, Kullu, Sirmaur and Shimla districts of the state. These companies are also carrying the seed production activities through the adoption of farmers in Solan, Kullu, Sirmour and Shimla districts. Therefore, keeping in view these factors in the present study has been conducted at the major vegetable seed producing district of the state.

3.1.1 Sampling Design

The simple random sampling design has been used for the selection respondents. For the collection of the data related to farmer, Saproon valley of district Solan was selected purposively because the seed production of cabbage and cauliflower by the farmers is a quite old practice. The list of the seed growers of the different villages of Saproon Valley was prepared in consultation with the private seed company and department of agriculture. From the list so prepared, a sample of 30 vegetable seed growers was selected randomly. The crop and village wise distribution of sampled respondents is given in Table 3.1.

Table 3.1 Village wise distribution of the sampled seed growers

Sr. No.	Name of village	Cauliflower seed growers	Cabbage seed Growers
1.	Killar	7	5
2.	Deothi	2	-
3.	Subathu	-	7
4.	Ghati	4	3
5.	Dhakoo	2	-
Total		15	15

3.2 Data collection

To meet out the requirements of the specific objectives of the study both primary as well as secondary data were collected and details of the same have been given below:

3.2.1 Primary data collection

Primary data were collected from the seed growers as well as from the officials of the private seed companies.

3.2.1.1 Seed Growers

The primary data were collected on specifically designed and pretested survey schedule through personal interview method. The detailed information on following aspects was collected from the selected respondents.

- Demographic features of the seed growers like age, education, experience in seed production etc.
- Technology adopted for seed production like method of field preparation, irrigation, insect – pest and disease management, etc.
- Company for which seed is produced, technical assistance received from the seed companies etc.
- Future perspectives and perceptions regarding the hybrid seed production.
- Problems faced by the seed growers during the seed production activities.

3.2.1.2 Private Seed Companies

In addition to this the information regarding the companies perceptions' about the different aspects of hybrid seed production in context to future perspectives of the seed industry were collected from the officials of the private seed companies operating in Solan and Kullu districts of the state.

3.2.2 Secondary data collection

The information related to the area, production and productivity of vegetable crops, list of seed growers, seed production practices etc. has been collected from the company's records/ reports, website of National Horticulture Board, Department of Agriculture etc.

3.3 Analytical Framework

Collected data was compiled and analyzed by using tabular method. The results has been presented and interpreted by using simple statistical and mathematical tools as discussed below:

- (i) **X² (chi square) test:**

$$X^2 = \sum (O-E)^2 / E,$$

where O is observed frequency, E is expected frequency.

- **HO (Null Hypothesis):** There is no significant relationship between processing system used by the company with the quality assurance adopted by the enterprise.
- **H1 (Alternate Hypothesis):** There is significant relationship between processing system used by the company with the quality assurance adopted by the enterprise

(ii) Total Weightage Score Method:

Attribute	Ranks	weights
A	1	n
B	2	IV
C	3	III
D	4	II
E	5	I

Total weights of attribute = $\sum F_{Xi, i=0}$, x = weight of rank, F = number of respondent giving a rank to the attribute, I = rank ranging from 1 to n.

Assumptions:

- The Information provided by the sample is assumed to be true.
- The actual figures have been rounded off or these estimated values have been taken for the purpose of convenience in analysis and interpretation.

Limitations:

- The sample size could not be increased more than one, because of limitation of time and only some of the different companies have been selected for the purpose of the study.
- The study limited to information given by the respondent and the pre-determined schedule method only.



RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

This chapter contains the analytical results of the survey of the 30 farmers growing hybrid vegetable seed in Himachal Pradesh. The results have been presented under following sections:

4.1 Demographic Features of Respondents

4.2 Hybrid vegetable seed production scenario in Himachal Pradesh.

4.3 Farmers and corporate perceptions for the Hybrid Vegetable Seed Production.

4.4 Problems associated with the hybrid vegetable seed production in the state.

4.1 Demographic Features of respondents

The study of the demographic features of respondents like age, education level, income level, occupation, land holding, inventories of farm etc. are of vital importance for taking the management decisions. These characteristics of sampled respondents have been studied and are presented in the following paragraphs.

4.1.1 Age status.

Seed production is a combination of art and science which brings perfection with age. The age wise distribution of sampled hybrid vegetable seed producers has been presented in Table 4.1 .The table clearly indicates that the farmers below the age group of 30 years were not associated with seed production activities. The percentage of farmers in the age category of more than 45 years was about 70 per cent followed by the age group of 31-45 years. Thus it can be concluded from the table that age has a direct relation with seed production activity.

Table 4.1 Age wise distribution of sampled respondents

S.N	Age group	No. of respondents	Per cent
1.	Up to 30 years	0	0
2.	30-45	9	30
3.	<45	21	70
	Total	30	100

4.1.2 Educational status

The educational status of the respondent bears a significant role in the adoption of recommended innovations and technologies for the seed production. The educational status of the sampled heads of the families has been studied and is presented in Table 4.2. It can be observed from the table that about 57 per cent of the heads of the family were having their education up to metric. The percentage of 10+2 and postgraduates was estimated at 13 and 7 per cent respectively. It can be concluded from the table that seed production has a negative relation with education. It is interesting to note that 23 per cent of the sampled heads of the families were illiterate. It was reported by sampled farmers that, they have learned the art of seed production from the forefathers and got the perfection with experience.

Table 4.2 Distribution of sampled respondents according their status of education

Sr. No	Educational status	No. of respondents	Per cent
1.	Metric	17	56.67
2.	Senior secondary	4	13.33
3.	Graduate	0	0
4.	Post Graduates	2	6.67
5.	Illiterate	7	23.33
	Total	30	100

4.1.3 Experience status.

The selected farmers were enquired about their experience in the field of seed production activities. They were of the view that farming is their traditional occupation and way of living. They were producing seeds of different crops as per the knowledge received from their forefathers. But hybrid seed production is entirely a different concept

where two different plants are used for seed production. The experience of the selected farmers in the field for hybrid seed production was analysed and presented in the Table 4.3. It can be seen from the table that about 67 per cent of the sampled house hold were having experience of more than 10 years in seed production. About 10 and 20 per cent of the sampled farmers were having an experience up to 3-5 and 6-10 years respectively.

