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Problems and Prospects of Horticulture in Himachal Pradesh

Abstract

Horticulture is defined as the art and science of cultivating fruits, vegetables, and ornamental plants. In Himachal Pradesh which is a hill state of India, the prevailing agro-climatic conditions, terrain and socio-economic variables are suitable for growing temperate to sub-tropical kind of fruits and vegetables. This has led to an increase in the area under horticulture from 36,795 hectares in 1974 to 2,29,202 hectares in 2017. There has been an upsurge in the production of different kinds of horticulture crops in the state from 1,86,186 metric tonnes to more than 6,11,877 metric tonnes during the same period. This commercialization of horticultural crops has not only augmented the state's economy, but also led to the socio-political and ecological transformation. Horticulture extension has sprung up the multitudinous problems associated with various horticulture operations such as cultivation, transportation, labour, packing, storage, marketing, fertilizers, pesticides, lack of technical know-how and storage etc. Although, such constraints hamper the scientific development of horticulture, but the pragmatic policies of the state government combined with their adoption by the progressive farmers have resulted in transformation of horticulture sector in the state.

The present paper is an attempt to focus on the problems as well as the future prospects of horticulture in the state. The paper has been divided into four parts. Part I deals with general introduction, data and methodology. Part II will focus on the varied problems related to horticulture. The prospects of horticulture form the subject matter of part III. Part IV is devoted to conclusions and policy recommendations.

Keywords: Horticulture, Problems, Prospects, Transportation, Diversification, Marketing

Introduction

The present status of horticulture sector in the state shows a picture of strength, risks and opportunities in view of changes that are taking place in pre-harvesting, harvesting and post-harvesting infrastructure and technology. Agro-climatic conditions of the area are suitable to grow temperate to sub-tropical kind of horticultural crops while the undulating topography of the state is a biggest constraint for infrastructural development in horticulture, which also restrict the use of technology in this sector.

Horticulture extension has sprung up the multitudinous problems associated with various horticulture operations such as cultivation, transportation, labour, marketing, fertilizers, pesticides, lack of technical know-how and storage etc. Although, such constraints hamper the scientific development of horticulture, but the pragmatic policies of the state government combined with their adoption by the progressive farmers have resulted in transformation of horticulture sector in the state.

A number of studies have been conducted by scholars regarding the problems as well as prospects of Horticulture in Himachal Pradesh. A few of them like Bisht (2018), Chandel (1976), Dahiya et. al. (1997) and Negi (1982), need to be highlighted. Bisht (2018) in his article highlighted the demand of Apple grown in Himachal and the tough competition being imposed to the apples imported from other countries. Chandel (1976) studied the horticulture crops in Himachal Pradesh. He discussed the different problems related to different horticulture crops and future prospects of horticulture in the state. Dahiya et. al. (1997) carried out a study on the development of horticulture in Himachal Pradesh. They emphasized on different policies and prospects of horticulture in the state. Negi (1982) studied Horticultural Produce Marketing Technology and Marketing Management where he tries to put emphasis mostly on post-harvest handling of fruit and marketing. However, these studies were not in

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depth and lacked many details. The present paper presents the carries out a study based on the primary data collected, using a well structured questionnaire.

Objectives of the study

Keeping in view the above research reviews, the major objective of the present study is to know the the problems and future prospects of horticulture in the state.

Study Area

The area of present study, is the state of Himachal Pradesh, located in the lap of the Himalayan ranges, situated in north-west India and bordered by Jammu and Kashmir in the north, Punjab in the west and south-west, Haryana in the south, Uttarakhand in the south-east and Tibet in the east. At present the state covers an area of 55,673 sq.kms, administratively divided into 12 districts, 169 tehsils and sub tehsils. Five rivers flow through this hilly state viz. Beas, Sutlej, Ravi, Yamuna and Chenab. The terrain varies as one move from south to north. Consequently, the climate also varies from mild to cold. Himachal Pradesh receives 160 cms average rainfall per annum.

