Asian Journal of Managerial Science
ISSN: 2249-6300 (P) Vol.11 No.1, 2022, pp.23-28
© The Research Publication, www.trp.org.in
DOI: https://doi.org/10.51983/ajms-2022.11.1.3098

Farm Size and Agricultural Productivity: A Study of Low Hill Zone of Himachal Pradesh

Sikander Kumar[1] and Kishor Kumar[2]
[1]Hon'ble Vice Chancellor, HP University, Shimla, Himachal Pradesh, India
[2]Assistant Professor, Department of Economics, HPU Regional Centre, Dharamshala, Himachal Pradesh, India
E-mail: sikanderkumar2010@redifmail.com, kishorbhardwaj076@gmail.com
(Received 7 March 2022; Accepted 20 April 2022; Available online 3 May 2022)

Abstract **- The relationship between size of holding and productivity has been the subject of study since the result of farm management investigations. The present paper also makes an attempt to examine the relationship between operational holding, gross value of output and value of major inputs used in the production of selected field crops. In addition to this, net returns across different farm sizes have also been examined. The results obtained from the study pointed out that there exists inverse relationship between the operational holding and productivity on maize crop, whereas, constant productivity relationship was observed on paddy and wheat crops. When all these crops were taken together, inverse relationship between the two-hold true. In respect of profitability, only small farmers are able to convert to their output advantages into net profitability by taking all these crops together. The important policy implications of the analysis is that consolidation of land holdings, formation and effective implementation of a development strategy and management of basic economic holding in the study area will undoubtly of primary importance to boost agricultural production, productivity and profitability thereby enhancing the productive employment and well-being of farm families.**
Keywords: **Farm Size, Agricultural Productivity, Low Hill Zone, Himachal Pradesh**

I. INTRODUCTION

The population of our country is increasing very fast leading to decline in land-man ratio and expansionary demand for food grain production. But as the demand for food increases as a result of population growth, the farmers try to produce more to maximize total farm output and farm business income by using more of better inputs like irrigation, HYV seed, fertilizer, etc. in order to fulfill the increasing demand, it has been argued that small farms are more efficient in producing most of the agricultural commodities. Over the past years in India, substantial progress has been made in respect of the performance of agriculture system which relies more on abolishment of intermediaries, security of tenants and ceiling of land holdings. But in order to formulate the proper policy regarding land reforms, it is equally important to know the exact relationship between farm size and productivity in Indian farming. The new agricultural strategy which is introduced in the mid sixties in our country has caused considerable changes in the trend of area, production and productivity. Though this strategy is confined to a few crops and not with the same vigor in all parts of the country, it favours large farm bias, however up to a limited extent. It is argued that new agricultural strategy has displaced the importance of family labour which was considered to be the main determinant of inverse relationship between farm size and productivity. The use of chemical fertilizers, HYV seeds, irrigation facilities along with other infrastructural facilities, process of liberalization, change in tenancy relations, replacement of share tenancy with fixed rent tenancy etc., have profound implications in favour of large farm bias. It is in this background; the present study was undertaken to examine whether farm size is an important factor to determine productivity. An attempt has also been made to find out the relationship between farm size and inputs use in selected crops across different categories of farms in the low hill region of Himachal Pradesh.

II. DATA BASE AND METHODOLOGY

For the purpose of collecting data, the entire state was divided into three agro-climatic zones viz., low-hill, and mid-hill and high-hill zones based on the height above the mean sea level. By considering the similar agro-climatic conditions having good production potential, fertile soil, good roads and communication network, production of major food crops viz., maize, paddy and wheat, low hill zone purposively selected out of which two blocks namely Una and Gagret have been selected from district Una. Una block represented the most progressive and leading area in adoption of improved farm technology whereas, Gagret block represented a mixture of both traditional and improved farm technology. There are 5 blocks in district Una. Out of the 5 blocks, 2 blocks were selected i.e. Una and Gagret, with the help of multistage random sampling which constitute nearly 40 per cent sample at the block level. At the second stage, 3 Panchayats in each selected block were selected. At the third stage, 4 Villages in each selected Panchayat were selected. In addition to this, the selected categories of farms have further been divided into three size-classes viz., marginal farmers (below 1.0 hectare), small farmers (1-2 hectares), and medium farmers having more than (2 hectares). The data pertaining to the year 2013-14 were collected by survey method with the help of well-structured schedule from 200 farms consisting of 90 marginal, 70 small and 40 medium selected randomly on the basis of probability proportional to the number of farms in

