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ARTICLES

Effects and Determinants of Diversification of Livelihood Options amongst Agricultural Households in India: A State Level Analysis

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ABSTRACT

The paper seeks to find out the extent of diversification of livelihood options, types of options adopted by agricultural households, effect of choosing different combinations of livelihood options on average household income, consumption expenditure and the incidence of poverty and the factors that determine the probability of choosing different combinations of livelihood options. The results show that in most of the states a majority of the households adopt two or even more livelihood options and that those households who adopt non-farm business as one of the livelihood options have significantly higher average income, consumption expenditure and low incidence of poverty. The results of multinomial logit model show that household size, age, education and gender of the head of the family, number of adults and dependents in the family, social group and land category of a household, access to technical advice, per capita income and the state/union territories to which a household belongs to are significant factors affecting the probability of a household choosing different combinations of livelihood options in relation to cultivation. The unequivocal message of the study is that promotion of non-farm business as one of the options along with cultivation holds the key to enhance farmers' income and pull them out of poverty.

Key words: Diversification, livelihood options, income, consumption and poverty

JEL.: E24, O13, Q12, Q13,

I

INTRODUCTION

Lack of alternative job opportunities and agriculture being a residual sector absorbing all those rural households who are not able to get jobs in the non-farm sector coupled with continuous sub-division and fragmentation of holdings have led to a continuous decrease in the average size of operational holdings from 1.67 hectares in 1982 to 0.87 hectare in 2013. Small and marginal farmers, who constitute around 85 per cent of all agricultural households, have low agricultural productivity and find it difficult to afford livelihood from cultivation. Consequently, they diversify their income sources to ensure food security and escape poverty. The medium and large farmers also diversify their income sources primarily by exploiting available synergies and opportunities to accumulate wealth. As a matter of fact, adoption of multiple livelihood options/income sources by farmer households is a worldwide phenomenon.

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According to Fuller (1991 cited in Subramanian, 2018), “full-time farming is the aberration and in the modern farming history multiple jobs holding among farm households is the norm”.

The literature on diversification of livelihood options, most of which pertains to the African countries, focuses on the diversification of livelihood options which provide resilience, flexibility, self-insurance and stability to the livelihoods of rural population (Ellis, 1998, 1999; 2000; 2008; Start, 2001; Loison, 2015; Johny *et al*, 2017). Though the causes and consequences of diversification of livelihood options and the extent to which it has led to increase in income, consumption, employment and reduction in poverty continue to be a moot point, the broad conclusions emanating from this literature are summarised below. First, livelihood diversification is increasingly resorted to by rural households to spread risk, smoothen consumption, smoothen labour allocation, overcome seasonality in agriculture and failure of credit and insurance markets and cope up with *ex post*/unforeseen shocks. Second, cultivating households with more land and assets achieve successful livelihood diversification by exploiting available opportunities through better synergies between farm and non-farm sectors while smallholders have not benefitted much from such diversification primarily because of asset constraints (Block and Webb, 2001). Third, rural farm households with diversified income strategies either specialise in large scale commercial farming or move to non-farm sector with the development of transport and communication sectors, growing urbanisation and emergence of small towns and expansion of manufacturing and service sectors. Four, diversification of livelihood/income strategies has mixed and context specific effects. While it has positive effect on income, overall food expenditure, asset creation, mitigating risk and seasonality and consumption smoothing, there is no consensus of its effect on income distribution, farm output and gender relations. However, there is a broad agreement that positive effects outweigh negative effects and diversified rural livelihoods are less vulnerable than the undiversified ones (Ellis, 1999; Rahman and Mishra, 2020; Barett *et al*, 2001; Block and Webb, 2001). Five, factors such as lack of human capital, infrastructure in terms of roads, power and communication, seasonality of agriculture, risk, imperfections in the labour market, weak/non-existence of credit and insurance markets, asset strategies and coping up strategies are the major determinants of livelihood diversification at macro/meso level (Ellis, 1998; 2000). Six, though determinants of livelihood diversification at the household level differ from one location to another due to spatial variations in farm economies, factors such as general education in terms of years of schooling, agricultural education, age of the head of family, family size, number of children and adults in the family, size of land holdings, risk averse attitude of households, gender of the head of the households, amount of assets, income per capita, variability of farm income, ownership of livestock, access to credit, and so on are reported to be important determinants of livelihood diversification (Abdulai and Crole-Reese 2001; Ellis, 2000; Agyeman *et al.*, 2014; Barett *et al*, 2001; Block and Webb, 2001).

The literature review in the Indian context further shows that there are not many studies on livelihood diversification by farmer households. The available studies have, *inter alia*, examined factors affecting diversification of livelihood options and have reported age of the head of the family, age square, number of family members, number of children, education measured by years of schooling, land size and social group are important determinants of diversification of livelihood options (Walker and Ryan, 1990; Subramanian, 2018; Judit *et al.*, 2017; Khatun and Roy, 2012; Saha and Bahal, 2014). The lack of literature on different aspects of diversification of livelihood options could be attributed to the non-availability of data on farmers' income. It is against this background that we have examined the extent of diversification livelihood options and the types of livelihood options pursued by agricultural households in twenty one major states; the effect of diversification of livelihood options on average household income, consumption and poverty across states and the factors that determine adoption of different combinations of livelihood options by agricultural households using data available in the *Situation Assessment Survey of Agricultural Households, 2013*. The paper is structured in six sections. Section II discusses about the data and statistical methods used to analyse the data. Section III discusses about the extent and different combinations of livelihood options adopted by the agricultural households. The effect of the adoption of different combinations of livelihood options on income, consumption expenditure and poverty is discussed in Section IV. The results of the multinomial logit model quantifying probability of different factors affecting adoption of different combinations of options in relation to cultivation are presented and discussed in Section V. Section VI summarises the main findings of the study.