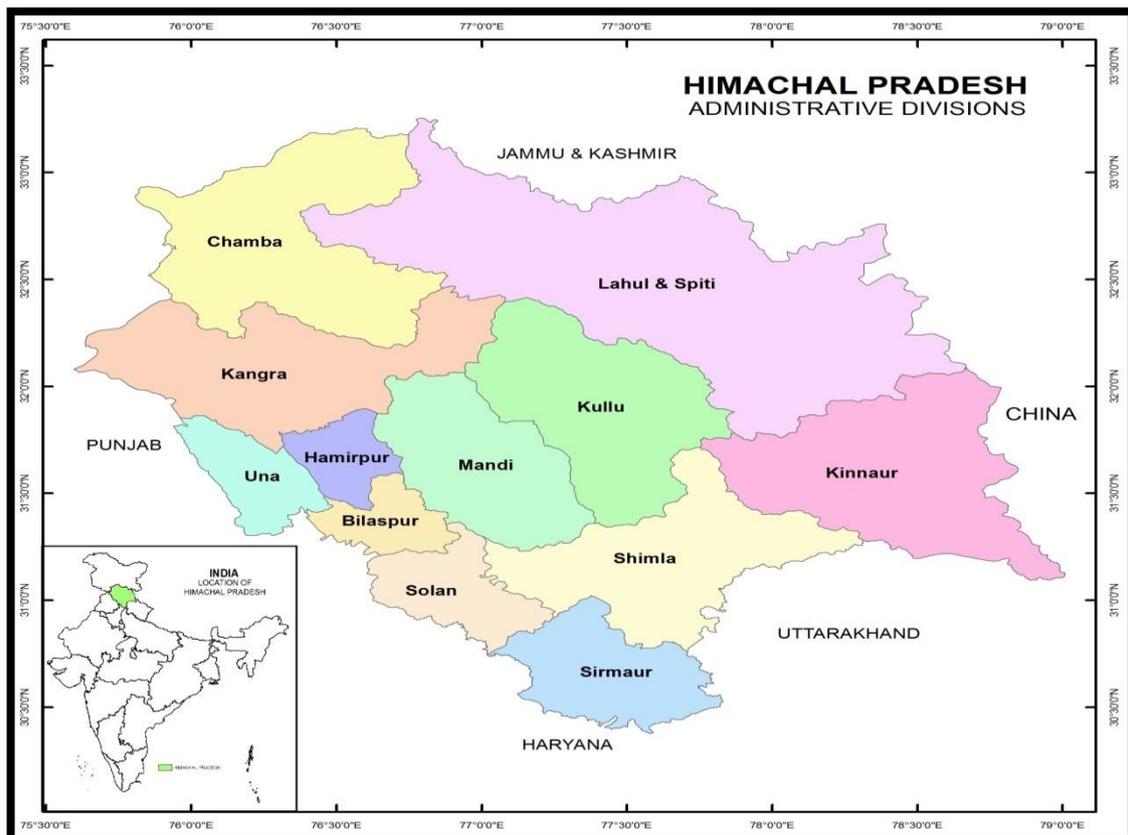
Horticulture has now become an essential part of the economy of the state. The state no doubt

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has earned huge profits from production of horticulture crops but these have not been without a cost. There are a number of problems which the horticulturists have to face from time to time. The prospects of horticulture industry in Himachal Pradesh are indeed very bright, provided the problems are overcome with the joint efforts of the growers and the state government.

Data and Methodology

The data used in the paper is largely primary in nature was collected through field work by interviewing 400 households from 80 sample villages growing horticulture crops belonging to different parts of the state through a well structured questionnaire. A rigorous study of the role of various factors operating at the lowest scale i.e. at the level of a farm has been done. Secondary data has been collected from various government offices from Shimla. The website of Directorate of Horticulture and Agriculture was consulted to collect the data regarding infrastructural facilities available for horticulture in the state.. Statistical techniques have been used for analysing the data and results presented in the form of figures and tables.



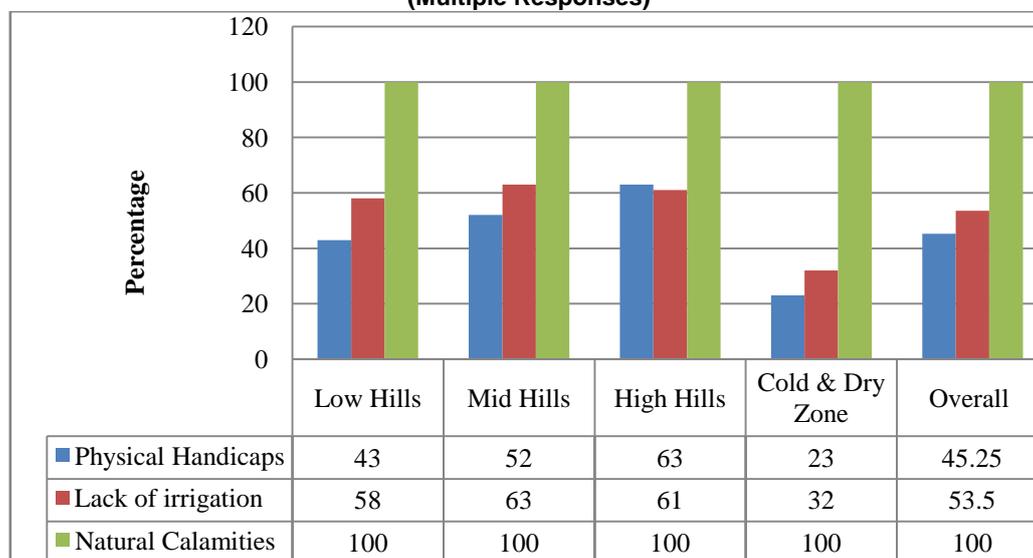
Problems of Horticulture

Horticulture in Himachal Pradesh although has become an integral part of the economy over time yet it suffers from a number of problems that can be categorized as 1) Physical Problems, 2) Social Problems, 3) Economic Problems, 4) Infrastructural Problems and, 5) Institutional Problems.