Table 4.3 Distribution of the respondent according to experience in seed production

Sr. No.	Occupational experience	No. of respondents	Percentage
1.	>=2 years	1	3.3
2.	3-5 year	3	10.0
3.	6-10 year	6	20.0
4.	<10 year	20	66.7
Total		30	100.0

4.1.4 Income status.

The main objective of the head of the family is to increase the farm income from the different farm activities. The income wise distribution of the heads of the family of the sampled household has been shown in the Table 4.4. The table indicates that the proportion of farmers in the income group of Rs 50,000-1, 00,000 were highest i.e. about 37 per cent followed by the income range of Rs 1-3 lakh (27 per cent). The percentage of the farmer in category of less than 50,000 and more than 3lakh was at about 20 and 17 per cent of the total sampled farmers.

Table 4.4 Distribution of income status of the respondents

Sr.No.	Income range	Respondents	Per cent
1.	>50000	6	20
2.	51-1lakh	11	36.67
3.	1-3 lakh	8	26.67
4.	<3 lakh	5	16.67
Total		30	100

4.1.5 Motivational factors

The seed growers were enquired about the source of motivation for seed production. It was narrated by the majority of the growers that seed production is their traditional activity but for hybrid seed production was a new activity for them. During the survey, it was found that friends, seed companies, seed dealers were the main sources of motivating the farmers for adoption of hybrid vegetable seed production activity (Table 4.5). The table indicate that about 53 per cent of the seed growers were motivated by the seed companies and about 40 and 6 per cent of seed grower were motivated by seed dealer and friends of the seed grower.

Table 4.5 Distribution of the respondents according to the source of motivation for seed production

Sr. No.	Motivated by	Number	Per cent
1.	Department of agriculture	0	0
2.	Friend/Relative	2	6.67
3.	Seed company	16	53.33
4.	Seed seller	12	40
Total		30	

4.2 Hybrid vegetable seed production scenario in Himachal Pradesh.

Himachal Pradesh has varied type of agro climatic conditions which offers the opportunity of growing wide range vegetable crops. The increasing demand for the fresh vegetable produce in the main market of the country has motivated the farming community of state to diversify their cropping systems in favour of vegetable crops. In general the productivity of vegetables is 2-10 times higher as compared to the cereals. Similarly, the price of the vegetable produce is also 1.5 to 2 times higher which makes the vegetable production as a profitable enterprise in the stated. The status of demand and seed production scenario for hybrid vegetable seed in the state is as under:

4.2.1 Demand of hybrid vegetables seed

As discussed above, the vegetable production is a profitable venture for the farming community of the state. The farmers who have suitable land and assured irrigation facilities generally prefer to grow vegetable crops as a source of income and employment generation. As a result the area under vegetable crops is continuously increasing. The trends area, production and productivity of vegetable crops have been shown in the Table 4.6 for a period of past 20 years. The table clearly indicates that the area under the vegetable has been increased from 39,000 ha (1991-92) to 80,000 ha (2010-11), registering an increase of about 200 per cent over the period. On the other hand, the productivity of vegetables during the same period has increased from 12.3 MT/ha to 18.3 MT/ha. This indicates that the area under the vegetable production in the state is continuously increasing as the farmers of the state may have considered it as the main cash crops.

Seed is one of the important inputs for vegetable production. During the survey it was found that tomato, cabbage, cauliflower, capsicum, peas, are the major vegetables which are commercially grown by the farmers of the state. The matter regarding the type of seed (open pollinated and hybrid varieties) for vegetable production was discussed with the officials of department of agriculture and the private input dealers (retailers). It was indicated by them that generally the farmers use the hybrid seeds in case of tomato, cabbage, cauliflower, capsicum, peas which are grown for commercial purposes. However, the seed of open pollinated varieties is also preferred by farmers in case of peas, garlic, onion, ginger, bean etc. It was categorically mentioned that the crops for which hybrid seeds are available in the market, farmers prefer to grow hybrid varieties over the open pollinated varieties on account of their high production potential and other quality traits like shape size, self-life etc. Thus, the demand is more than 80 per cent of vegetables seed used for the production of vegetables in the state is reported to be hybrid varieties.

Table 4.6 Trends in area, production and proactivity of vegetable in Himachal Pradesh

Sr. No.	Year	Area (000 ha)	Production (000 MT)	Productivity (MT/ha)
1	1991-92	38.7	476	12.3
2	2001-02	34.6	639.1	18.5
3	2008-09	74.7	1263.9	16.9
4	2009-10	79.8	1390.7	17.4
5	2010-11	80.4	1474.9	18.3

Source: NHB Database

4.2.2 Hybrid vegetable seed Production scenario

In general practice the farmers arrange seeds from self-production, fellow farmers, departmental sale centres and from the market. As discussed earlier that the farmers prefer the seed of hybrid varieties in case of commercial vegetable production, the production of hybrid seeds is beyond the reach general farmer. Therefore, for the hybrid seed they depend on the off-farm sources i.e. departments/universities/institutes or private seed companies. The brief detail of seed production activities in the state is as under:

i) State Agricultural Universities

Himachal Pradesh has two state agricultural universities i.e. Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya Palampur (CSKHPKV) and Dr. Y.S Parmar University of horticulture and Forestry, Nauni, Solan. These Universities produces the foundation seed of different crops which is being supplied to the department of agriculture for further multiplication at their farms. The deliberations with the university scientists revealed that the seed production activities of open pollinated crops are being taken by the universities at their headquarters, research stations/Krishi vigyan kendras' located in the different parts of the state. It was further indicated that the hybrid

seed production has not been initiated, yet in case of vegetable crops. However the hybrid maize seed is being produced at Regional research station Bajaura of CSKHPKV Palampur.

ii) Department of agriculture

The department of agriculture is performing the seed production/multiplication activities from the foundation seed received from the state agriculture universities and other institutes. The hybrid vegetable seed productions have also not been started by the department of agriculture till date. However, the department procure the seed of hybrid vegetable varieties from different seed companies for further distribution to the farmers.