II

THE DATA AND METHODS

As mentioned above, we have used unit level data collected in the 70th NSS round on Situation Assessment Survey of Agricultural Households from a sample of 70,107 households. These households were selected using stratified multistage random sampling procedure from 4529 villages from all 36 states and union territories of India for the year 2012-13. The data set provides information on different sources of income including non-farm business and socio-demographic-economic features of agricultural households. The data on farmers' income, sources of income and other related aspects is also available in the 59th NSS round on Situation Assessment Survey of Farmers, 2003. However, since data from two Surveys is not comparable because of changes in the concepts and definitions used in these two rounds, a comparison of changes in sources and level of income and consumption between these two rounds is not possible. For example, a comparison of the definitions and concepts used in two rounds reveals that in the 59th round, a farmer is defined "a person who operates some land and is engaged in agricultural activities during the last 365 days". Thus, a person qualifies to be a farmer if (i) he possesses some land (i.e., land, either owned or leased in or

otherwise possessed) and (ii) is engaged in some agricultural activities on that land during the last 365 days. And a household having at least one member farmer as defined above was considered a farmer household. In comparison, in the 70th round an agricultural household has been defined as the one receiving value of produce more than Rs.3000/- from agricultural activities and having at least one member self-employed in agriculture either in the principal status or in the subsidiary status during last 365 days. In addition, there were differences in the methodology of recording agricultural expenditure between the two surveys. We have, therefore, only used the unit level data available in the 70th NSS round (2013) in our study and have attempted a cross sectional analysis of diversification of livelihood options and its effect on income, consumption and poverty among farmer households and also among twenty one major states. Further, we have used Tendulkar's per capita poverty lines for rural areas for different states to estimate incidence of poverty among agricultural households. These poverty lines for different states have been multiplied by the average household size in each state to arrive at monthly poverty line equivalent income for each of the major state. The available data indicates the choice which a farmer household makes to adopt different combinations of livelihood options. In view of this, multinomial logit model is used to estimate the probabilities of adopting different possible combinations of livelihood options as categorically dependent variable given the set of independent variables. The functional form of multinomial logit model (MLM) is given below:

$$\pi_{ij} = \frac{e^{\alpha_j + \beta_j X_i}}{\sum_{j=1}^3 e^{\alpha_j + \beta_j X_i}}, \text{ where } j=1 \dots m \quad \dots (1)$$

From Equation 1, we estimate three regressions but the common practice in multinomial logit model (MLM) is to choose one choice as the base category and set its coefficient values to zero. So, if we choose the first category (cultivation only) and set $\alpha_1=0$ and $\beta_1=0$, we obtain the following estimates of the probabilities for the three choices (Gujarati, 2015):

$$\pi_{i1} = \frac{1}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad \dots (2)$$

$$\pi_{i2} = \frac{e^{\alpha_2 + \beta_2 X_i}}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad \dots (3)$$

$$\pi_{i3} = \frac{e^{\alpha_3 + \beta_3 X_i}}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad \dots (4)$$

π_{i1} , π_{i2} , π_{i3} represent the probabilities that household 'i' chooses alternative 1, 2, or 3, respectively, i.e., Group 1 cultivation only, Group 2 (i) cultivation + animal

farming; (ii) cultivation + wages & salary; (iii) cultivation + wages & salary + animal farming and Group 3: (i) cultivation + non-farm business; (ii) cultivation + animal farming + non-farm business; (iii) cultivation + wages and salary + non-farm business; (iv) cultivation + wages and salary + animal farming + non-farm business.

III

EXTENT AND TYPES OF LIVELIHOOD OPTIONS

Table 1 presents distribution of households according to number of livelihood options adopted by them across states. It shows that the proportion of households adopting cultivation as the only livelihood option is more than one-fourth in six states (Assam, Bihar, Chhattisgarh, Jharkhand, Kerala and Telangana). In Karnataka and Maharashtra, the proportion of such households is around 23-24 per cent while in Odisha, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal it is around 17 to 18 per cent. Among the remaining eight states (Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Punjab and Rajasthan), the proportion of households adopting cultivation as the only option varies from a low of around 4 per cent in Rajasthan to around 14 per cent in Madhya Pradesh. The proportion of households who have adopted two options including cultivation is more than three-fifths in Chhattisgarh, Punjab and Uttarakhand while in thirteen other states (Andhra Pradesh, Assam, Gujarat, Haryana, Jammu & Kashmir, Jharkhand, Karnataka,

TABLE 1. DISTRIBUTION OF HOUSEHOLDS ACCORDING TO NUMBER OF LIVELIHOOD OPTIONS: MAJOR STATES, 2013

State (1)	One (2)	Two (3)	Three (4)	Four (5)	All (6)	(per cent)
Andhra Pradesh	14.47	50.41	33.69	1.43	100	
Assam	31.73	54.68	13.08	0.51	100	
Bihar	35.71	48.57	15.28	0.43	100	
Chhattisgarh	25.83	61.81	12.36	0.00	100	
Gujarat	11.76	50.69	36.22	1.34	100	
Haryana	6.62	63.50	29.03	0.85	100	
Himachal Pradesh	6.89	41.59	45.91	5.61	100	
Jammu & Kashmir	9.07	49.82	36.54	4.57	100	
Jharkhand	28.27	57.00	14.46	0.26	100	
Karnataka	23.88	50.47	24.25	1.40	100	
Kerala	26.42	47.90	22.87	2.81	100	
Madhya Pradesh	14.02	53.18	31.69	1.11	100	
Maharashtra	22.97	50.83	24.96	1.24	100	
Odisha	18.03	50.28	29.90	1.79	100	
Punjab	5.72	61.50	31.13	1.65	100	
Rajasthan	4.08	47.37	46.34	2.18	100	
Tamil Nadu	17.55	49.56	30.77	2.11	100	
Telangana	29.88	57.59	11.61	0.92	100	
Uttarakhand	17.51	60.44	21.21	0.84	100	
Uttar Pradesh	16.47	58.01	24.24	1.26	100	
West Bengal	18.32	49.83	28.76	3.09	100	
All India	17.97	52.03	28.30	1.70	100	

Source: Computed by the authors using Unit Level Data from Situation Assessment Survey of Agricultural Households, 70th NSS Round, Ministry of Statistics and Programme Implementation, Government of India.

Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Telangana and West Bengal) it varies between fifty to sixty per cent. In three states (Bihar, Kerala and Rajasthan), the proportion of such households is around 47-48 per cent whereas in Himachal Pradesh it is around 41 per cent. Likewise, the proportion of households practicing three livelihood options including cultivation is around 46 per cent in Himachal Pradesh and Rajasthan, around 36 per cent in Gujarat and Jammu & Kashmir and around 29 to 31 per cent in Haryana, Madhya Pradesh, Odisha, Punjab, Tamil Nadu and West Bengal. In five states (Kerala, Karnataka, Maharashtra, Uttarakhand and Uttar Pradesh), around one-fifth to one-fourth of the households are practicing three livelihood options. In the remaining states (Assam, Bihar, Chhattisgarh, Jharkhand, and Telangana), the proportion of such households varies from 10 to 15 per cent. The proportion of households adopting four livelihood options is very low with a maximum of 5.61 per cent in Himachal Pradesh.

Table 2 presents distribution of households according to combinations of different types of livelihood options. There are four livelihood options, namely, cultivation, animal farming, wages and salary and non-farm business. These four options could be combined and adopted in eight different combinations, namely, (i) cultivation, (ii) cultivation and wages and salary (iii) cultivation and animal farming, (iv) cultivation and non-farm business, (v) cultivation, wages and salary and animal farming, (vi) cultivation, animal farming and non-farm business, (vii) cultivation, wages and salary and non-farm business and (viii) cultivation, wages and salary, animal farming and non-farm business. As may be seen from the table, more than three-fifths of the households in six states (Bihar, Assam, Haryana Punjab, Uttarakhand and Uttar Pradesh) have adopted cultivation and cultivation and animal farming as the two combinations of options followed by Karnataka where the proportion of such households is around 57 per cent. Similarly, in Gujarat and Madhya Pradesh around 48-50 per cent of the households have adopted these two combinations of options followed by West Bengal, Kerala and Maharashtra, where the proportion of such households is around 42-43 per cent.

In three states (Chhattisgarh, Jharkhand and Telangana), more than seventy per cent of the households have adopted cultivation and cultivation and wages and salary as the main combinations of livelihood options while in two others (Maharashtra and Odisha), the proportion of households practicing these options is around 48 per cent. The proportion of households adopting a combination of three options, namely, cultivation, animal farming and wages and salary is maximum in Andhra Pradesh and Jammu and Kashmir (around 30 per cent) followed by those practicing a combination of cultivation and wages and salary (27.86 per cent and 24.74 per cent). In Himachal Pradesh and Rajasthan, there is no significant difference in the proportion of households adopting two combinations of livelihood options, namely, cultivation and animal farming and cultivation, animal farming and wages and salary; which is around 36 per cent and 42 per cent, respectively. Another important feature emanating from the table is a very low proportion of households who have combined non-farm business

TABLE 2. DISTRIBUTION OF HOUSEHOLDS ACCORDING TO DIFFERENT COMBINATIONS OF LIVELIHOOD OPTIONS: MAJOR STATES, 2013
(per cent)

State	Cultivation (1)	Cultivation and wages (2)	Cultivation and salary (3)	Cultivation and animal farming (4)	Cultivation, wages and salary and animal farming (5)	Cultivation and non-farm business (6)	Cultivation, animal farming and non-farm business (7)	Cultivation, wages and salary, and non- farm business (8)	Cultivation, wages and salary, animal farming and non- farm business (9)	Proportion of households who have non- farm business as one of the options		All (11)
										(10)		
Andhra Pradesh	14.47	27.86	20.22	30.24	2.33	2.25	1.21	1.43	7.22	100		
Assam	31.85	11.85	40.72	10.54	2.33	1.91	0.69	0.51	5.44	100		
Bihar	35.71	9.78	36.89	12.74	1.90	2.11	0.43	0.43	4.87	100		
Chhattisgarh	25.83	53.96	7.45	11.97	0.40	0.00	0.40	0.00	0.80	100		
Gujarat	11.76	10.31	38.51	31.30	1.87	3.89	1.03	1.34	8.13	100		
Haryana	6.62	3.06	59.85	24.11	0.59	4.58	0.34	0.85	6.36	100		
Himachal Pradesh	6.89	5.13	35.82	36.38	0.64	9.21	0.32	5.61	15.78	100		
Jammu & Kashmir	9.07	24.74	21.43	30.22	3.65	4.43	1.90	4.57	14.55	100		
Jharkhand	28.27	47.80	3.70	10.77	5.51	1.17	2.53	0.26	9.47	100		
Karnataka	23.88	13.54	34.29	19.35	2.64	4.00	0.91	1.40	8.95	100		
Kerala	26.43	19.21	17.99	14.52	10.73	5.10	3.22	2.81	21.86	100		
Madhya Pradesh	14.02	19.14	33.16	29.23	0.88	1.84	0.62	1.11	4.45	100		
Maharashtra	22.97	25.87	21.40	20.67	3.56	2.42	1.88	1.24	9.10	100		
Odisha	18.03	30.35	14.04	24.22	5.89	3.69	1.99	1.79	13.36	100		
Punjab	5.72	2.75	58.13	13.50	0.62	5.17	12.47	1.65	19.91	100		
Rajasthan	4.08	5.32	41.19	42.49	0.88	3.48	0.39	2.18	6.93	100		
Tamil Nadu	17.55	23.17	23.97	25.72	2.42	3.32	1.73	2.11	9.58	100		
Telangana	29.88	43.01	12.60	8.64	1.98	0.79	2.18	0.92	5.87	100		
Uttarakhand	17.51	13.47	44.95	18.69	2.02	1.68	0.84	0.84	5.38	100		
Uttar Pradesh	16.47	7.50	48.96	19.53	1.54	4.40	0.32	1.26	7.52	100		
West Bengal	18.32	22.07	22.29	19.91	5.47	6.17	2.68	3.09	17.41	100		
All India	17.97	19.26	30.26	23.62	2.51	3.46	1.23	1.70	8.90	100		