each size class pertaining to the year 2013-14. Due to non-availability of data on some minor crops such as pulses, mustard, gram etc. we have concentrated in our analysis the size productivity relation of major food grain crops viz., maize, wheat, paddy and when all these crops were taken together. The most of the earlier studies have taken into account the gross value of output of all the crops grown as a measure of productivity but for the present study it was also considered appropriate to analyze the productivity of individual crop against holding size. The relationship between the two was worked out by fitting the log-linear equation with net operated area as endogenous and gross value of individual crops as exogenous variable as well as when all the crops as exogenous variable as well as when all the crops (maize+wheat+paddy) were considered together. More specially, the following log-linear equation was fitted to the data

Y= aX1b1eu
In the log form
Log y = log a+b1 logX1+u
Where,
Y= Gross value of output of respective crop (Rs.)
X1= Size of the operational holding (Hectare)
b1= elasticity coefficient
u= error term

In order to test the statistical validity of the relationship between farm size and productivity we have made the following hypothesis.

1. The null hypothesis, H0= There exists no relationship between farm size and productivity as b1=1.
2. The alternative hypothesis, H1= There exists positive relationship between farm size and productivity as b1>1.
3. The null hypothesis, H2= There exists negative relationship between farm size and productivity as b1<1.

In addition to this, the difference in the means of gross value productivity of different crops and mean inputs use between different categories of farms was tested with the help of appropriate statistical tools. The effect of farm size on inputs use estimated with the help of following regression equations:

Log H= log a+b1 logX1+u --------- (i)
Log M= log a+b1 logX1+u --------- (ii)
Log BTC= log a+b1 logX1+u -------- (iii)
Where,
H= per hectare labour use and is sum of family and hired-in labour.
X1= Farm size
M= Value of manure & fertilizer per hectare
BTC= Bullock labour& tractor charges per hectare
b1= Regression coefficient
u= Error term
a= Intercept term

III. LITERATURE REVIEW

A number of studies have studies have been conducted by Indian economists but a very few attempts have been made to study the relationship in the area where some natural factors stand in the way of adoption of modern packages of practices and introduction of intensive cultivation due to geographical and agro-climatic conditions. It may be categorically stated that no such studies on farm size and productivity relationship has been conducted in low hill zone. The debate on the possible relationship between farm size and productivity was started by A.K. Sen (1962) in india and later on joined by Khusro, A.P. Rao, Rudra, Hanumanta Rao, G.R. Saini and others. Majority of the studies pointed out that there exist an inverse relationship between the farm size and productivity. (Krishna, 1964, p. 87), (Sharma, 1971, p. 543), (Sankhyan, 1978, p. 773), (Saini, 1979, p. 108), (Sekar *et al.*, 1994, p. 859), (Chattopadhya *et al.*, 1997, p. A172) and (Sharma & Sharma, 2000, p. 605) are pioneering in this regard, though they offered different explanations in favour of inverse relationship.

On the other hand, a few studies conducted by (Nagraja & Bathaiah, 1985, p. 221) and (Reddy, 1993, p. 634), showed that inverse relationship between the two has disappeared with the advent of new agricultural strategy which involves HYV seeds, chemical fertilizers, labour saving machinery, modern irrigation equipments etc. However, the studies made by (Rao, 1967, p. 1989), (Rani, 1971, p. 89), in case of wheat crop indicated that productivity remains constant irrespective of the difference in holding sizes.

Study conducted by (Chand, 1996, p. 652) and (Kumar, 2011, p. 278) revealed that in spite of an inverse relationship between both there is a vast scope for raising income and productivity by diversification through tomato crop, which is most important among all vegetables is possible through appropriate improved infrastructure. (Wani, 2011, p. 64) highlighted that problem and prospects of mountain agriculture have responsible for this type of inverse relationship. In sum, the debate on this controversial issue continues to be a moot point in Indian agriculture.