Physical Problems

The Physical problems of horticulture in the state relate to undulating terrain, lack of irrigation, and natural calamities. These are crucial from horticulture point of view.

Figure- I
Himachal Pradesh: Physical Problems of Horticulture as Perceived by Growers
(Multiple Responses)



Source: Field Work, 2016

Note: Data in percent to the total respondents

As shown in Figure I about 45.2 percent of the respondents have reported that they encountered number of problems due to physical handicaps of the area. The proportion of such farmers is highest in the High Hill Zone (63 percent) followed by Mid Hills (52 percent), Low Hills (43 percent) and Cold & Dry Zone (23 percent). In High Hills and Mid Hill zone altitude of the mountain ranges is high; slope is steep and a large proportion of the area covered with snowfall throughout the year as a result development of infrastructural facility become tougher in these zones. Low Hill Zone which lies in the Shiwalik hills has low altitude but a large number of streams and *choes* cut across this zone and during rainy season these streams and *choes* create havoc in the area and a large part of arable land is washed away. On the other hand, in Cold & Dry Zone altitude is high and climatic conditions are very harsh as compared to other zone but most of the inhabited and cultivated area is along the river valleys, which are at the low height and road network is good as a result less number of the respondents reported the problems due to physical handicaps.

The figure also highlights the lack of irrigation facilities due to which a large number of respondents suffered from the problem of inadequate irrigation in these zones. During field work more than half of the sampled farmers have reported the problem of inadequate irrigation facility in the study area. The proportion of such farmers is higher in the Mid Hills Zone (63 percent) followed by High Hills (61 percent), Low Hills (58 percent) and Cold & Dry Zone (32 percent).

Himachal Pradesh is exposed to various concrete natural calamities which occur almost every year in one part or another. These natural calamities of varying intensity make their impact on society and land including agriculture and horticulture. Floods, excessive rainfall, drought, frost, hail storms,

excessive and poor snowfall and landslides are major natural calamities which create problems for growing horticultural crops in the state. Hundred percent of the respondents in all horticulture zone reported the problem of natural calamities. The extent and intensity of the calamities might vary from area to area but the impact is visible in all parts of the state.

Thus, it was analyzed that inaccessibility due to remoteness of the area is one of the biggest problems for fruits and vegetable cultivators in Himachal Pradesh. Although the extent of the problem varies from one zone to another but this problem still exists in every zone of the study area.

Social Problems

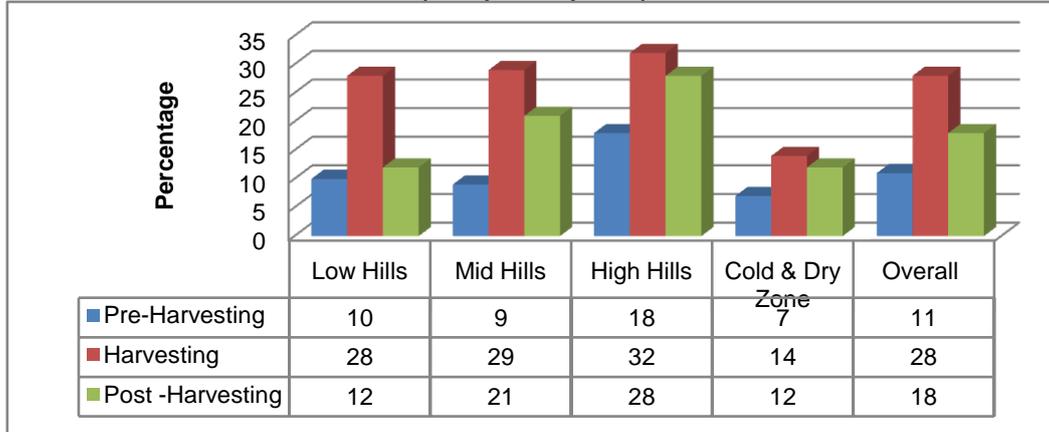
Social Problems include problems related to Labour and Small and Fragmented Land Holdings. Inadequacy of labour at times leads to grievous crisis to the cultivators of horticultural crops. The small and scattered land holdings are the one of the biggest constraint of horticulture development sector in the state. These scattered pieces of land also required extra labour which increase the cost of cultivation of the crops as a result the profit also reduce.

