



## AN EMPIRICAL ANALYSIS OF AGRICULTURAL DIVERSIFICATION AND FOOD SECURITY IN HIMACHAL PRADESH

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### Abstract

Food security is a measure of the availability of food and individuals' accessibility to it, where accessibility includes affordability. Though a lot of stress is being given on this issue but still it is a major concern in the present millennium. India ranked 76<sup>th</sup> among 113 countries in Global Food Security Index 2018 and 103<sup>rd</sup> out of 119 countries in Global Hunger Index 2018. To cope up with this strenuous situation agricultural diversification has emerged as a curative measure. Agricultural diversification can prove useful in managing food security by assuring availability of food in sufficient quantity and quality. Himachal Pradesh owing to its mountainous geographical set up offers a great variation in agro-climatic situation which offers immense opportunities for agricultural diversification. Himachal Pradesh has more opportunity to increase the agricultural productivity and tough challenges to overcome the gap between food demand and supply. The present study was undertaken for the year 2015-16 to examine the status of agricultural diversification in Himachal Pradesh and estimate the food security from the view point of food availability and extent of gap between demand and supply of food.

The study puts forth that a very low Herfindahl Index (0.22), which implies that the state is highly diversified. It also reveals that the actual availability ( $S_a$ ) of food commodities after kept for seed feed and post harvest losses were 85-80 per cent. The total production ( $S_p$ ), total consumption ( $S_c$ ), actual availability ( $S_a$ ) and supplied through public distribution system ( $S_g$ ) of wheat were 667623 MT, 100143 MT, 567480 MT and 241416 MT respectively. The analysis shows that Himachal Pradesh is almost secured and having ample opportunities and resources to attain food security. High agricultural diversification shows the state has diverse production base and variety of food products. Therefore, the food security can easily achieve in the state. The analysis shows that Himachal Pradesh is almost secured and having ample opportunities and resources to attain food security. High agricultural diversification shows the state has diverse production base and variety of food products. Therefore, food security can easily be achieved in the state.

**Keywords:** Agricultural Diversification, Herfindahl Index, per capita food availability, food security.

### Introduction

Food security is a measure of the availability of food and individuals' accessibility to it, where accessibility includes affordability. Though a lot of stress is being given on this issue but still it is a major concern in the present millennium. According to United Nations, there are nearly 195 million undernourished people living in India, which is a quarter of world's hunger burden. Although food grain production has increased more than five-fold from 50 million tonnes in 1950-51 to about 275 million tonnes in 2016-17, India ranked 76<sup>th</sup> among 113 countries in Global Food Security Index 2018 and 103<sup>rd</sup> out of 119 countries in Global Hunger Index 2018. To cope up with this strenuous situation agricultural diversification has emerged as a curative measure. Agricultural diversification can prove useful in managing food security by assuring availability of food in sufficient quantity and quality. In recent times, the government launched a number of programmes to increase the agricultural productivity. The government has also taken significant steps to combat under-nutrition and malnutrition over the past two decades, such as through the introduction of mid-day meals at schools, anganwadi systems to provide rations to pregnant and lactating mothers, and subsidised grain for those living below the poverty line through a public distribution system. The National Food Security Act (NFSA), 2013, aims to ensure food and nutrition security for the most vulnerable through its associated schemes and programmes. Himachal Pradesh is a predominantly mountainous state situated in the western Himalaya. The total cropped area covers 931862 ha which is 16.74 per cent of total geographical area (55673 Km<sup>2</sup>). Due to mountainous geographical set up there is a great variation in agro-climatic situation which offers immense opportunities for agricultural

diversification. The large numbers of food commodities are produced in Himachal such as cereals, millets, pulses, oil seeds, spices and condiments, vegetables, fruits along with other nutritious commodities like honey and mushrooms. Like India, Himachal Pradesh has more opportunity to increase the agricultural productivity and tough challenges to overcome the gap between food demand and supply. In view of this, the present study examines the status of agricultural diversification and food security in Himachal Pradesh with the following specific objectives:

- (i) To examine the status of agricultural diversification in Himachal Pradesh.
- (ii) To estimate the food security from the view point of food availability and extent of gap between demand and supply of food.