IV. RESULTS AND DISCUSSION

In this section, we shall examine the statistical basis of the inverse relationship between farm size and productivity and its connection with patterns of resource use on farms. Before going into the analysis of farm-size productivity relationship, it would be useful to have an idea of the basic characteristics of the study area across different farm size categories. These characteristics are presented in Table I in terms of family size, farm size, cropping intensity, household income, average propensity to consume etc., indicated that there are wide variations across different farm size categories. It is noted that average family size came out to be about 6.13. It is increasing with the holding size. Overall percentage of workforce is estimated to 59.95 per

cent of total sample population which is engaged in various economic-activities.

The literacy level is found more on medium holding groups as compared to their counterparts due to their better financial position and willingness to education to get good opportunities in other occupations. Overall literacy rate is worked out to be 72.10 per cent. Similarly, sex-ratio is found to be 91 females per 100 males. The ratio is found less on small and medium holding groups. During the survey period it is found that educated unemployment have put pressure on the boys of age group between 20-30 year remain yet bachelor which slightly is not in the favours for sex-ratio on small and medium groups. On the other hand, a person who have 2 or 3 shareholders, after marriage get separation from the parental home and owns a title of marginal farmer which slightly favors sex-ratio in this holding group. Size of holding is worked out to be 1.446 hectares. It is also clear from the table that cropping intensity is increasing with the increase in farm size indicating more use of available land for agricultural purpose. Similarly, value of all minor and major agricultural implements per farmer is worked out to be Rs. 27817.

The per household per month income and consumption expenditure is estimated about Rs. 16808 and Rs. 13127 respectively indicating a surplus of Rs. 44172 per annum which can be utilized to improve the land productivity. The overall value of livestock is worked out to be Rs. 17062 and is increasing with the increase in farm size. The average propensity to consume is less than one on small and medium farms indicating higher capacity to save whereas it is greater than one on marginal farms indicating lower capacity to save.

A. Farm Size and Productivity

Gross returns of maize, wheat, paddy and all crops are given in Table II. The data indicated that the gross returns from maize, paddy, and wheat as well as all crops are significantly higher on marginal farms as compared to the small and medium farmers in 2013 and 2014. To examine the effect of farm-size productivity of different crops, log-linear regression was done. The result of regression analysis presented in Table III. It gives the figures of farm-productivity relating to all crops together viz., maize, paddy and wheat in 2013 as well as in 2014. It can be seen from the table that out of total farms in 2013 i.e. 542,247 are marginal, 175 are small and 120 are medium while in 2014, out of 508, 230 are marginal, 176 are small and 102 are medium farms respectively. By considering all farms together, in 2013 the regression coefficient turns out to be 0.96 whereas, in 2014, it is 0.94 which is less than unity. Again, the test of significance of deviation from unity confirms the relationship between operational holding and productivity at 10 percent level of significance in 2013 and 2014. The inverse relationship may be attributed to more intensive use of inputs particularly human labour, fertilizer, manure and bullock labour on a certain range of area operated by marginal farmers. The intensity and use of these inputs declines with the increase in holding size. The number of cultural operations also declines with the increase in holding size. Thus, the difference in the major input use on different categories of farms is responsible for this inverse relationship between operational holding & productivity.

Size-wise analysis reveals that the coefficient of land turns out to be greater than unity for marginal farmers and statistically also significant at 5 per cent probability level confirms the positive relationship between operational holdings & productivity in both of year i.e. 2013 and 2014 respectively. It may be due to the fact that marginal farmers have to operate less area and the level of input use by these farmers such as human labour, intensity of cultivation, manure & chemical fertilizer, bullock labour, cultural practices etc. is quite high as compared to other categories of farm. Larger dose of these factor inputs on these farms is expanded not on one crop alone but on more than one crop grown during the period of production of these crops on the area.

This may further explain the higher productivity per hectare on the farms. Contrary, to this, elasticity coefficient in 2013 and 2014, for small and medium farms, turns out to be (1.056 & 1.153) which is greater than unity and (0.980 & 0.976) which is less than unity respectively. But these regression coefficients are not statistically different from unity revealing constant size productivity relationship on these farms. It means that productivity remains constant irrespective of operational holding. But if one gets constant productivity relationship on the basis of gross cropped area, the results will still be constant with inverse relationship between farm size and productivity. Productivity is defined in terms of hectare under the operational holding. Thus, by and large, inverse relationship between farm size and productivity is a confirmed phenomenon in the area under study.

B. Farm Size and Input Use

For the purpose of analyzing the relationship between farm size and productivity, we have also tested the relationship between farm size and input use of some of the important inputs viz., human labour, bullock labour & tractorization and manures & fertilizers, as it is presumed that higher productivity on small sized farms may be due to more intensive use of inputs, particularly mentioned above.