Figure II shows the problem of labour in horticulture sector as per the responses of the sampled farmers. It is evident from the figure that maximum number of the sampled farmers (28 percent) face the shortage of labour during harvesting period. About 32 percent of total respondents of High Hill zone, 29 percent of Mid Hill zone and 28 percent of the sampled growers in Low Hill zone reported shortage of labour during the peak season or harvesting period. At overall level 18 percent of the growers encountered with this problem during post harvesting period. Only 11 percent of the farmers reported the problem of shortage of labour at the time of pre harvesting. Thus, it is inferred from the analysis that the problem of labour shortage was more acute during harvesting and post harvesting period and the

maximum number of the growers facing this problem in High Hill zone and Mid Hill zone. Local labour is not enough to perform all these function so they hire the

migrant labourers from Bihar, Uttar Pradesh, Uttarakhand and Nepal.

Figure- II
Himachal Pradesh: Problem of Labour in Horticulture during different periods as Perceived by Growers (Multiple Response)



Source: Field Work, 2016

Note: Data in Percent to the total respondents

Himachal Pradesh is a land of small and fragmented land holdings. The average size of operational holding in Himachal Pradesh is 1.04 hectares (Economic Survey, 2013-14). The scenario of the fragmentation of land holding among sampled growers in different horticulture zone of the state shows that overall 56 percent of the respondents have reported that their land has been located in 2 to 4 different parts. Fragmentation of land holdings in this range is augmented. In Low Hill zone 43 percent of sampled growers have arable land scattered into 4 to 6 fragments which comprised the highest proportion across all zones, which is ascribed to the increasing population pressure on the land. Physical factors are also playing dominant role in large fragmentation of holdings. Large numbers of *nalas*, streams and *choes* limited the possibilities for land consolidation in this zone. The problem of labour becomes more vivid due to small and fragmented land holdings. In Low Hill and High Hill Zones proportion of semi-medium and medium holdings is relatively higher which caused the less incidences of labour problems but in High Hills and Cold & Dry zones large proportion marginal and small landholdings limits the scope of mechanization and as a result the demand of labour increased which lead to the problem of skilled labour as well as the higher wages.

Economic Problems

Lack of credit and lack of insurance facility are included in the economic problems being faced by

horticulture in the state. Lack of credit is a crucial issue for the horticulture growers of the state. Most of the farmers specifically marginal and small farmers are dependent upon the local money lenders due to their poor economic background. These small cultivators have few assets, so it is not feasible for banks to secure their lending. Hence there is a need to extend the institutional loan to small and marginal land holders to adopt new technology and better agricultural practices.

Table- I
Himachal Pradesh: Problem of Loan in Horticulture as Perceived by the Farmers

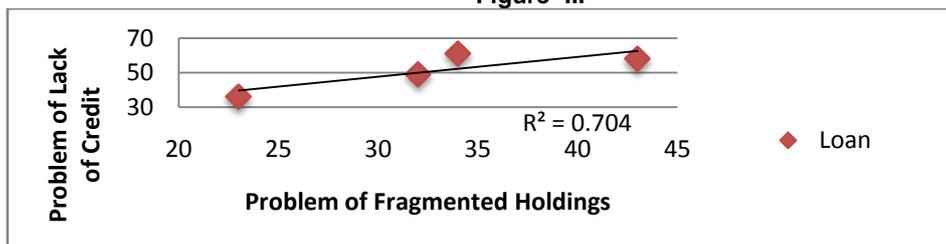
Zones	% of the Total Respondents
Low Hills	58
Mid Hills	61
High Hills	49
Cold & Dry	36
Overall	51

Source: Field Work, 2016

Note: Percentage calculated from the total respondent of each zone.

It is clearly evident from the Table I that overall 51 percent of the respondents still face the problem of lack of credit in Himachal Pradesh. The proportion of such respondents is higher in Mid Hill zone (61 percent), followed by Low Hills (58 Percent) High Hills (49 percent) and Cold & Dry zone (36 percent).

Figure- III



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The proportion of respondents, who reported the problem of lack of credit are increased in those zones where the number of fragmentation is higher, as it is clearly visible from the figure III that there is a strong positive correlation between these two variables. A linear relationship exists between the problem of fragmented holdings and the problem of lack of credit facilities which is ascribed to the fact that management of the fragmented pieces of land needed more workers as well as more capital; hence the farmers with fragmented land holdings required more credit facilities to manage various farm practices.

