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Food and Nutritional Security in the Frame of Crop Diversification in the Temperate Region of Jammu and Kashmir

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I

INTRODUCTION

The World Food Conference in response to the existence of widespread under-nutrition and incapability of agriculture to meet future food needs was the first to recognise the necessity of food security (Kalamkar, 2012). Nevertheless the concept developed and gained momentum in the early 1990s (Power *et al.*,1998) and in United States, the issue became the policy focus to address poverty related food accessibility at the household level (Hamilton, 1995).The concept is complex and multi-dimensional, and has approximately 200 definitions and 450 indicators (Hoddinot,1999). In its broadest spectrum, World Food Summit (1996) noted that food security at any level is achieved when all people at all times have physical and economic access to sufficient, safe and nutritional food to meet their dietary needs and food preferences for an active and healthy life.

The fact that the vicious circle of hunger and poverty are the main causes of malnutrition and the resultant faulty physical and mental development among children. Underlying this are various inadequacies including mainly household and community level food security. The affordability of the food despite being available is far from accessibility. In this context the existence of extremely tiny holdings on account of continuing increase in population and simultaneous sub-division of these holdings coupled with the lack of infrastructure for exploitation of available niche areas for inclusive growth are some of the vital constraints hampering agricultural growth and achieving food security in the mountainous state of Jammu and Kashmir. Only 5.07 per cent of its total area is cultivable and more than 95 per cent of holdings are small and marginal with an average size of 0.61 hectares, much less than national average. Food security being an essential foundation for meeting various millennium development goals (MDGs) related to hunger, child mortality, mental health, diseases, gender equality and primary education (Gill *et al.,* 2003), it becomes more important to address these issues through manipulations of the existing agricultural

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production system which is the primary sector of the economy of the state and has the potential to overcome these deficiencies through rational management of its resource base**.** The diversification of the crops in the state towards production of temperate niche cash crops like fruits/vegetables/vegetable seeds/spices/floricultural crops, etc., could be seen as a viable option for pushing further the incomes by generating employment opportunities of the small and marginal farm households (Vyas, 1996; Joshi *et al.*, 2007; Sharma, 2011).

Crop diversification has been observed to be economically profitable and environmentally viable for it helps reduce the continuous pressure accruing to the land due to repeated usage under exhaustive crops (Chand, 1996; Sharma 1996; 2005; Sharma and Chauhan, 2008). Therefore, while food security is a pre-condition for nutritional security, crop diversification could serve as a boon for its attainment for two reasons, one that the incomes will increase and second the production of nutrients on per unit of area will also increase by including fruits/vegetables and other cash crops in the crop plan. After securing access to food, sanitation, environment, adequate health services and knowledgeable care could follow to make the target nutritionally secure (World Bank, 2006). However, as of now, the statistical evidence from national and international studies reveal that every six seconds, a child dies of malnutrition (FAO, 2008). More recent estimate reduces this time gap to 4.5 seconds only as the deaths totalled 7 million annually (WFP, 2010).

In this backdrop, the present study was undertaken to analyse the changing consumption of food expenditure of rural and urban areas of the state over different time periods; estimate the potential of crop diversification to augment the income, employment and affordability of the low and highly diversified groups; to identify the demand and supply gap of food items and to assess the nutritional security of the sampled categories of farm households.

II

METHODOLOGY

The state of Jammu and Kashmir has quite diverse agro eco-systems. The state has four agro-climatic zones and the choice of crops varies with respect to the climate and also the altitude. The Kashmir valley is classified as valley temperate agro-climatic zone. The temperature during winters fall below 0^0 C and owing to cold climate, the society is mostly non-vegetarian and the choice of food is also different from other states. This very factor necessitates to investigate the role of diversification in the attainment of food security.