Source: Computed by the authors using data from the source mentioned in Table 1.

as one of their livelihood options with other options. There are four different combinations of options in which non-farm business is one of the options and the proportion of households adopting these combinations across states is very low. For example, among states, the proportion of those who have combined non-farm business with other options is maximum in Kerala (21.86 per cent) followed by Punjab (19.91 per cent), West Bengal (17.41 per cent), Himachal Pradesh (15.78 per cent), Jammu and Kashmir (14.55 per cent) and Odisha (13.36 per cent). In all other states, it is below 10 per cent and varies from 0.80 per cent in Chhattisgarh to 9.58 per cent in Tamil Nadu.

IV

EFFECT OF DIVERSIFICATION OF LIVELIHOOD OPTIONS

The effect of diversification of livelihood options has been studied in terms of its effect on average income, consumption expenditure and incidence of poverty among households practicing different combinations of options. In this context, Table 3 reveals that average annual income of households who have adopted all the four options, namely, cultivation, animal farming, wages and salary and non-farm business is significantly higher as compared to those who have adopted other combinations of options in twelve states (Andhra Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Telangana, Uttarakhand, Uttar Pradesh and West Bengal). In six states (Gujarat, Maharashtra, Odisha, Punjab, Rajasthan and Tamil Nadu), the average income of those who have combined cultivation with animal farming and non-farm business is the highest. Further, in Karnataka the average income of those who have combined cultivation with non-farm business and wages and salary is highest while in Madhya Pradesh it is the highest in case of those who have combined cultivation with non-farm business. Thus Chhattisgarh is the only state where average income of households who have adopted cultivation with animal farming is highest in comparison to other households. Table 3 further shows that among all households, average income of those who are practicing cultivation as the only option is the lowest in as many as fifteen states (Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal) which varies from Rs. 2185 in West Bengal to Rs. 9512 in Kerala. In four states (Haryana, Karnataka, Madhya Pradesh and Telangana), the average income is lowest in case of those who have adopted cultivation and wages and salary, while in Punjab it is the lowest in case of those who are pursuing three options, namely, cultivation, wages and salary and animal farming. In brief, the data presented in the table shows that the average annual income of those households who have adopted non-farm business as one of the options is the highest in all states as compared to those who do not have non-farm business as one of their options with the notable exception of Chhattisgarh.

TABLE 3. AVERAGE INCOME OF HOUSEHOLDS ADOPTING DIFFERENT COMBINATIONS OF LIVELIHOOD OPTIONS: MAJOR STATES, 2013
(Rs./annum)

State (1)	Cultivation (2)	Cultivation and wages & salary (3)	Cultivation and animal farming (4)	Cultivation, Wages & salary and animal farming (5)	Cultivation and non-farm business (6)	Cultivation, animal farming and non-farm business (7)	Cultivation, wages & salary, and non-farm business (8)	Cultivation, wages & salary, animal farming and non-farm business (9)	Cultivation, wages & salary, animal farming and non-farm business (10)	Households (11)
Andhra Pradesh	3147	5039	12563	6381	9008	14745	6940	39553	15744	8219
Assam	7748	16954	8026	9814	16367	16563	13283	24871	14079	10214
Bihar	3796	7822	6082	12637	7348	12831	7295	13665	12187	5877
Chhattisgarh	7105	6595	9776	7670	8630	0	7179	0	7332	7148
Gujarat	4835	7542	9638	10968	9169	19440	12182	17665	16278	9259
Haryana	8392	6783	19030	14319	17678	13422	21152	21779	15472	17106
Himachal Pradesh	5435	13791	12603	11324	13684	10018	14462	24964	15425	13069
J&K	4165	11180	11650	12021	17196	12535	28651	29835	19903	13673
Jharkhand	2306	5198	5042	11767	10691	10446	10582	29283	11256	5503
Karnataka	8015	7210	11941	21942	9372	22719	46488	26982	25047	11133
Kerala	9512	21680	11477	21401	16475	24023	28232	34131	24904	16579
Madhya Pradesh	5767	5670	13068	18910	8111	17552	13561	11838	11093	7088
Maharashtra	3653	5115	8041	9139	6238	14789	11433	14676	16626	8247
Odisha	2399	4917	6341	7012	8807	18098	14578	15708	12129	6853
Punjab	17022	22053	24278	14675	9413	43764	10686	32138	27815	23727
Rajasthan	4456	5737	9636	8488	7628	28025	5495	20090	21543	9187
Tamil Nadu	5347	6890	8014	20658	9573	18290	13903	14952	17271	8558
Telangana	7623	5594	12909	6840	8258	9852	7200	13989	8645	7537
Uttarakhand	3570	5548	6112	6091	9413	8992	6080	12076	7875	6297
Uttar Pradesh	3650	5650	10006	6909	9924	13934	13324	23847	13252	8835
West Bengal	2185	5254	3649	6121	7040	9539	8125	14524	9127	5352
All India	5121	8167	9824	12915	10062	16512	16208	20736	16247	9274

Source: Computed by the authors using data from the source mentioned in Table 1.