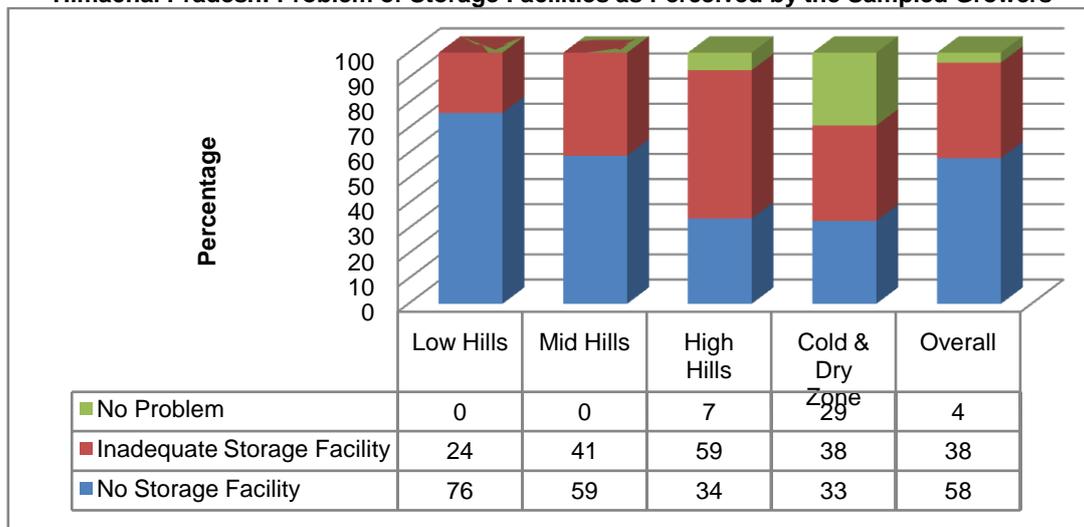
In Himachal Pradesh, natural calamities such as drought, heavy rainfall, heavy or scanty snowfall, hail storms etc. take a heavy toll on horticultural crops. There is a lack of insurance facilities to protect the loss of horticultural crops due to these adverse weather conditions. Since the government has not provided the insurance facilities to all blocks and all crops, hence a large number of the sampled growers were not satisfied with the insurance facilities launched in the state.

Infrastructural Problems

The major infrastructural problems reported by the growers were with regard to packing, transportation, storage, marketing and processing. **Packing** requires skilled labour and durable packing

material. Higher proportion of the sampled growers suffered from the higher prices of the packing material as overall 82 percent of the growers complained about the problem of higher prices. In cold & dry zone 90 percent of the growers felt the same problem, followed by Mid hill zone (86 percent), and Low hill zone (78 percent). Similarly, again in the cold & dry zone highest number of the respondents reported that, they do not get the packing material at desired place. However, moving from the zone of higher altitude to lower altitude the severity of the problem go down. Likewise, a large proportion of the growers in cold & dry zone, reported the problem of delay in the availability of packing boxes while the problem is relatively low in other zones. Supply of packing boxes such as corrugate fiber board cartons and wooden boxes is also a major issue for the horticulture growers in Himachal Pradesh, as overall 33 percent of the respondents complained about the shortage of packing boxes. The problem is more prominent in cold & dry zone, where 51 percent of the growers complained about it. Storage facility is the backbone of the fruits and vegetable supply chain. The shelf life of the horticultural crop can be prolonged by providing proper storage facilities, particularly cold storage facilities. But in the state there is lack of storage facility at producing areas.

Figure -IV
Himachal Pradesh: Problem of Storage Facilities as Perceived by the Sampled Growers