iii) Private seed companies

During the survey it was found that there are more than 20 seed companies who have their presence in the state for the supply of hybrid seeds through local retail network. The seed companies are producing hybrid seed of different vegetables at their seed multiplication farms located in the different parts of the country. During the survey it was noticed that there are a few companies Rasi, Namdhari, Indo-American, Nunhemsetc. which has established their research and seed multiplication units in state at Kullu, Sirmaur, Solan districts. In order to meet the increasing demand of hybrid seed the companies are also undertaking the hybrid seed production activities through the adoption of farmers in Kullu, Solan, Shimla and Sirmaur districts of Himachal Pradesh.

iv) Seed production by the farmers

The seed production activities are being carried by the farmers in the different parts of the state in case of cereals pulses, oil seeds. The main emphasis of farmer is on the seed production of self-pollinated varieties which are being procured by department of agriculture. The seed production of hybrid vegetable is mainly concentrated in the selected parts of Solan, Kullu, Sirmaur and Shimla districts of the state. The issue related to the hybrid seed production is discussed with respect to crops, varieties, and technology adopted by the farmers regarding the hybrid seed production. It was reported by the majority of the farmers that they are producing seeds for different companies. It was also reported by the farmers that they were not aware of the name of the varieties. They

simply produce seed and sold to the concerned companies on the agreed upon prices. There for it can be concluded from the above discussion that majority of vegetable growers are using the hybrid seed as per as the supply. Therefore it can be concluded that more than 95 per cent of the total requirement of the seed of the state is met by the private seed firms. However few farmers in the state were also producing the vegetable seed of the crops like onion for the private firms.

The officials of different private seed companies state that to meet out the demand of seed, they are adopting the farmers for seed production in Solan, Sirmaur, Kullu, and Shimla districts of the state.

In order to study the hybrid seed production at farmer level, technology used in seed production, reasons for seed production and the companies for which they are producing the seed have been studied by taking a sample of 30 farmers in Solan district of Himachal Pradesh.

4.2.3 Pattern of the vegetable seed production

During the survey it was observed that the farmers were producing good quality seeds of cabbage, cauliflower, onion, tomato, peas as per the demand of the seed companies. Out of these vegetables seeds cabbage and cauliflower seed production activities were the more popular among the farming community of the study areas. It was also found that the seed production is a group/village based activity, where the seed companies adopt the village for the hybrid vegetable seed production. The distribution of farmers according to the seed production of different vegetables crop has been presented in table below:

Sr.No	Crop	No of farmers	Per cent
1.	Cabbage	15	50
2.	Cauliflower	15	50
Total		30	

It can be seen from the table that the sampled farmers were producing the seed of cabbage and cauliflower (50 per cent each). It was mainly due to the fact that the seed production technology is different in different crops; hence they preferred to go for the production of hybrid seed of a single crop.

4.2.4 Response of farmer for producing hybrid vegetable

The agro-climate of the state is suitable for production of different crop enterprises. Varied type of agro-ecological situations of the state offers an opportunity to grow different varieties of crops in different region of the state. The sampled farmers were enquired about the factors which made them to go for hybrid seed production activity and are presented in the Table 4.7. It was indicated by the majority of the farmers that they were producing hybrid seed due to the suitability of the agro climatic conditions. About 43 per cent of the seed growers were of the view that they do it for the minimizing the risk of marketing. The marketing of seeds is easy as compared to the fresh vegetable produce which is bulky and perishable.

Table 4.7 Reasons for producing vegetable hybrid seeds

Sr.No	Reasons for seed production	No	Per cent
1.	Suitability of climate	17	56.67
2.	High returns	0	0
3.	Low risk	13	43.33
Total		30	

4.2.5 Companies for which growers are producing seed

As the common objective of the study mainly seek to identify the number of companies engaging the farmers for the seed production. Table 4.8 demonstrates the detail of the contract farming engaged by the different seed companies in reference to cauliflower and cabbage seed production. It has been observed that Indo- American taken

a lead in contract farming among the farmers followed by the Nun-hems, Rasi, Namdhari, etc. only for a marginal level Thus it may have been stated Indo-American is preferably the first choice of the farmers to get contracted for the production of the vegetable seed.

Table 4.8 Name of the companies for which farmers were producing seeds

Sr. No.	Name of the Company	No of respondents	Per cent
1.	Sungro	2	6.67
2.	Indo-American	10	33.33
3.	Nun hems	4	13.33
4.	Rasi	4	13.33
5.	Dhanuka	3	10
6.	NSC	3	10
7.	Namdhri	4	13.33
Total		30	

4.2.6 Seed production

The hybrid vegetable seed production technology is just like the production technology of other crops. The package and practices for the cultivation of vegetable crops is focused on the production of the fresh vegetable produce. The gestation period of seed production crops is generally longer than that of the vegetable grown for fresh produce. It is due to the fact that in vegetable produce the end product is fruit, however for seed production the crop take more time to produce the seed. Keeping in view the practices and longer gestation period, there is a need of proper field management of inputs, irrigation etc. The major crop for which the seed production is done and package, practices followed by the sample seed growers have been studied and are present in the following section.

4.2.7 Seed production technology

Hybrid seed production technology refers to the different field and crops operations which are carried for the purpose of hybrid seed production. The seed production activities include the operations starting from the selection of the crops, parent plants, field preparation, nursery raising, transplanting till the seed production. The practices performed by the sample farmers for seed production are given in Table-4.9. Seed production is a tedious activity. It depends upon the quantity of land. If more the land under cultivation greater is the work and the land under the cabbage and cauliflower production is mentioned in the table. About 93 per cent of the sampled farmers have land under seed production less than .8 ha. And 7 per cent of the farmers have land between 1.6 ha.