Table 4 presents the average annual consumption expenditure of households adopting different combinations of livelihood options across states. A perusal of the table shows that in about half of the states (Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Telangana, Uttarakhand and West Bengal), the average annual consumption expenditure of those households who have adopted all the four options is significantly higher as compared to those who have adopted either three, two or only one option. In six other states (Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh), the average annual consumption expenditure is highest in case of households adopting three options including non-farm business as one of the options. In Punjab and Haryana, households who have combined cultivation with animal farming enjoy higher consumption expenditure as compared to their counterparts adopting different combinations of other options. Similarly, in Chhattisgarh, Kerala and Odisha households who are practicing cultivation with non-farm business as one of the options have the higher average annual consumption expenditure in comparison to all others with different combinations of options. On the whole, the data given in the table shows that in all states average annual consumption expenditure of those households who have adopted non-farm business as one of their livelihood options is significantly higher as compared to those who practice/combine other options except Punjab, Haryana and Kerala.

The incidence of poverty among households practicing different combinations of livelihood options has been presented in Table 5. The table shows that in about half of the states (Assam, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Punjab and Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal), the incidence of poverty is significantly higher among those who are practicing cultivation along with animal farming. In five states (Andhra Pradesh, Chhattisgarh, Jharkhand, Odisha and Telangana) the incidence of poverty is the highest among those who combine cultivation with wages and salary whereas in three states (Bihar, Kerala and Maharashtra), it is more among those who practice cultivation as a sole livelihood option. The data on the incidence of poverty among households adopting different combinations of livelihood options across states once again clearly shows that the households who combine cultivation with non-farm business as one of the options along with other options have lower incidence of poverty as compared to their other counterparts.

V

DETERMINANTS OF DIVERSIFICATION OF LIVELIHOOD OPTIONS

We have estimated multinomial logit model to quantify the factors affecting the probability of choosing different combinations of livelihood options by agricultural households in relation to cultivation which is considered as a base category. As mentioned above, different livelihood options have been classified into three groups. Group 1 includes cultivation as the only option. Group 2 includes three combinations, namely, (i) cultivation + animal Farming; (ii) cultivation + wages and salary and (iii)

TABLE 4. AVERAGE CONSUMPTION EXPENDITURE OF HOUSEHOLDS ADOPTING DIFFERENT COMBINATIONS OF LIVELIHOOD OPTIONS: MAJOR STATES, 2013

State (1)	Cultivation (2)	Cultivation, Wages & salary and animal farming (4)						Cultivation, animal farming and non-farm business (6)	Cultivation, wages and salary, and non-farm business (7)	Cultivation, wages and salary, and non- farm business (8)	Cultivation, wages and salary, animal farming and non- farm business (9)	Households (10)	(Rs./annum)	
		Cultivation and wages and salary (3)	Cultivation and animal farming (5)	Cultivation and non-farm business (6)	Cultivation, animal farming and non-farm business (7)	Cultivation, wages and salary, and non- farm business (8)								
Andhra Pradesh	5913	4968	7227	6209	5715	7881	5670	8969	7156	5964				
Assam	6539	7263	6549	6813	6990	8211	8135	10739	7897	6765				
Bihar	6251	6349	6714	7067	5972	7957	5827	8948	7537	6466				
Chhattisgarh	5320	4638	4995	9696	4787	-	10194	-	-	8360	4888			
Gujarat	7099	6659	8146	9558	7647	11196	7561	10701	10323	7893				
Haryana	8772	9925	13779	8350	10575	11263	8738	9717	10549	12286				
Himachal Pradesh	5568	6798	9667	9530	8143	9645	6438	15060	11630	8986				
Jammu & Kashmir	8488	8127	10472	8958	10987	10606	14290	13434	11565	10021				
Jharkhand	5304	5881	6111	6453	5777	5068	6905	19816	6645	5676				
Karnataka	5595	5629	6824	6779	6159	8897	7741	9167	8173	6376				
Kerala	11899	11887	13134	15364	11785	14406	12137	14967	14680	12700				
Madhya Pradesh	4675	4194	6339	5489	4800	6394	4786	5696	5724	5220				
Maharashtra	5259	4979	6176	7732	5654	7834	7812	7299	7727	5694				
Odisha	4524	4290	5130	5571	4992	7059	7276	5225	6138	4840				
Punjab	11821	12091	16428	10297	5729	15669	6442	15324	5655	14849				
Rajasthan	5836	6108	8245	7332	7541	12480	4842	10455	10842	7912				
Tamil Nadu	6295	6489	8073	8306	7064	10023	7838	8344	8885	7210				
Telangana	5911	5577	6283	6401	6104	6222	6026	8815	6656	5914				
Uttarakhand	4223	5307	7436	3507	7321	11055	3144	11067	7063	6553				
Uttar Pradesh	6191	5415	8397	8095	7254	9770	6545	9293	9211	7650				
West Bengal	6255	5543	7326	7428	6826	9321	7374	10020	8549	6838				
All India	6433	6289	8214	8425	7084	9760	8152	10025	9215	7342				

Source: Computed by the authors using data from the source mentioned in Table 1

TABLE 5. INCIDENCE OF POVERTY AMONG HOUSEHOLDS ADOPTING DIFFERENT COMBINATIONS OF LIVELIHOOD OPTIONS: MAJOR STATES, 2013
(per cent)