Source: Field Work, 2016

Note: Percentage calculated from the total respondent of each zone

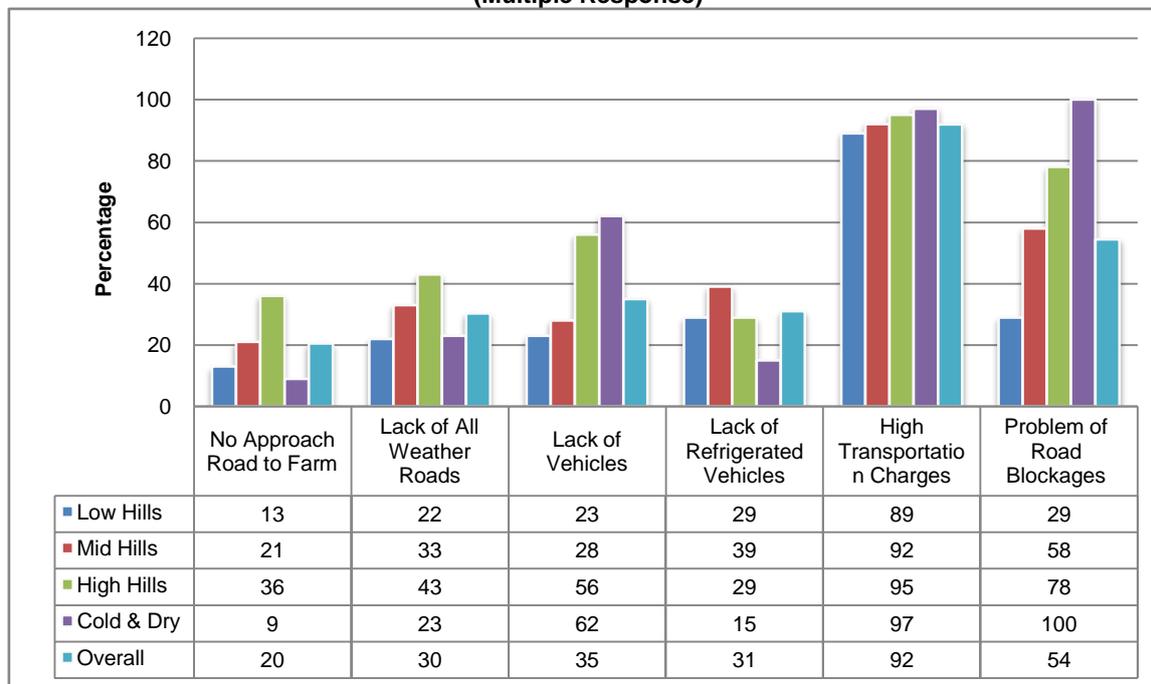
Figure IV shows that in low hills and Mid hill zones the proportion of the growers who complained that there is no storage facility was 76 percent and 59 percent respectively, which is above the overall proportion of the growers; however, in high hill zone and cold & dry zone the proportion of such farmers was below the overall percentage i.e. 58 percent. On the other hand in high hill zone and Mid hill zone 59 and 41 percent of the sampled growers respectively reported the problem of inadequate storage facility while in low hills and cold & dry zone the proportion is below overall percentage of the respondents. Although, a major chunk of the respondents complained about one or other storage related

problem; nonetheless, 7 percent of the sampled growers in high hill zone and 29 percent in cold & dry zone have reported that they are not facing any storage problem. Low hill zone and Mid hill zone are well-known for mango, citrus, peach and tomato production, which are highly perishable; moreover, the climatic conditions of this region are also hot; hence, there is a dire need of cold storage in these two zones. But unfortunately there are only 11 cold stores with a low storing capacity. In high hill zone storage facilities comparatively better than other zones, but still more cold stores required to preserve the apple crop during bumper season to avoid wastage in the market yard. The highest proportion of the

respondents reported that there is no problem of storage in the cold & dry zone although there is no

cold storage in the area which is attributed to the cold climatic conditions of this zone.

Figure- V
Himachal Pradesh: Problems of Transportation for Horticultural Produce as Perceived by the Growers (Multiple Response)



Source: Field Work, 2016

Note: Percentage calculated from the total respondent of each zone

All horticultural produce is perishable in nature; hence, requires prompt transportation, so that fruits and vegetables may reach the consumer well in time and unspoiled.

Figure V shows the problems of transportation in the horticulture sector of Himachal Pradesh. It is clearly visible from the figure that high transportation charges is the major problem in the study area as overall 92 percent of the sampled growers complained about the problem of higher cost of transportation. In cold & dry zone the proportion of such respondents is highest, which comprised 97 percent of the total respondents. While in other zones the proportion of the respondents who reported this problem is relatively low, which is probably attributed to the distance from terminal market and conditions of the road during peak season. Second crucial problem reported by the growers was the blockage of road during peak season, which caused delay in the supply of fruits and vegetables.

Again the problem is severe in cold & dry zone because 100 percent of the respondents encountered this problem during post harvesting period. The problem of road blockage in high hill and Mid hill zone is above the overall figure (54 percent), which indicates that the problem is quite serious in these zones also. While in low hill zone the proportion of such growers is below overall percentage of the growers. This is probably due to the lower elevation and gentle slopes of the low hill zone while in other zones due to steep slopes of the

Himalayan ranges and heavy rainfall during the months of July and August trigger many landslides and debris flow along the roads causing road blockage; consequently the supply of apple from these areas get obstructed during the peak season because July to August is the peak season of the apple harvesting in upper parts of the Mid hill zone, high hill zone and in Kinnaur district of the cold and dry zone and maximum rainfall occurred in these areas during July to August. Besides, some growers encountered the problem of lack of vehicles and all weather roads.

Problem related to marketing i.e. the problem of lack of market intelligence was reported by 87 percent of the growers. They complained about late information regarding the market. Some of them reported that they get the information of only few markets and this information sometimes is very deceptive, consequently the growers get very low price for their produce. The second largest market problem as perceived by the sampled growers was regarding various malpractices prevailing in the market. Most of the growers were discontent with the middlemen, because these people recoup more charges and most of the time delayed the payment.