The information regarding total cost and input structure per hectare is provided in Table IV. The total cost has been calculated by adding the costs of major food grains viz., maize, paddy and wheat. Taking first the overall position, it can be seen from the table that in terms of percentage as well as in absolute terms, the lion's share of cost is human labour followed by rental value of owned land. The cost of cultivation is a little over Rs. 56646 per hectare in 2013 and about Rs. 96423 in 2014. Human labour and rental value of

land account for about Rs. 33950 i.e; about 60 per cent of the total cost C and these same costs are Rs. 56642 which is about 59 per cent of the total cost C in 2014. The other major item of expenditure on farm is FYM, chemical fertilizers, tractor charges accounting for 18 per cent of the total cost C in 2013 and 26 per cent in 2014. As regards the input structure between the farms in different size classes, the total cost per hectare has a tendency to decline with the increase in holding size. The cost of family labour also shows a declining trend both in absolute as well as percentage terms. The same can be seen in case of FYM and interest on working capital. Use of hired-in labour, chemical fertilizer and tractor charges increases with the increase in land holding in percentage terms. The out-of-pocket expenses i.e. the cost A1 increases with the increase in farm size in percentage term while it shows a declining trend in absolute terms. It is little above one-third of the total respective cost C in 2013 and very close to one fourth in 2014 on all farm size categories. In 2013, the total cost C has calculated about Rs. 72606, Rs. 54252, and Rs. 49866 while in 2014 these are Rs. 110579, Rs. 87581 & Rs. 83203 on marginal, small and medium farms respectively indicating declining tendency with the increase in farm size. As far as bullock labour, seeds, depreciation, land revenue and irrigation charges are concerned, the trend is erratic.

TABLE I BASIC CHARACTERISTICS OF SOME SELECTED INDICATORS

Sl. No.	Indicators	Size Class of Holdings (in Hectares)			
		Marginal Holdings	Small Holdings	Medium Holdings	Overall Holdings
1	Average Family Size	5.90	5.86	7.13	6.13
2	Percentage of work force	60.82	62.20	55.08	59.95
3	Percentage of dependants	39.17	37.80	44.91	40.04
4	Literacy percentage	74.20	62.93	81.40	72.10
5	Sex Ratio (Per 100 males)	97	87	85	91
6	Size of Holding (Hect.)	0.833	1.490	2.752	1.446
7	Cropping Intensity	192.83	209.74	222.28	210.11
8	Value of Agricultural implements (Rs.)	19817	40990	42463	27817
9	Value of livestock (Rs.)	14277	16128	20784	17062
10	Household income per month (Rs./ Household)	10682.18	16904.41	22838.41	16808.33
11	Household Expenditure per month (Rs./ Household)	11218.09	10304.64	17858.75	13127.16
12	Average Propensity to Consume	1.05	0.78	0.78	0.78

Source: Field survey, 2013-14

TABLE II FARM SIZE AND GROSS RETURNS OF DIFFERENT CROPS

(Rs. per Hectare)

Sl. No.	Crops	Farm Size (Gross Returns)							
		Marginal Farmers		Small Farmers		Medium Farmers		Overall Farmers	
		2013	2014	2013	2014	2013	2014	2013	2014
1	Maize	17291.71	48884.45	14756.08	45660.95	12524.39	42614.54	14478.70	45719.98
2	Paddy	30359.78	49650.25	25829.04	44625.85	22080.69	43244.65	25322.22	45840.25
3	Wheat	19831.94	56445.45	17302.24	48491.42	15147.53	41977.78	16987.41	48971.55
4	All Crops	67483.43	154980.15	57887.36	138778.2	49751.92	127836.97	56758.33	140531.78

Note: Gross Returns or Gross Revenue i.e. gross Value of output (main+ by-product) at farm harvest prices from respective crop enterprise

TABLE III FARM SIZE AND PRODUCTIVITY RELATIONSHIP IN ALL CROPS: RESULTS OF REGRESSION ANALYSIS

Sl. No.	Size of Holdings	No. of observations		Constant log A		b^1 (coefficient)		't' value of deviation of b^1 from unity		R^2	
		2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1	Marginal Holding	247	230	4.34	4.24	1.09**	1.22**	2.30	2.92	0.73	0.76
2	Small Holding	175	176	4.25	4.33	1.056	1.153	0.97	0.99	0.63	0.68
3	Medium Holding	120	102	4.17	4.17	0.980	0.976	-0.35	-0.37	0.71	0.73
4	All Holdings	542	508	4.22	4.17	0.96***	0.94***	-1.80	-1.69	0.79	0.86