State (1)	Cultivation (2)	Cultivation and wages ans salary (3)	Cultivation and animal farming (4)	Cultivation, wages and salary and animal farming (5)	Cultivation and non-farm business (6)	Cultivation, animal farming and non-farm business (7)	Cultivation, wages and salary, animal farming and non- farm business (8)	Cultivation, wages and salary, animal farming and non- farm business (9)	Cultivation, wages and salary, animal farming and non- farm business (10)	Households who have non- farm business as one of the options (11)
Andhra Pradesh	10.84	15.25	11.32	0.78	11.10	0.39	0.39	0.22	1.77	50.28
Assam	16.12	3.07	17.85	0.81	2.24	0.12	0.12	0.00	1.04	40.33
Bihar	27.37	5.55	21.61	0.70	6.08	0.48	0.10	0.05	1.32	61.93
Chhattisgarh	9.67	28.68	3.17	0.16	5.94	0.00	0.16	0.00	0.32	47.78
Gujarat	8.24	4.85	15.53	0.80	8.89	0.46	0.19	0.04	1.49	39.01
Haryana	4.67	2.29	19.35	0.08	7.39	1.44	0.00	0.17	1.70	35.40
Himachal Pradesh	5.69	2.00	23.72	0.08	10.02	2.16	0.00	0.16	2.40	43.83
Jammu & Kashmir	7.38	10.61	13.98	1.26	6.89	0.70	0.14	0.07	2.18	41.04
Jharkhand	24.38	27.63	2.46	2.79	3.24	0.19	0.52	0.00	3.50	61.22
Karnataka	14.30	7.17	17.05	0.79	7.54	0.91	0.11	0.15	1.96	48.02
Kerala	16.15	1.79	8.20	1.31	1.43	0.90	0.08	0.08	2.37	29.93
Madhya Pradesh	8.95	11.74	10.92	0.49	12.88	0.65	0.10	0.18	1.42	45.91
Maharashtra	16.51	14.90	11.40	1.16	8.40	0.37	0.31	0.27	2.11	53.31
Odisha	13.36	17.44	7.68	2.41	7.53	0.33	0.68	0.15	3.57	49.57
Punjab	1.93	0.76	12.33	0.07	3.86	0.90	2.55	0.14	3.65	22.52
Rajasthan	3.23	3.75	21.88	0.24	20.10	0.60	0.24	0.24	1.33	50.29
Tamil Nadu	11.75	10.57	11.65	0.49	7.53	0.62	0.31	0.15	1.57	43.07
Telangana	13.85	19.53	2.77	0.66	1.65	0.20	0.33	0.07	1.25	39.05
Uttarakhand	15.49	9.76	32.15	1.68	7.07	0.34	0.34	0.00	2.36	66.84
Uttar Pradesh	11.69	4.73	24.51	0.49	9.29	1.37	0.11	0.30	2.27	52.50
West Bengal	15.35	13.40	15.28	2.64	8.85	0.94	0.45	0.45	5.84	58.72
All India	12.16	9.20	14.37	0.81	8.27	0.75	0.23	0.20	1.99	45.98

Source: Computed by the authors using data from the source mentioned in Table 1.

cultivation + wages and salary + animal farming. Group 3 consists of four combinations which are (i) cultivation + non-farm business; (ii) cultivation + animal farming + non-farm business; (iii) cultivation + wages and salary + non-farm business and (iv) cultivation + wages and salary + animal farming + non-farm business. Given the availability of data, the variables for the model have been chosen after a thorough review of empirical literature, cited above, on the diversification of livelihood options. Further, to control the state/union territory level differences in government policies, infrastructural facilities and agro-climatic conditions which have significant influence on households adopting different combinations of options, all states and union territories have been included as independent binary variables along with other variables. Two models have been estimated. Model I estimates the probability of different factors affecting adoption of different combinations of options included in Group 2 in relation to cultivation as the only option in Group 1 while Model II estimates the probability of different factors affecting adoption of combinations of options included in Group 3 in relation to cultivation as the only option in Group 1. The results of the model I and model II are presented in Table 6. A perusal of the table shows that variables like household size, male as the head of the family, number of adults in the family, log of per capita income and access to technical advice have positive and statistically significant effect on the probability of a household choosing different combinations of livelihood options included in Group 2 in relation to cultivation as the only option. Similarly, variables such as household belonging to scheduled caste, other backward castes and others category in relation to scheduled tribe, number of dependents, different education levels of the head of the family in relation to being illiterate, marginal, small and large households in relation to sub-marginal households have negative and statistically significant effect on the probability of a agricultural household choosing different combinations of livelihood options included in group 2 in relation to cultivation. The signs of some variables like education level of the head of the family up to primary, household being marginal and small and households belonging to scheduled caste are unexpected as these households are more likely to adopt combinations of options included in Group 2 in relation to cultivation as a sole option because of their low level of education, having low amount of land and coming from a caste with low holdings. The variables like age, age square surrogating life cycle effect, number of children in the family, and household below poverty line do not have statistically significant effect on the probability of a household choosing different combination of livelihood options in this group in relation to cultivation. The odds ratios associated with different variables further show that households who have large size, male as the head of the family, more adults, higher per capita income and access to technical advice have more than one time chances of choosing different combinations of options included in group 2 in relation to cultivation. The effect of state/union territories specific variations on the probability of a household choosing combination of options in group 2 in relation to cultivation, presented in Table 7, is positive and statistically significant if it comes from Andhra Pradesh, Haryana,

TABLE 6. FACTORS AFFECTING PROBABILITY OF AN AGRICULTURAL HOUSEHOLD CHOOSING
A COMBINATION OF LIVELIHOOD OPTIONS IN RELATION TO CULTIVATION: RESULTS
OF MULTINOMIAL LOGISTIC REGRESSION MODEL