Institutional Problems

In addition to the above mentioned problems, fruit farming in the state is also affected by inadequate institutional support such as the non-availability of pesticides, sprays and technical know-how. At overall level 46 percent of the respondents reported the

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problem of technical savvy; while 39 percent complained the problem of non-availability of agro-chemicals. In Mid hills and High hill zone the problems of technical know-how and non availability of agro-chemicals are comparatively low which is attributed to the large numbers of plant protection centres and PCDOs which are engaged in disseminating the technical information as well as providing plant protection chemicals. Furthermore most of the research laboratories such as plant tissue analysis laboratories, plant health clinics, biological control laboratories and Horticulture University are located in Mid hill and high hill zone. Secondly, the apple lobby of Himachal Pradesh is very strong which makes pressure on the government for fulfilling their demands. On the other hand in Low hill and cold & dry zones there is lack of such plant protection centres and research labs which is the cause of institutional problems in these area. In case of cold & dry zone lack of accessibility is also responsible factor for such problems.

Prospects of Horticulture

The prospects of horticulture in Himachal Pradesh are brighter. Agro-climatic conditions of the state provide ample opportunities to the farmers to grow a variety of fruits and vegetables.. The scope for diverting culturable waste land for horticulture is more and also being utilized by the growers. The opportunities for diversifying horticulture sector and increasing the productivity by using modern technology are great and being exploited by the government and the growers. Government is providing all possible help to the growers. Fruit processing industry has been established to reduce the post-harvesting loss of horticulture produce. Cultivation of horticulture crops can be enhanced by taking the following steps:

Diversification

In Himachal Pradesh there is a lot of potential and scope in further development as well as diversification within the horticulture sector. Apple, mango, citrus and potato remained the main crops of horticulture for a long period but, due to declining productivity of these crops the farmers of the state also started the cultivation of pomegranate, plum, cabbage, cauliflower and mushrooms. Many new fruits such as cherry, persimmon, olive, kiwi, strawberry, peanut, malta, papaya, guava, aonala, grapes, pomegranate, jackfruits have entered into the horticulture spectrum of the state and State government can promote these fruits to diversify the horticulture of the state.

Improvement in the yield of Fruits and Vegetables

Improvement in the yield of crops has its impact on the prospects and competitiveness of any region in the market. In Himachal Pradesh yield of the horticultural crops is very low; therefore, there is abundant scope for the improvement in the yield of these crops by enhancing the availability of major inputs such as irrigation, agrochemicals, HYV seeds, improved fruit varieties and rootstock, capital in the form of credit and insurance.

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Upgrading of the Existing Processing Units and Setting Up of New Ones

A variety of temperate and subtropical fruits and a large number of off seasonal vegetables are grown in different parts of Himachal Pradesh. Therefore there is a great scope of fruit processing in Himachal Pradesh; although, the state government has already taken some effective steps in this direction to process the procured fruit under Market Intervention Scheme (MIS). There should be more processing units in the state to use the marketable surplus produce during the bumper crop, as a large quantity of the fruits and vegetable go waste during bumper crops and the prices also fall glut in the market.

Improvement in the Present Market System

Horticultural crops are highly perishable in nature, the markets are sparsely spread in the state. Therefore, it is essential to open up new markets in the state to stop prejudice impact on the quality of fruits because of long distance transportation. For the better prospects of the horticultural growth in the study area there is a need to be eliminate the middlemen from present market system, so that a direct link between producer and market could be established.

Making Horticulture Sector, Hi-Tech

Deploying of technology such as sprinkler irrigation, drip irrigation, adoption of precision farming, use of greenhouses, and use of biotechnology in horticulture would bear positive results. Moreover, it is essential to use information technology to provide the near real-time information about the market to the growers so that they could gain optimum earnings from their produce. Furthermore, it is also important to manage the post harvesting handling in a scientific way to avoid damage and wastage of these perishable crops.

Bring Culturable Waste Land under Fruit Crop

In Himachal Pradesh there is a great scope of fruit cultivation on culturable waste land. These lands have not been cultivated during the last five years or more than that due to one reason or other but it is available for cultivation. In Himachal Pradesh culturable waste land accounts around 3 percent of the total geographical area (It is very interesting to note that if this amount of land could be brought under plough then the total share of it will be 19 percent of the total net sown areas).

There is a great scope for expansion of horticultural activities in the state especially on culturable waste land. The lower part of Himachal Pradesh comprising the districts of Una, Hamirpur, Bilaspur, Kangra, Bhatiyattahsil of district Chamba, Solan and Sirmaur has brighter prospects of amplification of fruits area on culturable waste land.

