



Impact of factors share on productivity of ginger (*Zingiber officinale*) in NEHR of India

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ABSTRACT

The ginger crop being major crop in the region plays a vital role in livelihood and income of the farmers of the North Eastern Hill Region (NEHR). Study covered NEHR states except Assam. The data pertains to year 2017–18 containing sample size of 271 farmers. The results discussed ample scope to increase factor share to scale-up productivity of ginger. Among the different factors of ginger production, the ginger seed and human labour have contributed large share in ginger production. The study recommends for construction of post harvest storage structures for ginger rhizome in the locality of ginger growing area to store their rhizome for next season crop. To enhance research and development expenditures in North Eastern Hill Region was especially to develop small size of machinery with the intent to reduce cost of human labour. The potential of ginger crop in the study area needs to be tapped not only to enhance the factor share but also through technological interventions.

Key words: Factor, Ginger, Impact, NEHR, Share

India is not only the larger producer but also the major consumer and exporter of spices in the world. During 2013–14, 0.81 lakh tonnes of spices were exported from India fetching an income of ₹13735.39 crore and during the same year, 0.13 lakh tonnes were imported with the total outlay of ₹ 2905.13 crore (GoI 2015a). Among the major spices grown, ginger ranked 6th in area and 4th in production during 2015. There is a growth in export of ginger by 2.09% over the last ten years (2005–2014) (Kumar and Kumar 2011). In North Eastern Region (NER) spices share only 6.41% to the horticulture production basket (Spices board 2015). The leading producers of ginger in NER are Assam (33.03%), Meghalaya (17.01%) and Sikkim (14.07%) and the least producer is Manipur (1.03%), respectively (GoI 2015a). The region produces about 370.24 thousand ton of ginger in the country during 2013-14 which are marketed as fresh product. Comparatively, within the region the ginger produced in higher altitude contains high oleoresin and gives higher oil recovery (Rahman *et al.* 2009).

In NER, ginger cultivation is intercropped with maize, french bean, chillies and tapioca (Rahman *et al.* 2009). Lack

of farm mechanization due to the topographical condition of the region, human labour is the main requirement in ginger cultivation. Rahman *et al.* (2009) reported that specifically, in Sikkim extraction of mother was done by female member and in Meghalaya, Mizoram and Nagaland female played a dominant role in retail selling of ginger. Kumar *et al.* (2012) reported that the average returns of ginger growing adopted the recommended practices in Sikkim was higher (₹ 2.55 lakh) compared to that of the farmers practice (₹ 1.31 lakh). Large scale seed production of improved variety like Nadia in Meghalaya and marketing support in Mizoram encouraged ginger cultivation (Hnamte *et al.* 2012). About 63.87% of the farmers in the region are marginal with maximum land holding of 1 ha (GoI 2014). Hence it becomes imperative to assess the role of various factors of production in yield of ginger in north east hill region.

MATERIALS AND METHODS

The study covered all the seven states, viz. Meghalaya, Mizoram, Manipur, Nagaland, Arunachal Pradesh, Sikkim and Tripura of North Eastern Region of India. From each of the states, the district with higher area under ginger cultivation was selected. The exception was Sikkim because the difference in ginger area between East Sikkim and South Sikkim was not substantial. From the selected district, the block with highest area was chosen purposively. Farmers were selected after preparation of a list of ginger producing village from the selected block using technique of proportionate to sample size.

Selection of sample respondents: A sample of 34, 35, 60,

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Table 1 Selection of sample respondents

State	Block	Total Respondent (No)	Selected Respondent (No)
Arunachal Pradesh	Roing	860	34
Manipur	Tribuang	150	35
	Henglep	180	
	Twibung	130	
Meghalaya	Rongjeng	790	60
Mizoram	Thangnuam	670	35
Nagaland	Dhansiripar	570	38
Sikkim	Taza block	590	32
Tripura	Jolaibari	730	37
Total		4670	271

35, 38, 32 and 37 numbers of respondents from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura respectively were selected to make a total sample size of 271 ginger growers. The distribution of selected respondents in different blocks of different selected states is furnished in Table 1.

Source of data: Primary household data were collected using the pre-tested well-structured schedule during 2017–18. Information on socio-economic characteristics and cultivation related data etc were collected.

Analytical techniques: To estimate the factors' share, firstly work out the cost and returns of ginger production using cost concepts recommended by the Commission for Agricultural Costs and Prices (GoI 1979), as delineated below:

Cost A₁: Value of hired human labour + attached labour, value of owned and hired bullock labour + charges on owned and hired machinery + value of seed (both farm produced and purchased) + value of owned and purchased manures + value of fertilizers + value of plant protection chemicals used + depreciation + repairs and maintenance of farm machinery and farm implements and farm buildings + land revenue, cesses + interest on working capital

Cost A₂: Cost A₁ + rent paid on leased in land

Cost B₁: Cost A₂ + imputed interest on owned fixed capital excluding land

Cost C₁: Cost B₁ + imputed value of family labour

Cost C₂: Cost B₂ + imputed value of family labour

Factors' Share Analysis: The determination of the major inputs in production process is very important, because the concept of factor share has a bearing on production and cost structures and choice of technology. It is the ratio of cost of factor input used in production process to the value of output. The physical quantity of each factor input when multiplied by its price and then divided by the value of the total product, will yield factor share input (Dhondyal 1977).