Independent variable (1)	Group 1: Cultivation as the Base Category		Odds ratio	
	Coefficients		Model I (4)	Model II (5)
	Model I (2)	Model II (3)		
Constant	-1.661*** (0.260)	-7.987*** (0.376)	0.190***	0.0003***
Household size	0.810*** (0.025)	1.097*** (0.029)	2.248***	2.995***
Age (years)	0.0001 (0.005)	0.005 (0.008)	1.000	1.005
Age squared (years)	-0.0001 (0.0001)	-0.0002* (0.0001)	0.999	1.000
Gender				
(Male=1, Female=0)	0.364*** (0.041)	0.487*** (0.069)	1.439***	1.627***
Children (No.)	-0.0004 (0.010)	0.017 (0.014)	0.999	1.017
Adult (No.)	0.018* (0.009)	-0.001 (0.012)	1.018**	0.999
Number of dependents	-0.668*** (0.025)	-0.863*** (0.029)	0.513***	0.422***
Social category:				
SC	-0.127** (0.051)	0.392*** (0.080)	0.881**	1.480***
OBC	-0.213*** (0.040)	0.602*** (0.066)	0.808***	1.826***
Others	-0.393*** (0.042)	0.356*** (0.069)	0.675***	1.428***
Education Level:				
Upto Primary	-0.157*** (0.033)	0.212*** (0.050)	0.855***	1.236***
Primary to Middle	-0.186*** (0.038)	0.317*** (0.057)	0.830***	1.373***
Middle to Secondary	-0.433*** (0.042)	0.026 (0.063)	0.649***	1.026
Above Secondary	-0.382*** (0.043)	0.096 (0.064)	0.683***	1.101
Land size:				
Marginal	-0.600*** (0.039)	-0.895*** (0.057)	0.549***	0.409***
Small	-0.833*** (0.036)	-1.295*** (0.051)	0.435***	0.274***
Medium	-1.035*** (0.040)	-1.736*** (0.059)	0.355***	0.176***
Large	-1.044*** (0.063)	-2.102*** (0.093)	0.352***	0.122***
Log of per capita income	0.410*** (0.014)	0.796*** (0.023)	1.506***	2.217***
Poverty:				
(Yes=1, No=0)	0.044 (0.036)	0.433*** (0.056)	1.045	1.542***
Access to technical advice:	0.115*** (0.030)	0.129*** (0.043)	1.122***	1.138***
(Yes=1, No=0)				
Number of observations	64709			
LR Chi2(112)	13439.57			
Prob > chi2	0.0000			
Pseudo R-square	0.1427			
Log likelihood	-40354.961			

Note: i. ***, ** and * denotes the level of significance at 1 per cent, 5 per cent and 10 per cent, respectively.
ii. Figures in parentheses are standard errors

Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Chandigarh, Sikkim, and Dadar and Nagar Haveli. However, it is negative and statistically significant if a household is located in Assam, Bihar, Chhattisgarh, Jharkhand, Kerala, Telangana, Arunachal Pradesh, Nagaland, Mizoram, Goa and Lakshadweep. The odd ratios further show that the chances of a household belonging to these states/union territories adopting different combinations of options in group 2 in relation to cultivation are more than one as compared to choosing cultivation as the only option. The positive and significant effect of state level variations on the probability of a households choosing cultivation in these states/union territories could be attributed to their being comparatively agriculturally more developed states. However, state level variations do

TABLE 7. COEFFICIENTS AND ODDS RATIO OF STATE/UNION TERRITORY AS ONE OF THE INDEPENDENT VARIABLES

State as independent variable (1)	Group 1: Cultivation as the Base Category		Odds ratio	
	Coefficients		Model I (4)	Model II (5)
	Model I (2)	Model II (3)		
Andhra Pradesh=1; Else=0	0.421** (0.212)	-0.001 (0.276)	1.523**	0.999
Assam =1; Else=0	-1.083*** (0.201)	-1.884*** (0.265)	0.339***	0.152***
Bihar =1; Else=0	-0.895*** (0.202)	-1.737*** (0.265)	0.409***	0.176***
Chhattisgarh=1; Else=0	-0.579*** (0.211)	-3.128*** (0.425)	0.560***	0.043***
Gujarat =1; Else=0	0.321 (0.211)	-0.384 (0.272)	1.379	0.681
Haryana =1; Else=0	0.930*** (0.243)	-0.283 (0.312)	2.535***	0.754
Himachal Pradesh=1; Else=0	1.146*** (0.241)	1.047*** (0.296)	3.146***	2.849***
Jammu and Kashmir=1; Else=0	0.601*** (0.230)	0.295 (0.287)	1.824***	1.344
Jharkhand=1; Else=0	-0.779*** (0.208)	-0.662** (0.274)	0.459***	0.516**
Karnataka=1; Else=0	-0.220 (0.206)	-0.618** (0.267)	0.803	0.539**
Kerala=1; Else=0	-0.958*** (0.206)	-0.760*** (0.262)	0.384***	0.468***
Madhya Pradesh=1; Else=0	0.077 (0.204)	-0.870*** (0.269)	1.080	0.419***
Maharashtra=1; Else=0	-0.175 (0.202)	-0.462* (0.259)	0.839	0.630*
Odisha =1; Else=0	-0.065 (0.205)	0.235 (0.262)	0.937	1.265
Punjab =1; Else=0	0.977*** (0.239)	-0.104 (0.301)	2.656***	0.901
Rajasthan=1; Else=0	1.516*** (0.223)	0.859*** (0.281)	4.552***	2.360***
Tamil Nadu =1; Else=0	0.291 (0.207)	-0.116 (0.265)	1.337	0.891
Telangana=1; Else=0	-0.696*** (0.209)	-1.177*** (0.282)	0.499***	0.308***
Uttarakhand=1; Else=0	0.068 (0.235)	-0.904*** (0.333)	1.070	0.405***
Uttar Pradesh=1; Else=0	0.021 (0.200)	-0.678*** (0.257)	1.021	0.508***
West Bengal=1; Else=0	-0.148 (0.203)	0.318 (0.258)	0.863	1.374
Chandigarh =1; Else=0	1.645** (0.746)	-14.244 (534.374)	5.183**	0.00001
Delhi =1; Else=0	0.293 (0.428)	-0.520 (0.551)	1.341	0.595
Sikkim=1; Else=0	1.031*** (0.284)	0.740** (0.347)	2.805***	2.095**
Arunachal Pradesh=1; Else=0	-2.788*** (0.222)	-3.049*** (0.339)	0.062***	0.047***
Nagaland=1; Else=0	-2.078*** (0.217)	-3.214*** (0.404)	0.125***	0.040***
Manipur=1; Else=0	-0.067 (0.215)	-0.139 (0.278)	0.935	0.870
Mizoram=1; Else=0	-0.599*** (0.222)	-2.215*** (0.399)	0.549***	0.109***
Tripura=1; Else=0	-0.167 (0.210)	-1.705*** (0.302)	0.845	0.182***
Meghalaya=1; Else=0	-0.197 (0.224)	-0.553* (0.298)	0.821	0.575*
Daman and Diu=1; Else=0	0.223 (0.467)	0.188 (0.553)	1.250	1.207
D and Nagar Haveli=1; Else=0	1.576** (0.756)	1.508* (0.816)	4.835**	4.520*
Goa=1; Else=0	-1.070*** (0.275)	-0.948** (0.372)	0.343***	0.387**
Lakshadweep=1; Else=0	-0.632* (0.382)	-2.595*** (0.655)	0.532*	0.075***
Puducherry=1; Else=0	-0.213 (0.346)	-1.456*** (0.558)	0.808	0.233***
Number of observations	64709			