Two districts, namely, Budgam and Kulgam falling in the central and southern Kashmir, respectively, were observed to have diversified agriculture and the general opinion of the officers of the development departments of agriculture in the state was that these districts despite being under developed in many aspects have improved their livelihood through diversification. Therefore, these two districts were selected

purposively for the study. From each district two development blocks, viz., Chadoora and Kansahib from district Budgam and Pahloo and Kulgam from district Kulgam were selected randomly. The data were collected from 220 respondents, 55 from each development block selected randomly and later classified into high and low diversified categories. Both primary and secondary data were used in this study. While the secondary data were collected from various Government publications and records of the development departments of agriculture/ horticulture/Directorate of Economics and Statistics, the primary data were collected from the respondents through a specially designed questionnaire using survey method. The head of the family was interviewed three to four times in order to record the data on consumption through recall back method. Averages and percentages were used to interpret that data. The extent of crop diversification was estimated through Herfindahl Index (H.I.) given as:

$$H.I=\sum_{i=1}^{N} Pi^2$$

where, H is the Herfindahl Index and is defined as sum of the squares of all 'N' proportions. It is a measure of concentration of diversification. For higher diversification, 'H.I' has a lower value and vice versa. It is bounded by '0' (complete diversification) to '1' (complete specialisation).

III

RESULTS AND DISCUSSION

Socio-Economic Profile of Sample Farmers

The socio-economic indicators of sample respondents categorised on the basis of diversification are presented in Table 1. It could be seen from the table that high diversified farming category has relatively large holding size (0.99 ha) compared to low diversified category. However, one common feature of these categories was the dominance of small farmers. Over 95 per cent of the average holdings on farms of both categories were under plough though this proportion was a little higher at high diversified farms. The proportion of cultivated area having assured irrigation facilities was higher at more diversified farming category which is expected to have encouraged higher intensification at these farms. Higher proportion of joint family structures at high diversified farms resulted in higher average size of families at these farms compared to low diversified category. Within the families of these categories the male members outnumbered females as indicated by the sex ratio of two categories though it was more favourable at high diversified category. The sex ratio was more unfavourable among adults, however, it is moving in favourable direction

among children as revealed by sex ratio of family as a whole, which is desired in view of male migration and increasing involvement of female labourer in agriculture. As far as literacy of family heads and its members is concerned, it was relatively higher in low diversified group which supposedly have enhanced their engagement in non-farm jobs. Further the data documented in Table 1 revealed higher percentage of working members among high diversified group. This scenario is expected to have direct bearing on family income and in turn affordability which has been examined in the following sections.

TABLE 1. IMPORTANT SOCIO-ECONOMIC PARAMETERS OF SAMPLED HOUSEHOLDS

Parameters (1)	High diversified (2)	Low diversified (3)
Average age of family head (Yrs)	54	49
Literacy of family head (per cent)	57.14	75.51
Average family size (No.)	7.69	6.29
Male	4.00	3.35
Female	3.69	2.94
Sex ratio	923	878
Adults (No.)	6.81	5.59
Male	3.65	3.02
Female	3.16	2.57
Sex ratio	866	851
Earning adult members (per cent)	42.51	37.23
Literacy rate (per cent)	73.40	78.50
Male	78.57	80.49
Female	50.28	57.64
Average literacy level (% of above 5 years age members)		
Graduate and above	18.37	16.81
Diploma	0.00	0.47
Higher secondary	18.37	18.68
Sececondary	18.78	18.21
Middle	19.18	20.08
Primary	25.31	25.74
Income sources other than farming (No.)	1.41	0.59
Average holding size (Ha.)		
Small (< or = 2 Ha.)	0.67 (67.78)	0.32 (31.87)
Large (> or = 2 Ha.)	0.52 (66.40)	0.26 (33.10)
All	0.99 (100.00)	0.79 (100.00)
Cultivated area (per cent of average total holding)	96.32	95.46
Irrigated area (per cent of cultivated area)	39.86	38.39
H.I. range	0.22-0.46	0.49-0.98

H.I. = Herfindahl Index.
Figures in parentheses indicate percentage.