### Material and Methods

The study is based upon secondary data collected for the reference period 2015-16 from Statistical Year Book, Economic Survey and Annual Season and Crop Report of Himachal Pradesh. The information on food requirement was abstracted from food grain consumption pattern estimated by Sharma, et.al (1998), while vegetable, fruits and milk as per recommendation of Nutrition Expert Group, ICMR (1968). The following estimates were made to interpret the results:

The agricultural diversification was calculated by using the Herfindahl Index. The index was used as follows:

$$HI = \sum p_i^2$$

$$p_i = a_i \div \sum a_i$$

Where

$p_i$   
 $a_i$

The proportion of area covered by  $i^{\text{th}}$  crop  
Area covered by  $i^{\text{th}}$  crop

The net supply of food products was estimated from the total production as follows:

$$S_n = S_a + S_g$$

$$S_a = S_t - S_c$$

$$S_c = dS_t$$

Or,  $S_a = S_t - dS_t$

Therefore,  $S_a = (1-d) S_t$

And  $S_n = (1-d) S_t + S_g$

Where

$S_n$  Net supply of food commodities

$S_t$  Total production of food commodities in Himachal Pradesh

$S_a$  Actual supply of food commodities

$S_c$  Total consumed as seed & feed and amount lost in post harvest handling

$S_g$  Food grains supplied under different government schemes

$d$  Proportion(15 to 20 per cent) of produce kept as seed, used as feed or lost in post harvest storage.

Further, per capita availability and food security was assessed. The food security was calculated by the estimation of extent of gap between net supplied and total requirement (total demand) of food in the state as follows:

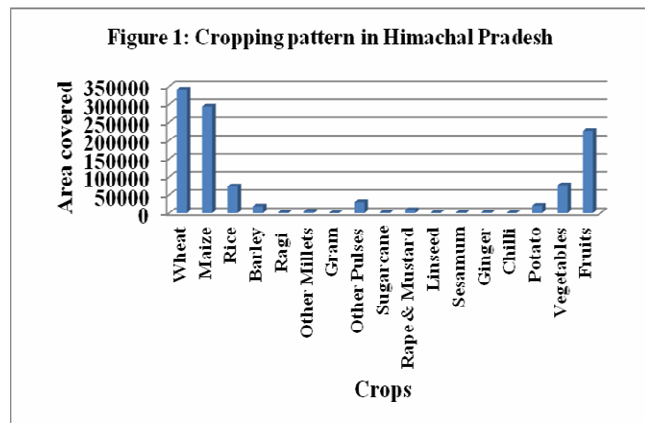
$$\% \text{ gap} = (\text{Net supplied} - \text{Total demand}) * 100 \div \text{Total demand}$$

When; % gap is positive then there is surplus of food grains and negative then there is deficit of food grains in the state.

### Results and Discussion

#### Area and diversification of crops

Himachal Pradesh has wide ranges of agro-climatic condition. The most of agricultural land is spread across valleys with many perennial rivers flowing through them, which provides ample scope for agricultural diversification. Fig.1 shows that the numbers of crops are being grown in Himachal Pradesh because of congenial growing condition.



The table 1 indicates very low Herfindahl Index (0.22), which implies that the state is highly diversified. Almost all cereals are grown in the state, out of them wheat covered maximum area 341048 ha, followed by maize, rice, barley and millets with the area cover 294222 ha, 73685 ha, 19225 ha and 6148 ha respectively. Because of climatic advantage in the state, it is very suitable for fruits and vegetables cultivation. The 226799 ha of land was covered under fruits and 76947 ha under vegetables. The considerable area of land covered under pulses and oil seeds crop with 30600 ha and 11250 ha respectively.