Ploughing is the first step for the field preparation. It depends upon the crop and also the type of soil. For field preparation the farmers were found to give 1-5 ploughs. It was noticed from the table that about 53 per cent of the farmers plough their field 1-2 times where 47 per cent of sampled household plough their field for 3-5 times. Intercultural operations like. Weeding, hoeing, roughing, gap filling are important for hybrid vegetable seed production. All the sampled households were using the techniques for seed production to maximize their crop yield. The table represents that all the sampled households were performing these operations for hybrid vegetable seed production. Sowing is the major operation of seed production activity. The table reveals that about 60 per cent & 40 per cent of the seed growers sowed their crop in the month of October and November. Mainly the seed production is done in the villages where the resources and use of technology is very less so all the household samples do their cultural operations manually. The land holdings of sampled households were small and in the sampled area it is difficult to maintain distance isolation so the growers adopted the method of time isolation to maintain the genetic purity of the seeds. The nutrition is first requirement of every crop. So the farmer applies different type of fertilizers and manures to fulfil the requirement of the crops. Here table shows that all the sampled households add urea, fym, compost for the better yield of the crop. Protection is required for every crop. To prevent the pest and fungal attacks the application of different insecticides is important.

Table 4.9 Seed Production Technology

Sr.No.	Operations	Crops	
		Cabbage (%)	Cauliflower(%)
1.	Area (a)		
	>.8 ha	93	80
	<1.6 ha	7	20
2.	Ploughing		
	1-2 times	53	34
	3-5 times	47	67
3.	Transplanting Time		
	October	60	40
	November	40	60
4.	Inter cultural operation		
	Hoeing	100	100
	Gap filling	100	100
	Weeding	100	100
	Roughing	100	100
	Earthing up	100	100
5.	Method		
	Manual	100	100
	Mechanical		
6.	Isolation		
	Time	100	100
	Distance		
7.	Nutritional Management		
	FYM	100	100
	Compost	50	60
	Urea	100	100
8.	Plant protection		
	Insecticide	100	100
9.	Irrigational requirement		
	1-5 times	100	90
	Flood	80	60
	Sprinkler	93	85
10.	Harvesting Status		
	June	100	100
11.	Production status		
	>500	93	73
	<500	7	27
12.	Post harvesting operations		
	Drawing	100	100
	Grading	0	0
	Treatment	0	0
	Storage	0	0
	Packaging	0	0

The table depicts that all the sampled growers use different insecticides to protect their crops. Water is necessary for the growth of every living organism. There is a water scarcity in some of the sampled area. Whereas in some region there is no scarcity of water and they use flood irrigation and some of the farmers use sprinklers where the water scarcity is the main problem. The harvesting is the main activity in the seed production. Season plays an important role in it. The dry conditions are required for the harvesting. So in the summer the habitat is dry. The table shows that the harvesting is done in the month of June. The table shows that 93 per cent of the farmers produce seeds up to 500 kg whereas only 7 per cent of the farmer produces seeds more than 500 kg. The postharvest operations have their own importance. Drawing, grading, treatment, storage, packaging comes under the postharvest operations. The growers were not capable of buying graders for their seeds so they depend upon the company for which they were producing the seed and also for other value additions like treatment, packaging etc.

The area under vegetable crops is continuously increasing due to increasing area under vegetable production in the state the demand for seed is also increasing. The increasing demand for seed is providing opportunity to the seed corporations, public sector, private sector, companies and the farming community for the seed production activities. With the introduction of the new seed policies in 1988 large no of incentives and large number of import and export barriers are removed. Keeping these factors in account large number of private seed companies and farmers are associated with seed industry. The perceptions of farmers and seed companies towards the hybrid seed are line as under.

Hybrid seed production is a highly technical and scientific enterprise. Since the seed companies has not sufficient land resource in the potential seed growing area like H.P and they are identifying new area for increasing their seed production. Similarly the farmers are being ignored or adopted by the seed companies in different grounds. Therefore it is important to study the farmers and corporate perceptions for the hybrid vegetable seed production in the state. The perception of the farmers/corporate sector is presented in the table. The hybrid seed production is influenced by many factors is as described.

4.2.8 Assistance rendered by the seed companies

The private seed companies provide different type of assistance to the seed growers. It is imperative for the farmers for the farmers to receive a prior informative assistance from the scientists and seed specialist of the company. The table describes the kind of assistance provided by the company, mainly in reference to cabbage and cauliflower. It has been observed that largely technical know-how followed by field visits and some amount of the guidance has been rendered to the cabbage and cauliflower growers. However in reference to cabbage seed, the farmer has been assisted by the specialists of the seed companies, though timely field visits followed by informative knowledge rendering reference to the usage of plant production inputs.

Table 4.10 Kinds of assistance rendered by the company in respect to the crops grown by the farmers in lieu to the hybrid vegetable seed production.

Sr.No.	Assistance / Crops	Cauliflower	Cabbage
1.	Technical know-how	8	6
2.	Field visit	7	12
3.	Guidance	6	5
4.	Sample seeds	5	8
5.	Storage	5	9
6.	Plant Protection inputs	5	13

In order to identify the significant relationship assistance rendered by the seed companies with mainly two kinds of vegetable seeds i.e. cauliflower and cabbage. A chi-square test have been applied as this test is normally known as non-parametric, stating that the independent variables refers to dependent variables are related, assuming that the collected data have been calculated from the heterogeneity of independent variables.

Applying Chi-square test:

HO (Null hypothesis) – There is no significant relationship of assistance rendered by the companies to the farmers with the nature of crops grown by the farmers.

H1 (Alternate hypothesis) – There is no significant relationship of assistance rendered by the companies to the farmers with the nature of crops grown by the farmers.

O	E	(O-E) ²	(O-E) ² /E
8	5.7	5.5	1.0
7	7.7	0.5	0.1
6	4.4	2.4	0.5
5	5.3	0.1	0.0
5	5.7	0.4	0.1
5	7.3	5.2	0.7
6	8.3	5.5	0.7
12	11.3	0.5	0.0
5	6.6	2.4	0.4
8	7.7	0.1	0.0
9	8.3	0.4	0.1
13	10.7	5.2	0.5
			4.0

As the calculated value of the chi-square test is 4.0, whereas the tabulated value at the degree of freedom $(u-1)(v-1)$ of 5 at significance level of 5 per cent. It is 2.6. Since $C_v > T_v$, thus the H_0 (Null hypothesis is rejected and it may have been stated that there is no significant relationship of assistance rendered by the companies to the farmers with the nature of crops grown by the farmers

4.2.9 Family members are trained for the seed production activity

Although there is a labour scarcity but the family members of various growers were trained enough for the seed production activity. The table shows that about 93 per cent of the family members of the sampled household were trained for the seed production.