Changing Consumption Expenditure Pattern: The mountainous states have by and large more per capita consumption of food compared to the plains. Owing to being fragile, inaccessible and poorly mobile, these states require more energy compared to plains. The state of Jammu and Kashmir is one among those states which have more severity of these characteristics and ranks the 5th position after Arunachal Pradesh, Manipur, Mizoram and Nagaland in terms of consumption. The

expenditure on consumption of various food items as per the NSSO reports of the 50th Round (1993-94) and 66th Round (2009-2010)), pertaining to both rural and urban areas of Jammu and Kashmir state are presented in Table 2. The figures reveal that per capita expenditure on food consumption of both rural and urban areas has increased significantly by 138, 89, 221, 261 and 225 per cent in rural areas compared to 185, 91, 189, 269 and 194 per cent in urban areas respectively in cereals, pulse/pulse products, livestock products, fruits/vegetables and edible oils. The results further revealed that of the total expenditure of Rs.629 in 2009-10 in rural areas was made on cereals followed by livestock products and the minimum was made on pulse and pulse products. This situation was however, different in the case of urban areas where out of the total expenditure of Rs. 902 the maximum was spent on consumption of livestock products followed by cereals and the lowest on the pulses and pulse products. The overall situation of both rural and urban areas revealed that livestock and livestock products followed by cereals, fruits/vegetables, edible oils and pulse/pulse products formed the components of food expenditure in order of preference.

TABLE 2. AVERAGE MONTHLY PER CAPITA EXPENDITURE (RS.) ON VARIOUS FOOD ITEMS IN JAMMU AND KASHMIR DURING 1993-1994 (50TH ROUND) AND 2009-2010 (66TH ROUND)

	Rural			Urban			Average		
Commodity (1)	1993-1994 (2)	2009-2010 (3)	Per cent change (4)	1993-1994 (5)	2009-2010 (6)	Per cent change (7)	1993-1994 (8)	2009-2010 (9)	Per cent change (10)
Rice	33.81	119.56	253.62	36.54	125.72	244.06	35.18	122.64	248.66
Wheat	34.60	58.66	69.54	31.68	69.65	119.85	33.14	64.16	93.59
Jowar	0.03	0.00	-100.00	0.00	0.00	0.00	0.02	0.00	-100.00
Maize	8.81	4.83	-45.18	0.39	0.38	-2.56	4.60	2.61	-43.37
All cereals	77.30	183.95	137.97	68.61	195.85	185.45	72.96	189.90	160.30
Pulses and Pulse Products	17.69	33.50	89.37	18.76	35.90	91.36	18.23	34.70	90.40
Meat, Egg and Fish	4.59	35.76	679.08	13.14	82.65	529.00	8.87	59.21	567.85
Milk and milk products	48.27	134.15	177.92	78.80	183.01	132.25	63.54	158.58	149.59
Total L/S products	52.86	169.91	221.43	91.94	265.66	188.95	72.40	217.79	200.81
Fruits (Fresh)	5.23	16.28	211.28	13.55	41.29	204.72	9.39	28.79	206.55
Fruits (Dry)	0.76	2.75	261.84	3.06	13.18	330.72	1.91	7.97	317.02
Vegetables	17.37	65.21	275.42	28.97	113.75	292.65	23.17	89.48	286.19
Total Fruits and veg.	23.36	84.24	260.62	45.58	168.22	269.07	34.47	126.23	266.20
Edible Oil	16.58	53.90	225.09	23.00	67.65	194.13	19.79	60.78	207.10
Total Food Expenditure	224.45	629.18	180.32	305.48	901.80	195.21	264.97	765.49	188.90

Source: A- 335, A-371, A-479, A 515, A-695, A-875 for Data on Jammu and Kashmir of Report No. 538 Level and Pattern of Consumption Expenditure NSS 66th round (2009-10). (Published in December 2011).

A marked shift in the overall consumption expenditure on cereals in Jammu and Kashmir has been observed during the past two decades (1993-94 to 2009-10). It is evident from the Table that consumption expenditure in jowar and maize has reduced by 100 and 43 per cent respectively compared to rice and wheat which has increased by 249 and 94 per cent, respectively during the same period. The highest percentage of 266 per cent was, however, recorded in the expenditure on consumption of fruits and vegetables which could be considered as a healthy sign in the urban areas of being aware about the balanced diet.

It could be concluded from the results that a two-way effect of increasing the income on food expenditure and the substitution of fine grains for the coarse ones clubbed with the subsequent replacement of cereals by protective foods like milk, fruits and vegetables depending on income, custom, habits and tastes of the people could also be a significant reason for changing expenditure on food consumption. The higher consumption of food articles in Kashmir valley in all the periods can very well be attributed to the factors other than income owing to the higher energy requirements due to climate and more labour (Rao, 2000; 2003).