Note: (i)***, ** and * denotes the level of significance at 1, 5 and 10 per cent, respectively. (ii) Figures in parentheses are standard errors.

not have any statistically significant effect on a household choosing combination of options in Group 2 in relation to cultivation if it belongs to Gujarat, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, Delhi, Manipur, Tripura, Meghalaya, Puducherry and Daman and Diu.

The results of Model II show that while variables like household size, male being the head of the household, household belonging to scheduled caste, other backward castes and other castes in relation to scheduled tribe, levels of education in relation to illiteracy, log per capita income and access to technical advice have positive and

statistically significant effect, age square, number of dependents and households belonging to different land categories in relation to sub-marginal category have negative and statistically significant effect on the probability of a household choosing combinations of options included in group 3 in relation to cultivation. The variables like age, number of children, number of adults, education level of middle to secondary and secondary and above in relation to illiteracy do not have statistically significant effect on the probability of household choosing combinations of such options. This is unexpected as households with these characteristics are in a more favourable position to practice livelihood options included in Group 3. The odd ratios associated with different variables further suggest that those households who have large size, male as a head of the family, belong to scheduled caste, other backward castes and others in relation to scheduled tribe, higher per capita income, access to technical advice, education up to primary and middle levels and are poor have more than one time chances of choosing combinations of livelihood options included in group 3 with non-farm business as one of the options as compared to choosing cultivation as the only option. In so far as the effect of a household belonging to a particular state/union territory is concerned, Table 7 shows that there is no significant effect of state/union territory level variations on the probability of a household choosing combination of livelihood options in group 3 in relation to cultivation if it belongs to Andhra Pradesh, Gujarat, Haryana, Jammu and Kashmir, Odisha, Punjab, Tamil Nadu, West Bengal, Delhi, Chandigarh, Manipur and Daman and Diu. However, if a household comes from Himachal Pradesh, Rajasthan, Sikkim and Dadar and Nagar Haveli, its probability of choosing combinations of options from group 3 in relation to cultivation is positive and statistically significant. Similarly, the probability of a household choosing combinations of these options in relation to cultivation is negative and statistically significant in case a household is from Assam, Bihar, Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Telangana, Uttarakhand, Uttar Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Mizoram, Tripura, Meghalaya, Goa, Lakshadweep and Puducherry. The odd ratios for different states/union territories show that the chances of a household choosing a combination of options included in group 3 are more than one if it belongs to four states/union territories, namely, Himachal Pradesh, Rajasthan, Sikkim, and Dadra and Nagar Haveli.

VI

CONCLUSIONS

In sum, our analysis shows that in most of the states a majority of the households adopt two or even more than two livelihood options. Among different livelihood options, around fifty per cent of the households or even more adopt cultivation and animal farming as the two main options in nine states (Bihar, Assam, Haryana, Gujarat, Karnataka, Madhya Pradesh, Punjab, Uttarakhand and Uttar Pradesh) while in three others (Chhattisgarh, Jharkhand and Telangana) more than seventy per cent of the households adopt cultivation and wages and salary as the two livelihood options. In

most of the states, average income of those households who adopt cultivation as the only option is significantly lower as compared to their counterparts combining cultivation with other options. Further, a very low proportion of households have combined non-farm business as one of their livelihood options with other options across most of the states with the notable exceptions of Kerala, Punjab, West Bengal, Himachal Pradesh, Jammu and Kashmir and Odisha where the proportion of such households is comparatively higher. The conclusions of our study broadly support the findings in the literature that diversification of livelihood options has a positive effect on income and consumption expenditure of the agricultural households and leads to reduction in poverty. In particular, the study shows that those households who have adopted non-farm business as one of the livelihood options enjoy significantly higher amount of household income and consumption expenditure and have low incidence of poverty as compared to their counterparts who do not have non-farm business as one of the options. The results of the multinomial logit regression model further show that factors such as household size, gender of the head of the family, age square capturing life cycle effect, number of adults in the family, education levels of the head of the household, social group to which a household belongs, land category of the household, access to technical advice, per capita income, household below poverty and the state/union territories to which a household belongs affect the probability of a household choosing different combinations of livelihood options included in group 2 and group 3 in relation to cultivation though the signs and levels of statistical significance of these variables differ in two models. In broad terms, the unequivocal message emanating from the findings of the study is that promotion of non-farm business as one of the options along with cultivation holds the key to enhance farmers' income and consumption and pull them out of poverty.

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