Table 4.11 Family members trained for seed production activity

Sr.No.	Family trained	Respondents	Per cent
1.	Yes	28	93.33
2.	No	2	6.67
	Total	30	100

4.3 Farmers and corporate perceptions for the hybrid vegetable seed production

As discussed in the previous section that the farmers have high preferences for the adoption of hybrid varieties for commercial cultivation vegetables which in turn increases the demand for hybrid vegetable seeds. Due to the high demand, the prices of the hybrid seeds in the market are quite high as compared to the open pollinated seeds. In order to earn higher profits from the hybrid seeds, a large number seed companies are associated with hybrid seed production activities. The seed companies are also associating the farming community for seed production to meet out the increasing demand of hybrid vegetables seed. In this section an attempt has been made to study the factors affecting the seed production, status of training and farmers'/companies' perceptions regarding the seed production.

4.3.1 Factors affecting seed production

It is very significant to consider the intrinsic and extrinsic factors for growing hybrid vegetable seed, since these factors allows the farmers to cultivate a desired quality of seed. Thus, requires a particular view and perception. In order to identify the significant relationship of factors to be considered for producing hybrid vegetable seed with specific reference to major seed production of cauliflower and cabbage. A non-parametric test have been applied known as chi square test that assume the observed data in regard to variables conjoint with dependent variable have been collected to heterogeneity of samples, demographic and economic structure. Accordingly a hypothesis has been generated and test has been applied as follows.

Table 4.12 Factors responsible for hybrid vegetable seeds production in relevance to the crops grown by the farmers

Sr. No.	Factors/ Vegetables	Cauliflower	Cabbage
1.	Soil Type	7	8
2.	Climate	5	8
3.	Infrastructure	6	7
4.	Irrigation	7	6
5.	Procurement agency	8	9
6.	Skill Labour	7	8
7.	Seed Pricing	8	7
8.	Storage	5	7
9.	Returns	6	8

Applying chi-square test:

HO (Null hypothesis) - Factors responsible for hybrid vegetable seeds production in relevance to the crops grown by the farmers are highly significant.

H1 (Alternate hypothesis) - Factors responsible for hybrid vegetable seeds production in relevance to the crops grown by the farmers are highly significant.

O	E	(O-E) ²	(O-E) ² /E
7	7.0	0.0	0.0
5	6.0	1.1	0.2
6	6.0	0.0	0.0
7	6.0	0.9	0.2
8	7.9	0.0	0.0
7	7.0	0.0	0.0
8	7.0	1.1	0.2
5	5.6	0.3	0.1
6	6.5	0.3	0.0
7	8.0	1.1	0.1
5	7.0	3.8	0.6
6	7.0	0.9	0.1
7	7.0	0.0	0.0
8	9.1	1.2	0.1
7	8.0	1.1	0.1
8	8.0	0.0	0.0
5	6.4	2.0	0.3
6	7.5	2.2	0.3
			2.3

As the calculated value is 2.3, whereas the tabulated value is 3.8, at the degree of freedom of $(u-1)(v-1)$ of 8 at significance level of 5% . As the $C_v < T_v$, thus H_0 (Null; hypothesis) is accepted and it may have been stated that Factors responsible for hybrid vegetable seeds production in relevance to the crops grown by the farmers are highly significant.

4.3.2 Farmers' and companies' perceptions

The climate of the study area is suitable for the production of the hybrid vegetable seeds. The perceptions of the farmers/companies' regarding hybrid seed production have been analysed and are presented in Table 4.13. The table depict that 60 per cent of the farmers reported that climate is suitable for seed production and 70 per cent of the corporate persons accepted that climate is suitable for the seed production activities. It was also the general perception of the farmers as well officials of the company that the demand of hybrid seed will further increase as reported by 70 per cent and 80 per cent of the farmers and corporate persons, respectively.

The price of produce or income from an enterprise is an important factor for its prosperity and sustainability and same is true for the hybrid vegetable seed production. It was the experience of the 65 per cent of seed production farmers and about 75 per cent of the officials of the seed production companies that the existing prices and income level from seed productions are quite good. They were of the view that the same trend will follow in future. About 68 per cent of the sampled seed growers were of the view that the marketing is quite convenient on account of non-perishability of seed. Moreover, in most of the time the company directly lift/procure the material from farms or the growers send their produce to the company as per as their convenience. The sampled farmers of the study area were also having high perceptions regarding the hybrid seed production activities as majority of the respondents were of the view that the post-harvest losses in case of seeds were negligible. Moreover the transportation and transportation cost were also easy and cheap, respectively, in case of seed as compared to other agricultural products. So, keeping in view their topography and infrastructural facilities like road and mode of transportation, the seed production is a viable and sustainable option for them. It was the opinion of the 70 per cent of the seed producing farmers that they are directly

selling their produce to the seed companies which eliminated the other market intermediaries. The perception of the seed companies regarding the different parameters like demand of seed, retail network and quality traits of hybrid varieties was also encouraging.

The above discussion indicates that the hybrid seed production offers high future perspectives for the farmers as well as the private seed companies in terms of expansion of business, prices and return from the seed production activities.

Table 4.13 Corporate and farmers perceptions about vegetable production

Sr. No.	Particulars	Perceptions	
		Farmers (%)	Corporate (%)
1.	Suitability of climatic conditions	60	70
2.	Increasing demand of the hybrid seed	70	80
3.	High seed prices and income	65	75
4.	Marketing convenience	68	73
5.	Uniform maturity and fruit size	20	76
6.	Low postharvest losses	89	90
7.	Increase in retail outlets	80	90
8.	Easy and cheap transportation	60	80
9.	Disease resistant varieties	30	80
10.	Small marketing channel	70	81
11.	Low market mal practices	45	75

4.3.2 Status and opinion regarding seed production training

Training is important for any activity. Most of the sampled household reported that training is an important factor for the production of hybrid seed of vegetable. The opinions in this regard were obtained from the sampled farmers and are presented in Table 4.14. It can be seen from the table that about 93 per cent of the seed growers feel that training is an integral part of seed production activities. However, 6 per cent of the farmers reported that there is no need of training for seed production. State agricultural universities and agricultural department organizes various training programs for vegetable and seed production technology for the skill up gradation of the farming community. The table further indicates that about 40 per cent of the sampled seed growers have undergone training for seed production.