Production System Diversification Impacting Income and Employment

The value of the Herfindahl index worked out to be 0.23 and 0.40 indicating high and low diversified groups respectively. The cropping pattern of these groups in the study area revealed that of the total operational area the cereals accounted for more than 38 per cent and oilseeds by more than 12 per cent in both the categories. Fruits and vegetables accounted for 38 per cent and 5 per cent in high diversified groups compared to 40 per cent and 5 per cent in low diversified group. The data further revealed that fruits were the most important component of the crop plan (Table 3).

TABLE 3. AREA UNDER DIFFERENT CROPS IN TWO DIVERSIFIED GROUPS

(*ha*)

	High diversified (H.I. 0.22-0.46)		Low diversified (H.I. 0.49-0.98)	
Crops	Area	Per cent	Area	Per cent
(1)	(2)	(3)	(4)	(5)
Rice	0.35	26.45	0.27	26.41
Maize	0.16	11.92	0.13	12.40
Oilseed	0.19	14.15	0.12	12.20
Oats	0.06	4.69	0.05	4.44
Potato	0.01	0.95	0.01	0.95
Onion	0.01	0.48	0.00	0.45
Kale	0.01	0.72	0.01	0.80
Turnip	0.01	0.71	0.01	0.95
Radish	0.01	0.80	0.01	0.80
Other vegetables*	0.02	1.51	0.01	0.98
Fruits	0.50	37.63	0.40	39.62
Total sown area	1.33	100.00	1.02	100.00
Cultivated area	0.95	-	0.75	-
Cropping intensity	-	139.00	-	135.83

*Other vegetables include tomato, chillies, cauliflower, cabbage, beans, carrot, pea.

The improvement in affordability to have better food was observed through diversification which led to increase in the productivity of nutrients in both the categories of farms studied.

The crop diversification made a significant impact on household income which could be judged from the figures registered in Table 4 which reveals that 34 per cent of the total income in high diversified group was contributed by agriculture (crops, horticulture and livestock) alone compared to 25 per cent by low diversified group. Even though the service sector contributed 62 per cent of the total income under low diversified group as against 32 per cent by high diversified group, yet, it could be very well understood from the figures that high diversified group could have a better sustainability compared to low diversified group for being agricultural dominated which provides far better sustenance if proper management practices are followed.

TABLE 4. PER HOUSEHOLD AVERAGE NET INCOME PATTERN OF HIGH AND LOW DIVERSIFIED GROUPS FROM DIFFERENT SOURCES

	High diversified (H.I. 0.22-0.46)		Low diversified (H.I. 0.49-0.98)	
Sources	Amount (Rs./year)	Per cent	Amount (Rs./year)	Per cent
(1)	(2)	(3)	(4)	(5)
A. Business	35429	12.91	14041	5.76
B. Services	103094	37.57	150204	61.65
C. Labour	15092	5.50	6612	2.71
D. Skilled labour	4020	1.47	3306	1.36
E. Pension	23755	8.66	7837	3.22
F. Agriculture and allied	93034	33.90	61659	25.31
1. Crops	23033	8.39	17737	7.28
2. Fruits	64535	23.52	49206	20.19
3. Livestock	5466	1.99	-5284	-2.17
Total (A to F)	274423	100.00	243659	100.00

The fact could further be substantiated with the figures presented in Table 5 which revealed that agriculture alone contributed 32 per cent of the total employment compared to all other sectors and made a contribution of 16 per cent to the employment from business in high diversified group, while as the major contributor to the employment generation from the low diversified group was services which contributed 50 per cent of the total employment.

Therefore, it could be concluded that highly diversified group had better access to food security than low diversified groups for being more rational in generating employment from all the activities carried out by raising crops, fruits, livestock, business and services etc., compared to the low diversified group which concentrated more on services rather than exploitation of other income generating ventures.