**Table 1: Agricultural Diversification**

Crops	$a_i$ (ha)	$p_i$	$p_i^2$
Wheat	341048	0.308412	0.095118
Maize	294222	0.266067	0.070792
Rice	73685	0.066634	0.004440
Barley	19225	0.017385	0.000302
Ragi	1882	0.001702	0.000003
Other Millets	4266	0.003858	0.000015
Gram	360	0.000326	0.000000
Other Pulses	30240	0.027346	0.000748
Sugarcane	1940	0.001754	0.000003
Rape & Mustard	8590	0.007768	0.000060
Linseed	810	0.000732	0.000001
Sesamum	1850	0.001673	0.000003
Ginger	2276	0.002058	0.000004
Chilli	599	0.000542	0.000000
Potato	21080	0.019063	0.000363
Vegetables	76947	0.069584	0.004842
Fruits	226799	0.205096	0.042064
<b>HI</b>			<b>0.22</b>

#### Supply of food grains through public distribution system (PDS)

The Government supplies the essential commodities through Targeted Public Distribution System (TPDS) which ensures availability of essential commodities like Wheat, Rice, Pulses, Levy Sugar etc., through a net work of Fair Price Shops. In the State, the TPDS, having total ration cards 18,38,036. These card holders are provided with essential commodities through the network of 4,922 fair price shops which constitutes 3,221 Cooperative Societies, 14 Panchayat, 71 Civil Supplies Corporation, 1,609 Individual and 7 Mahila Mandals in the State. Total Rice supplied in the state was 163271 MT out of which 154765 MT has distributed and 80506 MT kept as stock. Total wheat supplied was 241416 MT out of which 231658 MT has distributed and 9758 MT kept for stock. Similarly total pulses supplied, distributed and kept for stock were 32966 MT, 31944 MT and 1022 MT respectively (Table 2).

**Table 2:** Major food grains available through different Govt. Schemes ( $S_g$ ) in 2015-16.

Particulars	Schemes	Rice (MT)	Wheat (MT)	Pulses (MT)
Distributed	APL	65500	130447	
	BPL	16732	17909	
	AAY	61248	83302	
	Annapurna	57		
	MDM	11228		
Total Distributed		<b>154765</b>	<b>231658</b>	<b>31944</b>
Stock	APL	5752	5932	
	BPL	401	671	
	AAY	2351	3155	
	Annapurna	2		
	MDM			
Total Stock		<b>8506</b>	<b>9758</b>	<b>1022</b>
<b>Total Supplied</b>		<b>163271</b>	<b>241416</b>	<b>32966</b>

**Net availability of food grains**

Agricultural commodities are essential commodities which are used for consumption, kept for seed and feed and

other purposes. Out of total production 15-20 per cent of produce kept as seed, used as feed or lost in post harvest storage.

**Table 3:** Net availability of food grains ( $S_n$ ) in 2015-16.

Crops	$S_t$ (MT)	$S_c$ (MT)	$S_a$ (MT)	$S_g$ (MT)	$S_n$ (MT)
Wheat	667623	100143	567480	241416	808896
Maize	737650	110648	627003		627003
Rice	129881	19482	110399	163271	273670
Barley	34333	5150	29183		29183
Ragi	1932	290	1642		1642
Other Millets	3093	464	2629		2629
Pulses	59554	8933	50621	32966	83587
Ginger	33700	5055	28645		28645
Potato	202440	30366	172074		172074
Vegetables	1653506	330701	1322805		1322805
Fruits	928790	185758	743032		743032

Table 3 reveals that the actual availability ( $S_a$ ) of food commodities after kept for seed feed and post harvest lose were 85-80 per cent. The total production ( $S_t$ ), total consumption ( $S_c$ ), actual availability ( $S_a$ ) and supplied through public distribution system ( $S_g$ ) of wheat were 667623 MT, 100143 MT, 567480 MT and 241416 MT respectively. The actual availability of maize, Rice, pulses, vegetables and fruits were 627003 MT, 19482 MT, 50621 MT, 1322805 MT and 743032 MT respectively. Under government schemes 241416 MT of wheat, 163271 MT of rice and 32966 MT of pulses were supplied in the state. Overall net available food were 808896 MT of wheat, 627003 MT of maize, 273670 MT of rice, 29183 MT of barley, 4271 MT of millets, 83587 MT of pulses, 28645 MT of ginger, 172074 MT of potato, 1322805 MT of vegetables and 743032 MT of fruits.