Table 4.14 Distribution of respondents according to opinion for training

Sr.No.	Need of Training	Respondents	Per cent
1.	Highly required	28	93.33
2.	Moderately required	-	-
3.	Not required	2	6.67
	Total	30	100
Number of Trained respondents			
Attend Training			
1.	Yes	12	40
2.	No	18	60
	Total	30	100

4.4 Problems associated with the hybrid vegetable seed production in the state

Agriculture by nature is a risky enterprise. It is posed to a large number of problems concerning soil, climate, natural calamities, production, marketing management etc. Hybrid seed production is also one of the commercial activities which are also not free from such problems. The extent of problems becomes more acute for farming community particularly in hilly and remote area like Himachal Pradesh. The problems faced by seed growers in reference to hybrid seed production were analysed are presented in Table 4.15.

The problem reported by the seed growers have ranked by using total weighted score method by assigning weightage 1 and 2 depending upon low and high degree of problems, respectively, for the sampled respondents. The high cost of inputs like seed/seedlings, fertilizers, plant protection chemicals etc. in the seed production was reported as major problem by the 100 per cent seed growers of the study area. It was reported by the seed growers that they are interested in purchase of the parent lines required for the hybrid seed production but the costs are quite high. Similar, they were of the view that they are required to follow as spray schedule of the plant protection materials to manage the incidence of insect pest and diseases for the quality seed production. The cost of these materials was reported to be quite high.

The next group of problem for hybrid seed production was related to the high cost/availability of skilled labour and seed grader. It was narrated by the respondent that seed production is labour intensive activity and the labour was not available at the peak season. The non-availability of labour can be attributed to the implementation of MNREGA. Moreover the charges of skill labour were reported to be highest because the demand for skilled labour in the area was high during the peak periods. The problem like scarcity of water was rank 3rd. Irrigation was reported to be important factor for the quality seed production. The scarcity of water adversely affects the production and quality of produce. The problems like cost of fertilisers, equipment, etc. were placed in the medium category of problems. Although the insect pest and disease management is an important component of product but their intensity was less due to cold climate in the study area.

Table 4.15 Intensity of problems faced by the farmers regarding input use for the seed production

Sr. No	Particulars	Weightage		TWS	Rank
		2	1		
		Intensity of problems			
		High	Low		
1.	Labour Intensive	20	10	50	5
2.	Scarcity of skill labour	25	5	55	2
3.	High labour cost	25	5	55	2
4.	High cost of inputs like seed/seedlings, fertilizers plant protection chemicals etc.	30	0	60	1
6.	Fertilisers cost is high	21	9	51	4
7.	Higher price Insecticide	19	11	49	6
8.	Isolation is difficult	18	12	48	7
9.	Roughing is difficult	13	17	43	8
10.	Scarcity of water	21	10	52	3
11.	Difficulty in disease management	18	12	48	7
12.	Unavailability of Equipment	22	8	52	3
13.	Weak pest management	20	10	50	5
14.	Unavailability of Grading tools	25	5	55	2
15.	Absence of storage	3	27	33	10
16.	Costly storage facility	4	26	34	9
17.	Seed storage facilities at distant area	22	8	52	3

4.4.1 Type of labour required for seed production

Availability of labour required for seed production is a key element which plays an important role in seed production. Seed production requires a good deal of labour skilfulness for meeting the technical requirements appropriately. It can be observed from table 4.16 that labour required for hybrid seed production was of mix nature (skilled and unskilled) depending on the nature of work to be performed at different stages of growth of the plant. It may have been a constraint but only for the short term since the skilled labour could have been viewed with the sustainability of labour for a longer period of time, especially in the business of seed production.

Table 4.16 Categories of labour used by the seed growers for hybrid seed production

Sr. No.	Type of labour	Respondents	Per cent
1.	Skilled	0	0
2.	Unskilled	0	0
3.	Both	30	100
Total		30	100

4.4.2 Availability of skilled labour

Skilled labour is important for the seed production. Skilled labourers were aware of various loopholes of the seed production. Although there was a scarcity of skilled labour in hybrid seed growing areas yet the seed growers conducted the various operations in the fields during the seed production seasons by engaging skilled labour. Table 4.17 revealed that about 97 per cent of the sampled seed growers experienced the scarcity of skilled labour in their areas. In order to address this issue, it was suggested by the majority of the seed growers that on-farm training to the seed grower may be arranged by the department of agriculture or by private seed companies for which they are producing hybrid seeds.

Table 4.17 Response of the seed growers about the availability of skill labourer

Sr. No.	Labour availability	Respondents	Per cent
1.	Easily available	1	3.33
2.	Scarcely available	29	96.67
	Total	30	100

While exploring the problems of the study area related to the seed production, it was expressed by most of the respondents that there was a high degree of difficulties level while producing the hybrid seed, especially in cauliflower and cabbage. Various other problems were also arises during the seed production. Thus, seed production is a difficult task which required quality seed, better inputs, and better technology. Thus, it was revealed from the above discussion that seed production is a difficult task.