TABLE 5. HOUSEHOLD WISE EMPLOYMENT PATTERN OF HIGH AND LOW DIVERSIFIED GROUPS IN DIFFERENT SECTORS

	High diversified (H.I. 0.22-0.46)		Low diversified (H.I. 0.49-0.98)	
Sectors	Quantity (mds/year)	Per cent	Quantity (mds/year)	Per cent
(1)	(2)	(3)	(4)	(5)
Agriculture				
Crops	84.91	10.22	56.15	9.05
Fruits	123.20	14.83	89.84	14.48
Livestock	58.22	7.01	45.98	7.41
Total agriculture	266.34	32.07	191.97	30.94
Business	131.43	15.82	68.88	11.10
Services	327.76	39.46	312.92	50.44
Labour	69.18	8.33	28.78	4.64
Skilled labour	35.82	4.31	17.86	2.88
Total	830.52	100.00	620.40	100.00

The Demand and Supply Gap

The supply of the food is the sum total of the production made on the farm, the procurement through public distribution system (PDS) and the market purchase which is reflected in the table as actual consumption, while the production is the actual farm produce. The gap between demand and supply is the difference between production and actual supply and also between actual supply and requirements as per ICMR recommendations. However, owing to the climate of the study area, the consumption is more than recommended, especially during winter when the temperature drops to minus zero which increases the energy requirements for proper metabolism of the body. Thus here the actual supply of food would mean actual consumption and deviations from actual consumption with respect to production and ICMR recommendations determine the gap in demand and supply.

The data (Table 6) reveal that in both the groups in the study area, meat, eggs, sugar and fish were not at all produced, thus the deficiency was 100 per cent. However, in cereals and oil the deficiency in production was recorded at just 6 and 38 per cent respectively in highly diversified group compared to 16 and 21 per cent in low diversified group. When compared to actual requirement, it was 17 and 100 per cent more than the requirement in high diversified group and 22 and 100 per cent in low diversified group. It would be of interest to note here that the fruits were consumed less despite being surplus, while the pulses and legumes were consumed less than the availability and requirements in both the categories. This could be due to the reason that 95 per cent of the apple produced in the valley is exported to other states, while only 5 per cent is being consumed in the state. Pulses, on the other hand, do not form part of the PDS in the state, and as such are not available in the desired quantity. The pulses that are imported from outside state are usually consumed in urban areas resulting in poor supplies of these food items to rural areas. Also the pulses are grown as rainfed crops mostly in upper belts at higher altitudes in the state, thus have low productivity, as such is kept for domestic consumption only. The

overall situation is that most of the food items listed in Table 6 excepting meat, eggs, sugar and fish were consumed much more than recommended as per the ICMR recommendations.

TABLE 6. AVERAGE ANNUAL PER CAPITA FOOD SUPPLY AND DEMAND GAP IN HIGH AND LOW DIVERSIFIED GROUPS

(*qtls.*)

Item (1)	High diversified (H.I. 0.22-0.46)			Low diversified (H.I. 0.49-0.98)		
	Actual consumption (2)	Actual production (3)	Actual requirement* (4)	Actual consumption (5)	Actual production (6)	Actual requirement* (7)
Cereals and Millets	1.85	1.73 (-6.21)	1.53 (17.05)	1.97	1.66 (-15.91)	1.53 (22.17)
Pulses and Legumes	0.03	0.12 (251.02)	0.15 (-344.44)	0.03	0.10 (211.50)	0.15 (-361.54)
Fruits	0.09	8.94 (9832.36)	0.18 (-102.70)	0.08	8.35 (10963.56)	0.18 (-141.94)
Vegetables	0.82	2.28 (176.60)	0.73 (11.50)	0.74	2.30 (210.76)	0.73 (1.15)
Milk	1.07	3.04 (183.75)	0.55 (48.90)	1.01	2.91 (189.42)	0.55 (45.59)
Meat	0.06	0.00 (-100.00)	0.09 (-50.00)	0.04	0.00 (-100.00)	0.09 (-134.38)
Eggs (number)	109.44	0.00 (-100.00)	180.00 (-64.47)	76.70	0.00 (-100.00)	180.00 (-134.67)
Sugar	0.06	0.00 (-100.00)	0.11 (-91.49)	0.04	0.00 (-100.00)	0.11 (-150.00)
Fish	0.02	0.00 (-100.00)	0.09 (-435.71)	0.01	0.00 (-100.00)	0.09 (-525.00)
Oil	0.10	0.06 (-38.13)	0.00 (99.95)	0.08	0.06 (-20.65)	0.00 (99.93)

*Based on ICMR dietary recommendations.