Note: * Significant at 1 per cent level. ** Significant at 5 per cent level *** Significant at 10 per cent level

TABLE IV INPUT USE ON DIFFERENT CATEGORIES OF FARMS

(Rs. per Hectare)

Sl. No.	Items	Farm Size							
		Marginal Farmers		Small Farmers		Medium Farmers		Overall Farmers	
		2013	2014	2013	2014	2013	2014	2013	2014
1	Value of Hired-in Labour	1055.03 (1.45)	2526.00 (2.28)	1789.35 (3.29)	4948.50 (5.65)	3077.01 (6.17)	7717.50 (9.28)	2059.81 (3.63)	5064.00 (5.25)
2	Value of bullock labour (owned+hired-in)	5145.18 (7.09)	-----	3907.56 (7.20)	-----	3051.16 (6.11)	----	3852.7 (6.8)	-----
3	Value of Seeds (Homegrown+Purchased)	1819.19 (2.51)	2130.40 (1.93)	1571.67 (2.89)	1449.24 (1.65)`	1503.91 (3.01)	1340.80 (1.61)	1608.38 (2.83)	1640 (1.70)
4	Value of FYM (owned+purchased)	5635.33 (7.77)	7625.20 (6.90)	3537.47 (6.52)	4966.40 (5.67)	2851.57 (5.71)	4097.20 (4.92)	3716.86 (6.56)	7722.80 (8.0)
5	Value pf chemical fertilizer	2381.49 (3.28)	3595.86 (3.25)	1840.32 (3.39)	2548.14 (2.91)	1897.31 (3.80)	2633.22 (3.16)	1975.98 (3.48)	2925.72 (3.03)
6	Insecticides & pesticides	308.57 (0.42)	416.70 (0.38)	154.53 (0.28)	183.15 (0.21)	265.19 (0.53)	357.80 (0.43)	228.66 (0.40)	304.22 (0.32)
7	Irrigation charges	5.96 (0.008)	10.51 (0.009)	8.84 (0.01)	13.74 (0.016)	5.36 (0.01)	15.99 (0.02)	6.78 (0.01)	20.52 (0.02)
8	Threshing charges	1882.0 (2.60)	1894.50 (1.71)	1658.69 (3.05)	1485.30 (1.70)	1489.82 (2.98)	1353.30 (1.63)	1638.78 (2.89)	1577.70 (1.64)
9	Tractor/ machinery charges (owned+hired-in)	4942.29 (6.81)	14854.67 (13.43)	4579.92 (8.44)	14616.19 (16.69)	4777.71 (9.58)	14595.10 (17.54)	4739.9 (8.36)	14688.65 (15.23)
10	Depreciation charges	562.56 (0.77)	1687.68 (1.53)	279.15 (0.51)	837.45 (0.96)	203.89 (0.40)	611.67 (0.74)	310.27 (0.54)	1045.6 (1.08)
11	Interest on working capital	2285.15 (3.15)	5027.33 (4.55)	500.66 (0.92)	1101.45 (1.26)	329.83 (0.66)	725.26 (0.87)	817.82 (1.44)	2284.68 (2.37)
12	Land Revenue	6.34 (0.008)	12.05 (0.01)	19.26 (0.03)	36.59 (0.042)	20.47 (0.04)	38.89 (0.047)	16.63 (0.02)	29.18 (0.03)
13	Miscellaneous charges	809.09 (1.11)	1618.18 (1.46)	373.87 (0.68)	747.74 (0.84)	401.95 (0.80)	884.27 (1.06)	480.74 (0.84)	1083.40 (1.12)
	Cost A1	26839.04 (36.97)	41399.08 (37.44)	20221.89 (37.27)	31484.65 (35.95)	19875.18 (39.85)	34371 (41.31)	21443.31 (37.86)	38386.47 (39.81)
14	Rent on leased-in land	---	---	---	--	---	---	---	---
	Cost A2	26839.04 (32.97)	41399.08 (37.44)	20221.89 (37.27)	31484.65 (35.95)	19875.18 (39.85)	34371 (41.31)	21886.92 (38.64)	38386.47 (39.81)
15	Rental Value of owned land	12147.0 (16.73)	30367.5 (27.46)	10419.71 (19.20)	26049.28 (29.74)	8955.46 (17.95)	22388.65 (26.91)	10216.49 (18.03)	26268.48 (27.24)
16	Imputed Value of owned fixed capital	928.61 (1.28)	1439.95 (1.30)	745.97 (1.37)	1308.20 (1.49)	809.61 (1.62)	1432.89 (1.72)	809.17 (1.42)	1393.68 (1.45)
	Cost B	39914.65 (54.97)	73206.53 (66.21)	31387.57 (57.85)	58842.13 (67.19)	29640.25 (59.43)	58192.54 (69.94)	32912.58 (58.10)	66048.63 (68.49)
17	Imputed Value of family labour	32691.03 (45.03)	37372.50 (33.80)	22865.35 (42.14)	28739.20 (32.81)	20225.91 (40.56)	25010.40 (30.06)	23724.31 (41.89)	30374.03 (31.50)
	Cost C	72605.68 (100.00)	110579.0 (100.00)	54252.92 (100.00)	87581.33 (100.00)	49866.16 (100.00)	83202.94 (100.00)	56646.69 (100.00)	96422.66 (100.00)