**Per capita availability of food**

The state has a very diverse availability of food grains along with nutritious non food commodities. The quantity of available food does not depict the actual situation of food security, it depends upon the size of population. The per capita availability of wheat, maize and rice were 322.84 gm/day, 250.24 gm/day and 109.22 gm/day. The pulses, vegetables and fruits are major source of nutrients and essential components of food. Per capita availability of pulses, vegetables and fruits were 33.36 gm/day, 527.94 gm/day and 296.55 gm/day respectively. Other nutritious food commodities also available, the per capita availability of mushroom, honey, milk, fish, meat and egg were 2.04 gm/day, 0.11 gm/day, 512 gm/day, 2.79 gm/day, 1.6 gm/day and 0.03 per day respectively (Table 4).

**Table 4:** Per Capita Food Availability in 2015-16

Commodities	$S_n$ (MT)	Per Capita Availability (gm/day)
Wheat	808896	322.84
Maize	627003	250.24
Rice	273670	109.22
Barley	29183	11.65
Millets	4271	1.70
Pulses	83587	33.36
Ginger	28645	11.43
Potato	172074	68.68
Vegetables	1322805	527.94

Fruits	743032	296.55
Mushroom	5103	2.04
Honey	264	0.11
Milk	1283000	512.06
Fish	6981	2.79
Meat	4005	1.60
Egg (Million)	81	0.03

### Food security

The extent of gap between the net supply and total requirement of food commodities shows that the state was having surplus availability of food commodities except rice

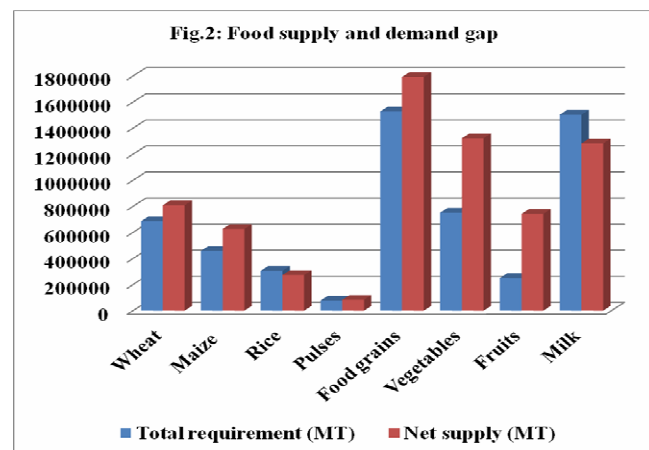
and milk. The net supply of wheat was more than maize but surplus of wheat was lesser than maize because the preference of maize as a coarse grain was going to decline.

**Table 5:** Food Security in 2015-16

Commodities	Per capita requirement (g/day)	Total requirement (MT)	Net supply (MT)	% Surplus (+) or deficit (-)
Wheat	274	686529	808896	15.13
Maize	183	458521	627003	26.87
Rice	122	305681	273670	-11.70
Pulses	31	77673	83587	7.08
Food grains	610	1528404	1793155	14.76
Vegetables	300	751674	1322805	43.18
Fruits	100	250558	743032	66.28
Milk	600	1503348	1283000	-17.17

Note: Food grain consumption pattern estimated by Sharma, et. al (1998), while vegetable, fruits and milk as per recommendation of Nutrition Expert Group, ICMR, 1968

Table 5 reveals that the state was very rich in fruits and vegetables the per cent surplus of vegetables and fruits were 43.18 and 66.28 respectively.



The Fig. 2 clearly depicts the deficit supply in case of rice as well as milk. Because of hilly terrain and low livestock productivity, there was deficit of rice and milk respectively.

### Conclusions

The analysis shows that Himachal Pradesh is almost secured and having ample opportunities and resources to attain food security. High agricultural diversification shows the state has diverse production base and variety of food products. Therefore, the food security can easily achieve in the state. To achieve food security government plays an important role and supplied considerable amount of food commodities to the state through PDS. The per capita availability of food has been appreciably higher than the minimum requirement. The extent of gap between demand and supply of food commodities shows the strong food

security in the state. Keeping in view the dietary pattern as well as the recommendations made by ICMR, the state is surplus in wheat, maize, pulses, vegetables and fruits but deficit in rice and milk. Therefore, emphasis should be laid on promoting the processed products of surplus food commodities to increase further production. Besides that emphasis should be laid on ensure irrigation facility to increase the productivity of rice and improve the feed and fodder production through surplus food grains especially from maize which is surplus that will help in decrease the deficit of milk.

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