$\Pi (X_1) = P_1 X_1 / P_y$, $\Pi (X_2) = P_2 X_2 / P_y$, $\Pi (X_3) = P_3 X_3 / P_y$, $\Pi (X_4) = P_4 X_4 / P_y$, $\Pi (X_5) = P_5 X_5 / P_y$, $\Pi (X_6) = P_6 X_6 / P_y$, $\Pi (X_7) = P_7 X_7 / P_y$, $\Pi (X_8) = P_8 X_8 / P_y$, $\Pi (X_9) = P_9 X_9 / P_y$, $\Pi (X_{10}) = P_{10} X_{10} / P_y$, $\Pi (X_{11}) = P_{11} X_{11} / P_y$

Table 1 Factor share analysis of ginger in selected states of North eastern Hill Region (2016–17)

Factors of production	Arunachal Pradesh			Manipur			Meghalaya			Mizoram		
	Value (₹/ha)	Ginger (₹ 17153.43/t)	Factor share (%)	Value (₹/ha)	Ginger (₹ 20149.52/t)	Factor share (%)	Value (₹/ha)	Ginger (₹ 13692.84/t)	Factor share (%)	Value (₹/ha)	Ginger (₹ 19996.87/t)	Factor share (%)
Output	155238.54	9.05	100	99337.14	4.93	100	92426.67	6.75	100	93585.36	4.68	100
Seed/Rhizome	33328.69	1.94	21.44	36786.67	1.83	37.12	24986.67	1.82	26.96	40176.64	2.01	42.95
Hired labour	18745.22	1.09	12.04	30684.96	1.52	30.83	12661.38	0.92	13.63	11168.87	0.56	11.97
family labour	13517.70	0.79	8.73	6122.86	0.30	6.09	17297.11	1.26	18.67	18109.57	0.91	19.44
Total human labour	32262.92	1.88	20.77	36807.81	1.83	37.12	29958.50	2.19	32.44	29278.44	1.46	31.20
Tractor	4555.55	0.27	2.98	-	-	-	-	-	-	-	-	-
Bullock	6481.75	0.38	4.20	-	-	-	-	-	-	-	-	-
Depreciation	846.24	0.05	0.55	790.68	0.04	0.81	566.93	0.04	0.59	920.7	0.05	1.07
Interest on working capital	4796.81	0.28	3.09	5119.67	0.25	5.07	2866.12	0.21	3.11	3919.97	0.20	4.27
Rental value of land	7843.14	0.46	5.08	8000.00	0.40	8.11	8481.67	0.62	9.19	8700.00	0.44	9.40

where, Π (X1), Share of seed; Π (X2), Share of Hired labour; Π (X3), Share of Imputed value of family labour; Π (X4), Share of Total human labour; Π (X5), Share of Tractor; Π (X6), Share of Bullock; Π (X7), Share of Depreciation; Π (X8), Share of Interest on working capital; Π (X9), Share of Rent paid for lease in land; Π (X10), Share of Interest on owned fixed asset; Π (X11), Rental value of land; P1, Cost of seed; P2, Cost of Hired labour; P3, Cost of Imputed value of family labour; P4, Cost of Total human labour; P5, Cost of Tractor; P6, Cost of Bullock; P7, Cost of Depreciation; P8, Cost of Interest on working capital; P9, Cost of Rent paid for lease in land; P10, Cost of Interest on owned fixed asset; P11, Cost of Rental value of land; P_y , Price of the output;

RESULTS AND DISCUSSION

The ginger is the major spice in the group of spices in terms of its production and area acreage in NEHR. The ginger crop in the hills is grown in upland as well as in lowlands. The productivity of crop varies with the state and also it depends on various factors of production of ginger in the region. Productivity of a crop is always better scale to measure fertility and economic feasibility of a crop for particular farm and region.

Ginger rhizome/seed: Ginger rhizome (seed) contributed highest share among the factors of productivity of ginger crop across states in the Region except Sikkim, Tripura and Meghalaya, wherein the share of labour factor was highest trailed by ginger rhizome (Table 1 and 2). The productivity depends upon the quality of rhizome. The quality of base material/rhizome decides the extent of productivity. This is reflected in price fluctuations as well as variability in quantity of seed/rhizome used by the ginger growers in the respective states. Among the state highest share of factors of seed/rhizome has been estimated in the state

of Mizoram (42.95%) followed by Manipur (37.12%), Nagaland (27.01%), Sikkim (28.18%), Meghalaya (26.96%), Arunachal Pradesh (21.44%), and Tripura (13.74%) in productivity of the ginger. Therefore, the mechanism for supply of quality rhizome was a matter of concern and the state agriculture department of respective states must develop proper seed supply system in the state to avoid the prevailing cost disparities of ginger seed/rhizome.