Note: Figures in the Parentheses are percentage to respective column total

V. CONCLUSION

To sum up, the inverse relationship between the farm size and productivity was observed in maize crop whereas, constant productivity was observed in case of paddy and wheat crops. When all the crops taken together, the inverse relationship between farm size and productivity per hectare holds true on the basis of gross cropped area. As between the farms, the positive relationship between the two was on marginal holdings and constant productivity was observed on small and medium holding groups. Even if one gets constant productivity relationship on the basis of gross cropped area, the inverse relationship between farm size and productivity per cultivated hectare holds. The inverse relationship between the farm size and productivity may be due to the overwhelming importance of human labour in the production process, a dependence on farm-yield manures for retaining and enhancing soil fertility. Primitive labour-intensive methods of cultivation, a virtual absence of markets in some inputs (e.g. farmyard manure), lack of irrigation facilities and inverse relationship between the intensity of some inputs with the farm size etc. The study also indicated that per hectare labour input varies inversely with the size of holding in each crop; however, there was no much striking difference between the small and medium holdings as regard the use of labour. Crop-operation wise also, it was the intercultural operation which was found to be more labour intensive followed by land-preparation and

transporting. The use of more labour transporting was due to the distance from house to small and fragmented holdings.

The case of hired-in labour and hired-out labour was found only during the peak seasons when farmers are obliged to hired-in labour to supplement their own labour to complete the various activities associated with crop cultivation well in time. The bullock labour was only used in 2013 by the farmers of the study area but in 2014 not any one farmer was found that used bullock labour for the cultivation due to the introduction of modern technology. The use of bullock labour was more on maize crop (13 days) as compared to paddy (12 days) and wheat crop (7 days). As between the farms in different size-classes, the per-hectare bullock labour input had a tendency to vary inversely with the size of holding in the cultivation of all crops as well as each crop except wheat cultivation where small farmers were using less of it. The use of bullock labour is substitutable to tractorization in some crop operations viz., land preparation and sowing activities however, up to limited extent. The study of farm yard manure revealed that there is a declining tendency of manure use with the increase in holding size in the cultivation of all crops as well as in each crop. The explanation probably lies in the fact that the availability of farm yard manure per unit of land is higher for the marginal and small farms. This in turn, is due to the fact that these farmers have larger number of cattle per hectare. Therefore marginal and small farmers have sufficient stock of manure. Secondly, there is no market for farm yard manure thereby forcing medium farmers to rely upon their own sources of farm yard manure. The average quantity of NPK consumption in 2013 was approximately 411 Kgs. and 488 Kgs per hectare in 2014. It was observed more on wheat crop as against maize and paddy crop. The consumption of NPK per hectare did not vary with the farm size. It was consumed more on marginal farms and less on small farms. The study of insecticides and pesticides use pointed out that our sample farms do not use this item in the cultivation of maize and wheat crop. They use this mainly in the cultivation of paddy crop in order to reduce the growth of unnecessary plant. The study of farm implements indicated that there was an increasing tendency of all the implements possessed by the farmers with the increase in holding size (with minor fluctuation in between). The cost structure and returns revealed that there exist a higher fluctuation in costs in 2013 as compared to 2014 due to change in the prices of agricultural inputs which leads towards less returns of agriculture to farmers of the study area. As far as the net returns of farming are concerned, the marginal farmers are not as strong as in the case of output. Therefore, in the light of declining net returns from farming, especially of marginal and small farms, the viability of farming needs to be improved. It necessitates for the consolidation of landholdings, management of basic and economic holding and introduction of an integrated development strategy encompassing both its production and marketing aspects to make the cultivation of these crops a competitive vis-à-vis profitable enterprise. For this, there is need of strengthen and modernize the extension network to transfer the production technology and technical know-how to the farmers in order to increase the risk bearing capacity. Keeping in view the local conditions, the development of high yielding variety of seeds which must be stalk rot resistant, dwarf and early maturing with high yield potential along with low input-output ratios is also of primary importance.