Figures in parentheses represent deviation (per cent) from actual consumption.

Nutritional Security at Household Level

One of the important parameters of the food security is nutritional security, especially at household level, which is governed by the production/choice of the crops grown on the farmers' field. It is more pertinent to mention here that diversification has proved an important tool in the attainment of food and nutritional security at household level. A close scrutiny of Table 7 reveals that both the groups were surplus in carbohydrates, fats, proteins, vitamins (B2, B9, C and K), but were deficient in vitamin (B1, B3, B12, D and E). However, high diversified group were surplus in vitamin B6 compared to the low diversified groups which were deficient in vitamin B6 by 17 per cent. Also both the groups were surplus in Ca, Mg and Mn but were deficient in Fe, P, Na and Zn. The high diversified group turned surplus in K and energy compared to low diversified group which recorded 3 per cent and 12 per cent deficiency in K and energy respectively. The main supplement of carbohydrates came from paddy which was grown on more than 40 per cent of the total cropped area on both the categories. The overall intake of the nutrients with respect to ICMR

TABLE 7. AVERAGE ANNUAL PER HOUSEHOLD SUPPLY AND DEMAND GAP OF NUTRIENTS WITH RESPECT TO ICMR RECOMMENDATIONS

Particulars	High diversified (H.I.0.22-0.46)				Low diversified (H.I.0.49-0.98)			
(1)	Available (2)	Requirement (3)	Deficit/Surplus (4)	(5)	Available (6)	Requirement (7)	Deficit/Surplus (8)	(9)
Energy (10000 kcal)	663	627	+36	(+5.68)	563	637	-74	(-11.59)
Carbohydrates(Qtls)	12.03	5.18	+6.85	(+132.34)	10.03	5.24	+4.79	(+91.38)
Fats (Qtls)	1.27	0.89	+0.38	(+42.75)	1.14	0.90	+0.23	(+25.91)
Protein (Qtl)	1.78	1.39	+0.40	(+28.67)	1.61	1.41	+0.20	(+13.87)
Vitamin A (Qtls)	163.75	142.53	+21.22	(+14.89)	142.21	144.21	-2.00	(-1.39)
Vitamin B1 (g)	2.81	3.03	-0.22	(-7.14)	2.44	3.08	-0.64	(-20.74)
Vitamin B2 (g)	4.56	3.59	+0.97	(+26.94)	4.65	3.65	+1.00	(+27.32)
Vitamin B3 (g)	29.87	39.29	-9.42	(-23.97)	23.86	39.78	-15.92	(-40.02)
Vitamin B6 (g)	5.26	4.87	+0.39	+7.97	4.13	4.95	-0.82	(-16.54)
Vitamin B9 (kg)	305.46	0.26	+305.20	-	218.47	0.26	+218.20	-
Vitamin B12(Kg)	0.01	2.07	-2.07	(-100.00)	0.00	2.08	-2.08	(-100.00)
Vitamin C (Kg)	0.52	0.11	+0.40	(349.72)	0.43	0.12	+0.32	(+275.73)
Vitamin D (g)	0.02	0.03	-0.01	(-21.29)	21.54	25.77	+0.00	(-0.02)
Vitamin E (g)	3.91	22.49	-18.58	(-82.61)	3.39	22.55	-19.16	(-84.96)
Vitamin K (g)	3.11	0.14	+2.97	(+2099.76)	26.45	1.42	+2.50	(+176.62)
Calcium (Kg)	3.15	1.76	+1.39	(+79.23)	3.16	1.80	+1.36	(+75.30)
Iron (g)	23.76	57.82	-34.07	(-58.91)	19.50	58.82	-39.32	(-66.84)
Magnesium (Kg)	0.78	0.58	+0.20	(+34.05)	0.68	0.59	+0.09	(+14.66)
Manganese (Kg)	0.10	0.01	+0.09	(+1020.74)	0.08	0.01	+0.07	(+821.28)
Phosphorus (Kg)	1.84	1.99	-0.15	(-7.47)	1.51	2.01	-0.50	(-24.95)
Potassium (Kg)	9.15	8.28	+0.87	(+10.49)	8.23	8.46	-0.23	(-2.71)
Sodium (Kg)	1.02	4.75	-3.73	(-78.51)	1.06	4.85	-3.79	(-78.17)
Zinc (g)	15.53	27.80	-12.27	(-44.13)	12.65	28.17	-15.52	(-55.08)