Conclusions and Policy Recommendations

In Himachal Pradesh horticulture which comprise of fruits and vegetables has been suffering from numerous problems since the early 20th century. These problems are responsible for uneven spatial spread of horticulture crops. The study leads to the following conclusions and recommendations:

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Conclusions

1. Difficult physical landscape, harsh climatic conditions, lack of irrigation and natural calamities have been serious problems for people practicing horticulture in the state.
2. The fragmented land holdings and their size has affected the cultivators in negative ways.
3. There is lack of credit facilities in the horticulture sector and also a problem of inadequate insurance facility for horticultural crops which makes the situation more adverse for the growers.
4. There is a lack of infrastructural facilities in and the problem of market intelligence; malpractices prevailed in the market, also there is lack of procurement prices for all horticultural crops. Facility for storage of produce is lacking.
5. Institutional problems exists in all over the state as the number of institutes and research labs which disseminate the technical information regarding various horticulture practices and take care of the supply of various agrochemicals is quite low

Recommendations

1. The problem of fragmented land holdings can be solved by consolidating them.
2. The government should provide refrigerated vans to carry the produce to the market and also sufficient storing facilities to the producers and better infrastructure.
3. The government should take up the task of providing credit facilities and insurance facilities to the growers.
4. More of institutes and research labs for dissemination of information should be set up.

References

1. Azad, K.C., Swarup and Sikka (1998), *Horticulture Development in Hill Areas: A study of Himachal Pradesh*, Mittal Publishers, New Delhi, pp.131-156
2. Chandel, Jagdish, (1976), *Horticulture in Himachal: Problems and Prospects*, An Unpublished M. Phil. Thesis, Himachal Pradesh University, Shimla
3. Department of Economics and Statistics.(2016-17). *Economic Survey of Himachal Pradesh 2016-17*. Retrieved from the Department of Economics and Statistics website: <http://admis.hp.nic.in/himachal/economics>
4. Department of Horticulture (2014, June 26). *Horticulture production infrastructure*. Retrieved from the Department of Horticulture website: <http://hpagrisnet.gov.in/horticulture>.
5. Department of Horticulture(2015-16) *Horticulture development in Himachal Pradesh*Retrieved from the Department of Horticulture website: <http://hpagrisnet.gov.in/horticulture>.
6. Department of Horticulture(2016-17) *Total area underHorticulture in Himachal Pradesh*Retrieved from the Department of Horticulture website: <http://hpagrisnet.gov.in/horticulture>

7. Department of Revenue. (2014, June 16). *Consolidation of Holdings*. Retrieved from the Department of Revenue website: <http://admis.hp.nic.in/hprevenue/Consolidation.aspx>
8. Food and Agriculture Organization of United Nations (FAO). (n. d). *An introduction to horticulture marketing*.Retrieved from www.fao.org/docrep.
9. Kaur, N. (2004). *Diffusion of orchards in Himachal Pradesh*.Unpublished PhD thesis, Panjab University Chandigarh.
10. Mathias, K. (2010). *The Effect of Land Fragmentation on the Productivity and Technical Efficiency of Small Holders Maize Farms in Southern Rawanda*. Unpublished M.Sc thesis, Makerere University, Rawanda.
11. Planning Commission of India (2014).*Himachal Pradesh Development Report*.Retrieved from http://planningcommission.nic.in/plans/stateplan/index.php?state=sp_sdrhp.htm. This File was last Updated/Modified: April 04 2014 17:38:32.
12. Sarswat, S. P., Sharma, M.L., &Vaidya, C.S. (2003).*Production and marketing of peach fruit: A study in Rajgarh area of district Sirmaur in Himachal Pradesh*. AERC, H.P.U., Shimla. Himachal Pradesh.
13. Sharma, R. C. (Ed.). (2006). *Challenging problems in horticultural and forest pathology*.Indus Publishing. New Delhi.
14. Swarup, R. and Sikka, B.K. (1987), *Production and Marketing of Apples (An Economic Study in Himachal Pradesh)*, Mittal Publications, Delhi, pp 1-7 &113-124.
15. The Hill Post. (2013, April 14). *Hill storms batter apple orchards in Himachal Pradesh*. Retrieved from <http://hillpost.in/2013/04/hail-storms-batter-apple-orchards-in-himachal/68184/>
16. The Hill Post. (2018, July 03).*Climate change threat to Himachal needs serious public participation*.Retrieved from <http://hillpost.in/2018/07/Climate-change-threat-to-Himachal-needs-serious-public-participation>.
17. The Weekend Leader.(2014, June 11). *Himachal not to use anti-hail guns to protect crops*. Retrieved from <http://www.theweekendleader.com/Headlines/654/himachal-not-to-use-anti-hail-guns-to-protect-crops.html>
18. Tribune Reporter, (2014, June 1). *Dhauladhar receives fresh snowfall*. The Tribune. Retrieved from <http://www.tribuneindia.com/2014/20140602/himachal.htm>
19. The Hindustan Times, (2018 August 4) .*HP apples giving foreign varieties a run for money*.Retrieved from <http://hindustantimes.com/india-newshimachal-apples-give-imported-varieties-a-run-fo-their-money-in-indian-market/story-GaurvBisht>