REFERENCES

[1] Chand, K. P., Singh, R., & Sharma, M. L. (1986). Diversification of Agriculture in Himachal Pradesh – A Spatio temporal analysis. Agriculture Situation in India.

[2] Chattopadhya, Manabendu, Sengupta, & Atna. (1997). Farm Size and Productivity-A New Look at the Old Debate. *Economic and Political Weekly, 32*(52), A172-A173.

[3] H, & Steven, M. (2003). Farm Size and Determinants of Productive Efficiency in the Brazilian Centre West. Retrieved from www.numesis.org.br.

[4] Rasmus, H. (1996). How Rural Market Imperfections Shape the Relation between Farm Size and Productivity: a General Frame work and an Application on Pakistani Data. *Development Economic Group (DERG).*

[5] Krishna, R. (1964). Some Production Function for the Punjab. *Indian Journal of Agricultural Economics, 19*(3), 87-93.

[6] Khusro, A. M. (1964). Returns to Scale in Indian Agriculture. *Indian Journal of Agricultural Economics, 19*(3), 51-64.

[7] Nagraja, B. K., & Bathaiah, D. (1985). The Impact of New Technology on the Size Benefit Relationship in Indian Agriculture: A Study of Chittoor district of Andhra Pradesh. *Indian Journal of Economics, 66*(261), 221-242.

[8] Rani, U. (1971). Size of Farm and Productivity. *Economic and Political Weekly, 6*(26), 89-93.

[9] Reddy, R. (1993). New Technology in Agriculture and Changing Size Productivity Realtionships: A Study of Andra Pradesh. *Indian Journal of Agricultural Economics, 48*(4), 634-648.

[10] Sharma, P. S. (1971). Impact of Fram Size on Agricultural Productivity in India: A Cross Sectional Analysis. *Agriculture Situation in India, 25*(8), 543-545.

[11] Sekar, C., Ramswamy, C., & Senthilanthan, S. (1994). Size Productivity Relations in Paddy farms of Tamil Nadu. *Agriculture Situation in India, 48*(12), 859-863.

[12] Sankhyan, P. L. (1978). Size of Holding and Productivity. *Agriculture Situation in India, 32*(12), 773-775.

[13] Sharma, H. R., & Sharma, R. K. (2000). Farm Size and Productivity Relationship- Empirical Evidence from an Agriculturally Developed Region of Himachal Pradesh. *Indian Journal of Agricultural Economics, 55*(4), 605-614.

[14] Saini, G. R. (1979). Farm Size, Resource Use Efficiency and Income distribution. Alled Publishers Private Ltd. Bombay, 108-109.

[15] Rao, A. P. (1967). Size of Holing and Productivity. *Economic and Political Weekly, 2*(44), 1989-91.

[16] Chand, R. (1996). Diversification through High Value Crops in western Himalayan Region: Evidence from Himachal Pradesh. *Indian Journal of Agricultural Economics, 51*(4), 652-663.

[17] Kumar, V. (2011). Agriculture in Himachal Pradesh: issues for the Twelfth five year plan. *Indian Journal of Agricultural Economics, 66*(3), 278-288.

[18] Wani, M. H. (2011). Hill Agriculture in India; Problems and Prospects of Mountain Agriculture. *Indian Journal of Agricultural Economics, 66*(1), 64-66.