SUMMARY
AND
CONCLUSIONS

5. SUMMARY AND CONCLUSIONS

Seed is considered as the most critical input for the production of an agricultural crop. The yield of crop depends upon the type of varieties used. In the market seed of both hybrid and open pollinated are available. The extent of use of hybrid varieties is more prevalent in case of vegetable production. Due to the increasing demand of vegetable seeds, a large number of companies are associated with the production of vegetable seeds. The private seed companies are also motivating the farmers for seed production in Himachal Pradesh. Keeping these factors in consideration the present study has been conducted to check the various problems and perception of the hybrid seed growers and corporate persons of the state. To meet out the objectives of the study, the major hybrid seed producing districts of the state were identified with the help of officials of department of agriculture and private seed companies. Solan, Shimla, Kullu, Sirmaur were identified as main districts where the farmers were producing the seed for the private seed companies. From these districts one district i.e. Solan was selected purposively and the list of villages where seed production was prevalent was prepared. The primary data on demographics feature, seed production technology adopted, problems faced in hybrid seed production was collected from sampled seed growers by personal survey method on specifically designed schedule. The results have been presented by using simple tabular method, averages, percentages, total weightage score method, and chi-square etc. the main findings of the study are as under:

Among the demographics features age, education, experience in seed production, were considered important for the adoption of the seed production activity. It was found that majority of sampled seed growers(70 per cent) were in the age group of more than 45 years followed by the age group of 30-45 years (30 per cent), indicating the direct relation of age with seed production activity. The educational status of the respondents was found to moderate as about 57 per cent of the respondents were matriculate. The percentage of matriculate and post graduates was about 7 per cent. However, about 23 per cent of the sampled seed growers were illiterate. It is the view of the respondents that

education has nothing to do with the seed production. It is the experience which matters in hybrid seed production. The sampled seed grower were also enquired about their experience in seed production, it is found that about 67 per cent of the respondents were having an experience of more than 10 years. The percentage of respondents in the experience range of 3-5 and 6-10 years was 10 and 20 per cent, respectively. The annual income from the seed production was quite good as about 80 per cent of the seed growers were earning income in the range of 51,000 to 3, 00,000. It was reported by the majority of the respondents i.e. 53 per cent that they have been motivated for the adoption of seed production activity by the private seed sellers and relatives, respectively.

The scenario of seed production was analysed from the analysis of trends of area under vegetable. It was found that the area under vegetables has been increased by about 200 per cent which represents the increase in the demand of the hybrid vegetables seed. As far as the production is concerned, it was found that none of the state agricultural universities nor the department of agriculture is producing the seed of hybrid vegetables. Hybrid seed production is primarily done by the private seed companies. There were more than 20 seed companies which are producing the hybrid seed of different vegetables in different parts of the country and distributing the same in the state. A few seed companies like Rasi, Namdhari, Ino-American, etc. has research and seed production unit in Kullu, Solan, Sirmaur districts of the state. The companies were associated with hybrid seed production of tomato, cabbage, cauliflower. It was found that the seed companies has been also associated with the farmers of Solan, Sirmaur, Shimla and Kullu districts for the production of seed of different vegetables. The sampled seed growers were found to produce the seed of cabbage and cauliflower for different seed companies i.e. Rasi, Namdhari, Indo-American etc. It was reported by the seed growers that they were producing the seed of different vegetables and sold to the concerned seed companies on agreed upon prices. The sampled seed growers were enquired about the main reason for adoption of seed production activity. It was the view of about 43 per cent of the respondents that they producing the seed in order to minimize the risks associated with fresh vegetables production. However 57 per cent were of the view that they were in seed production activity mainly due to the suitable climate for seed production. It was the general view of the majority of the farmers that seed production operations were almost

similar to that of the other crops but seed production is little bit technical and requires proper management practices. It was also narrated by the respondents that they follow the package of practices as mentioned by the seed companies. The study of production technology revealed that they have followed requisite practices like raised seed transplanting, plant protection, rouging etc. Since, the sampled seed growers were producing the seeds for the private seed companies. It was found that private seed companies were providing technical guidance, seeds of parent lines, plant protection material etc. It was also reported by the seed growers that 50 per cent of seed companies are also conducting field visits during the crop season in order to monitor the growth of crops on different parameters.

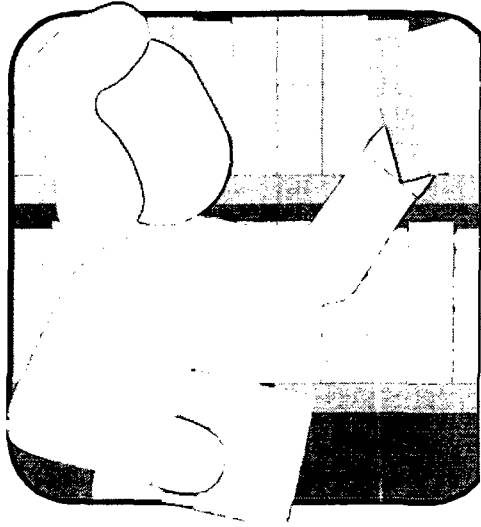
Officials of private seed companies operating in Himachal Pradesh and sampled growers were enquired about their perception regarding the hybrid seed production perspectives. Seed production is viewed as a viable and sustainable option by both the seed companies and Seed growers. About 60 per cent farmers and 70 per cent of company officials feel that climate of the study area is suitable for seed production. More than 70 per cent of the farmers also felt that the demand of hybrid seed is continuously increasing and will also follow the same trends in future.

It was the view of the 68 and 90 per cent of the respondents that the marketing of produce and post-harvest losses are the major concern activities. According to them both these parameters were found to be favourable in terms of future perspectives mainly due to the non-perishable nature of the seed and the marketing is also comparatively easy.

Agriculture by nature is a risky enterprise. It is posed to a large number of problems concerning soil, climate, natural calamities, production, marketing management etc. Hybrid seed production is also one of the commercial activities which are not free from such problems. The extent of problems becomes more acute for farming community particularly in hilly and remote area like Himachal Pradesh. The high cost of inputs like seed/seedlings, fertilizers, plant protection chemicals etc. in the seed production was reported as major problem by the 100 per cent seed growers of the study area. The problem like scarcity of water was rank 3rd. Irrigation was reported to be important factor for the quality seed production. Seed production requires a good deal of labour

skilfulness for meeting the technical requirements appropriately. It can be observed that labour required for hybrid seed production was of mix nature (skilled and unskilled) depending on the nature of work to be performed at different stages of growth of the plant. About 90 per cent of the seed growers reported that both type skilled as well as unskilled labour is required for seed production.

While exploring the problems of the study area related to the seed production, it was expressed by most of the respondents that there was a high degree of difficulties level while producing the hybrid seed, especially in cauliflower and cabbage. Various other problems were also arises during the seed production. Thus, seed production is a difficult task which required quality seed, better inputs, and better technology. Thus, it was revealed from the above discussion that seed production is a difficult task.