Labour: Labour is key factor of production in agriculture. Various forms of labour, viz. human, tractor and bullock are used in ginger production in the region (Table 1 and 2). The maximum activities in ginger production were performed manually.

Human labour: Human labour in ginger production comprises hired labour and family labour of ginger growers. Its share in productivity in ginger varies with the state. It ranges in between 6.35% to 37.12% across the states. The highest share of total human labor was estimated in the state of Manipur (37.12%) which was followed by Sikkim (35.10), Tripura (34.34%), Meghalaya (32.44%), Mizoram (31.20%), Arunachal Pradesh (20.77%) and Nagaland (6.51%). It is apparent from the Table 1 that the huge share of human labour contributed in ginger productivity which lead the human drudgery and lesser efficiency of labour and consequently affected the productivity of ginger. Therefore, site specific mechanization was the need of hour.

Tractor: The use of machinery in ginger production has been estimated very less. Its use was only Arunachal Pradesh and Nagaland, where its contribution in ginger productivity was estimated to be of 2.98% and 3.82%, respectively. Therefore, use of tractor in ginger production must be encouraged to enhance the labour efficiency in the region.

Bullock: The use of bullock labour similar to tractor labour it is very less in the region. The utility preferences of animal are rearing of cattle mainly for meat not for draft

Table 2 Factor share analysis of ginger in selected states of North Eastern Hill Region (2016–17)

	Nagaland			Sikkim			Tripura		
	Value (₹/ha)	Ginger (₹ 20401.34/t)	Factor share (%)	Value (₹/ha)	Ginger (₹ 20313.37/t)	Factor share (%)	Value (₹/ha)	Ginger (₹ 26070.14/t)	Factor share (%)
Output	144237.49	7.07	100	126146.01	6.21	100	155638.72	5.97	100
Seed	38979.96	1.91	27.01	35495.85	1.75	28.18	21440.07	0.82	13.74
Manure	4941.67	0.24	3.39	4974.19	0.25	4.03	1762.22	0.07	1.17
Hired labour	2981.13	0.15	2.12	20107.15	0.99	15.94	28799.38	1.10	18.42
Family labour	6472.58	0.32	4.53	24214.22	1.19	19.16	19149.46	0.73	12.23
Total human labour	9453.71	0.46	6.51	44321.37	2.18	35.10	53509.10	2.05	34.34
Tractor	5615.77	0.27	3.82	-	-	-	-	-	-
Depreciation	803.47	0.04	0.57	801.88	0.04	0.64	560.76	0.02	0.34
Interest on working capital	3999.15	0.20	2.83	4603.43	0.23	3.70	3810.01	0.15	2.51
Rental value of land	8645.00	0.42	5.94	8000	0.39	6.28	9375.00	0.36	6.03

purpose. Its use was found only in the state of Arunachal Pradesh which contributed 4.20% in the ginger productivity. Therefore, the bullock labour should be encouraged for its use in cultivation of ginger which has manifold benefits for the ginger growers.

Depreciation: The depreciation has been accounted for different tools and implements used in cultivation of ginger considering its use proportionate to the crop. It ranges from 0.34–1.07% of contribution in productivity of ginger. The highest the depreciation shows the highest used of new tools and implements in production of ginger. In this aspect Mizoram was found to be leading state and followed by Manipur and Sikkim.

Interest on working capital: The interest on working capital has been worked out by considering the formal interest rate of money in the locality taking into consideration the time span of the crop. Its contribution was more or less same in all the states except Manipur (5.07%) and Mizoram (4.27%). The capital management is very crucial aspect for the farmers and its proper management is the only solution to enhance the profitability of the farmer.

Rental value of land: The rental value of land has been estimated as a contribution in productivity of ginger in the range of 5.08–9.40%. It was highest in Mizoram and lowest in Arunachal Pradesh. This difference depends upon the distance of the land from the main market of the ginger. The land nearer to market has more rental value than that of distant one.

The study revealed that there was ample scope to increase the factor share to scale-up the productivity of ginger in the region. Among the different factors of ginger production, the ginger seed and human labour have contributed large share in ginger production across the states. Hence, for ginger rhizome should be constructed so that farmer can store their rhizome for next season crop; this needs to put in place post harvest storage structures in the locality of ginger growing area. To enhance the research and development expenditures in Hilly Region, so that it will help to reduce the cost of human labour in ginger cultivation in the region. To reduce the cost of production of ginger, urgent need is felt to develop small size of machinery.

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