(+) indicates surplus and (-) indicates deficit; Figures in parentheses represent percentage.

Note: The figures have been worked out as per the ICMR recommendations (Annexure I).

recommendations indicated that both the groups enjoyed sufficient intake of carbohydrates, fats, proteins, important minerals and vitamins indicating thereby that the study area had by and large household security in both the categories of farm households, however, the magnitude of nutrient intake was significantly higher in highly diversified group compared to low diversified group.

IV

CONCLUSION AND POLICY IMPLICATIONS

The study concludes that the diversification of agriculture in general increases sustainability and addresses the issues of food security through employment and income generation and helps in attainment of nutritional security. The dietary pattern in high diversified groups indicated more of nutritional and food security at household level compared to low diversified groups. It is pertinent to note here that while considering the mountain specificities of the state the focus is demanded on the creation of infrastructure that would help in exploitation of the niche areas for development of the state. This necessitates consideration of following policy suggestions.

- Agriculture value chain programme needs to be strengthened to develop efficient value chain from supplier to the farmer to consumer.
- Agriculture entrepreneurship development be pursued through promotion of linkages between farmers and agri-businesses. This would however, need public-private partnership to facilitate creation of infrastructure for improving harvest logistics in terms of the disposal of fruits tuned with the market demands.
- Rural livelihoods need to be improved through strengthening the market policies and regulations, reducing trade barriers and generating domestic and export market opportunities and encouraging private sector participation in food production.
- The sustainable intensification of the agricultural production need to be targeted through identification of key markets for the agricultural/horticultural production.
- Financial sector plays a vital role in reducing poverty, therefore, financial sources like savings, loans, payment services etc. should be strengthened so as to help these people increase their incomes, build their assets and participate in market economies.

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ANNEXURE I

RECOMMENDED DIETARY ALLOWANCES AND NUTRIENT REQUIREMENTS 2010
AS PER ICMR

Group Particulars (1)	Man Moderate work (2)	Woman Moderate work (3)	Children 1-6 years (4)	Boys 7-15 years (5)	Girls 7-15 years (6)
Energy (kcal/d)	2875	2519	1205	2210	2010
Carbohydrates (g/d)	200	263	90	137	137
Fats (g/d)	40	32	26	37	35
Protein (g/d)	61	63	18	41	41
Vitamin A (µg/d)	5400	6413	3600	5400	5400
Vitamin B1 (mg/d) Thiamine	1	1	1	1	1
Vitamin B2 (mg/d) Riboflavin	2	1	1	1	1
Vitamin B3 (mg/d) Niacin	18	15	10	15	13
Vitamin B6 (mg/d) Pyridoxine	2	2	1	2	2
Vitamin B9 (µg/d) Folic acid	100	131	45	68	68
Vitamin B12 (g/d)	1	1	1	1	1
Vitamin C (mg/d) Ascorbic acid	40	53	40	40	40
Vitamin D (µg/d)	10	10	10	10	10
Vitamin E (mg/d) Alpha-tocopherol	9	9	9	9	9
Vitamin K (µg/d)	55	55	55	55	55
Calcium (mg/d)	700	925	60	553	553
Iron (mg/d)	23	26	11	23	23
Mg (mg/d)	268	273	60	128	157
Mn (mg/d)	4	4	4	4	4
P (mg/d)	700	925	600	733	733
K (mg/d)	3750	3225	1325	3750	3225
Sodium (mg/d)	2092	1902	797	2092	1902
Zinc (mg/d)	12	12	6	9	9
Iodine (µg/d)	150	169	90	140	140