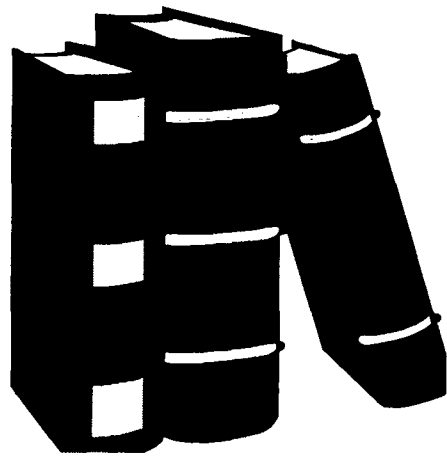


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APPENDICES

APPENDIX-1

Farmers survey schedule

CSK HIMACHAL PRADESH KRISHI VISHVAVIDYALAYA

Title of project: Hybrid vegetable seed production in Himachal Pradesh-farmers and corporate perspectives

- Occupational Experience: i) ≥ 2 year ii) 3-5 years iii) 6-10years iv) < 10 years
 - Age status : i) ≥ 18 years ii) 19-30 years iii) 31-45 years iv) < 45 years
 - Educational Status: i) Metric ii) Senior Secondary iii) Graduate iv) Post graduate or above v) Illiterate
 - Income Status(Annually): i) \geq Rs. 50000 ii) 51000-1 Lakh iii) 1-3 Lakhs iv) < 3 Lakhs
1. Experience of hybrid vegetable seed production: i) ≤ 2 years ii) 3-5yrs iii) 5-10 yrs. iv) > 10 years
 2. Who motivated you for the adoption of hybrid vegetable seed production?
 - a) Department of Agriculture b) Friends/ Relatives c) Seed company d) Seed seller
 3. What were the main reasons for seed production?
 - i) Suitability of climatic condition. ii) High returns iii) Low risk on account of profitability iv) To address the problem of marketing.

5. Name the crops for which you are producing hybrid vegetable seed and technology used for seed production.

Sr. No.	Particulars	Name of crop					
		Cabbage		cauliflower			
		Qty	Var	Qty	Var	Qty	Var
1.	Field preparation						
	Area (Kanal)						
a.	No. of ploughing						
2.	Sowing						
a.	Variety						
b.	Time of sowing						
c.	Methods						
	Manual						
	Mechanical						
d.	Isolation						
	Distance						
	Time						

	Weeding						
	a.)Manual						
	b.)chemical						
c.	Roughing						
d.	Earthening up						
4.	Nutrient management						
a.	FYM						
b.	Compost						
c.	Chemical fertilizers						
	i. Urea						

	ii. Can						
	iii. SSP						
	iv. liquid fertilizers						
5.	Plant protection						
a.	Disease management						
b.	Insect/pest management						
6.	Irrigation						
a.	No of irrigations						
b.	Method of irrigation						
	i. flood						
	ii. Drip						
	iii. Sprinkler						
7.	Harvesting						
a.	Time (month)						
b.	Storage						
	Methods						
8.	Total Production (Kg)						
9.	Postharvest operation						
a.	Drawing						
b.	Grading						
c.	Treatment						
d.	Storage						
e.	Packaging						

4. Do you think that training is necessary for seed production? (Y/N)
5. Have you attended any such training in the field of seed production before entering in Production? (Y/N) if yes
6. What was the duration of training? ----- (days/month)
7. Mention the company/organization/Institution where you got trained -----
8. Do you feel that you need advanced training in this field? Y/N, if yes
9. Where you want to get advanced training? -----
10. Name of the companies for which you are producing seeds?
1) _____ 2) _____ 3) _____ 4) _____
11. Does the company provide technical knowhow/critical inputs for seed production? Y/N
12. If yes, mention the type of assistance rendered by the company

Sr. No.	Particulars	Name of crop					
1	Technical know how						
2	Field visits during production season						
3	Guidance during postharvest management						
4	Provide seeds of parent lines/critical inputs						
5	Provide storage facilities						
6	Plant protection inputs						

13. Do you sale seeds to the local farmer? Give details for different vegetables

S.N.	Particulars						
1	Quantity						
2	Price						

14. Do you think Hybrid seed production is a difficult task? If yes mention why

15. How you manage it?

16. Type of labour required for the hybrid seed production?

1) Skilled 2) unskilled 3) both

17. Is skilled labour is easily available? (Y/N)

If No how you manage it?

18 Is your family members are trained in performing different seed production operations?

19 Whether the seed production technology is traditional or high-tech? and why

20 What are the major factors responsible for hybrid vegetable seed production?

S.N.	Factors	Name of Vegetable					
1	Type of Soil						
2	Climate						
3	Availability of infra-structural facilities						
4	Availability of assured irrigation						
5	Assured seed procurement agency						
6	Availability of Skilled labour						
7	Price of the seed						
8	Storage facility						
9	High returns						

21 Problems faced by the Farmers regarding inputs use

Sr. No	Problems	Response: Y/N	Suggestions
1.	Seed production is highly labour intensive.		
2.	Non availability of skilled labour		
3.	Skilled labour is costly		
4.	Inputs are costly		
5.	Seeds are costly		
6.	Fertilizers are costly		
7.	Insecticides are costly		
8.	Difficulties in maintaining isolation		
9.	Roughing of seed is difficult		
10.	Scarcity of water for irrigation		
11.	Climatic uncertainty		
12.	Difficulties in management of diseases		
13.	Suitable farm tools and equipment are not available		
14.	Insect pest attack on the crop		
15.	Grading equipment are not available		
16.	Scientific storage facilities are not available in the village		
17.	Scientific storage facilities are costly.		
18.	Storage facilities are at distant places		

Brief Biodata of the Student

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QUALIFICATION	BOARD/UNIVERSITY	PERCENTAGE	DURATION
B.Sc.(Hons.) in Biotechnology	H.P University, Shimla	64.40%	2007-2010
10+2(Medical)	H.P Board, Dharmshala	62.40%	2005-2006
Matriculation	H.P Board, Dharmshala	70.8%	2003-2004

Personal Trait

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Mother's Name Smt. Savitri Devi Sharma

Date of birth 31stDecember, 1988

Nationality Indian

Gender Male

Marital Status Single

Languages Hindi, English