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## **Risk of Financing Agriculture in the North-Eastern Hill Region of India with Special Reference to Meghalaya**

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### **Abstract**

The study pertains to the economic issues of risk and uncertainties associated with financing hill agriculture from the twin angles of risk of farmers to utilize the credit and of bankers to disburse the agricultural loan. The issues discussed are: first, why the financial institutions are reluctant to lend agricultural advances? Second, whether the farm income or rate of return on equity and non-equity capital is sufficient to repay the loan? Third, what are the major sources and the magnitude of risks and uncertainties associated with hill farming? Fourth, nature of agricultural marketing situation and how it affects the farm income in this region and finally, the possibilities have been explored, where and how the agricultural lending can be stepped up with positive economic return? The study has revealed that agricultural farming in north-east region of India is severely constrained by high risk and uncertainty arising out from various factors. Under the prevailing condition the expectation of a steady and assured income from agriculture is quite limited; hence, the hill farming fails to attract considerable private investment. The prevailing risk and uncertainty situation compels them to operate at low-input and low-output subsistence farming with low volume of marketable surplus. It has been found that the financial institutions face difficulty in financing the hill agriculture in view of low repayment performance and increasing non-performing assets for agricultural loan. Also, the absence/poor performance of crop insurance scheme (presently only Meghalaya and Sikkim are implementing the National Agricultural Insurance Scheme) increases the risk of hill farming considerably. Non-availability of reliable agricultural database (time series

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as well as cross section) on area, production and yield, cost of cultivation has been found the major impediments for implementing the crop insurance scheme efficiently. The agricultural situation in this region is highly heterogeneous; variability is extremely high even within a few kilometres of area. It has been suggested that suitable methodologies followed by a wide database be developed to estimate the yield and cost of production of horticultural crops which will help policymakers to formulate right policy to protect the interest of farmers as well as smooth functioning of all stakeholders — entrepreneurs, private investors, bankers and crop insurance implementing agencies.

### **Introduction**

Indian economy has recorded a growth rate of over six per cent during the post-liberalization era, but the real concern is the drastic fall in agriculture's contribution to the gross domestic product (GDP) in recent years, which stands at merely 24 per cent, in spite of the fact that 60 per cent of the country's population thrives on agriculture. Declining trend in the share of agriculture in total GDP is quite obvious and desirable for any developing country as it leads to the transition from agrarian to industrial economy. But, this declining trend in agriculture's share must be followed by the declining trend in population depending on agriculture, which is not happening for the Indian economy. Hence, revitalizing the agriculture sector is a priority for country's overall development and the agricultural credit is the most crucial factor to make the agrarian economy vibrant, particularly in the areas where the benefits of Green Revolution have not yet percolated, like the NEH Region of India. Realizing the need to enhance credit flow to agriculture, the Government of India, in consultation with the RBI, NABARD and Commercial Banks, announced on June 18, 2004, a credit package for the agriculture sector, which envisaged doubling of the agricultural credit over the next three years. To step-up agricultural credit from all lending institutions, estimated at Rs 80,000 crore during 2003-04, by 30 per cent to around 1,50,000 crore during 2004-05 with the share of various agencies as Rs 57,000 crore by the commercial banks, Rs 8500 crore by RRBs and Rs 39,000 crore by co-operative banks (Government of India, 2005). Despite continuous efforts, the flow of credit to the agricultural sector failed to exhibit any appreciable improvement due mainly to the fact that commercial banks are not tuned to the needs and requirements of the small and marginal farmers, while co-operative banks, on the other hand, lack resources to meet the expected demand (Mohan, 2004). Notwithstanding the impressive geographical spread, functional reach and consequent decline in the influence of informal sources of credit, rural financial institutions were characterized by several weaknesses, viz. decline in productivity and efficiency, and erosion

of repayment ethics and profitability (Reserve Bank India, 1998). Considering the country as a whole, institutional sources accounted for about 61.2 per cent of the total cash loan in 1981, which increased to only 66 per cent in 1991 (Mohanty and Haque, 2003).

The poor performance of economic growth and development of the NEH region, inspite of its rich endowment of natural resources, is indeed a matter of great concern. More than 80 per cent of the people in these states are dependent on agriculture and allied activities, but have poor resource-base, low economic status and limited investment capacity. The agricultural development can be stepped up through channelling of financial resources in the proper direction. The region has not been lacking in policy attention and programme. In fact, the total outflow of funds from the centre to this region is estimated to be of about Rs12,000 crore (US\$ 2.7 billion), which is higher than the disbursements received by India as a whole from the multilateral institutions like the World Bank and Asian Development Bank. It is also higher than the total aid received by Bangladesh. Thus, the flow of funds does not seem to be the problem, but they need to be used in such a way that the seeds of sustainable development are so sown that the growth of the region becomes self-propagating (Mohan, 2003). However, the agricultural advances are quite low in this region as compared to other parts of India. For example, the share of agricultural advances by all banks in the NEH Region was as low as 11.75 per cent in Assam followed by 14.66 per cent in Nagaland, 12.35 per cent in Manipur, 20 per cent in Arunachal Pradesh, and 26.28 per cent in Tripura (Government of India, 2000). Thus, the NEH Region is on one side receiving substantial amount of financial resources but the agricultural sector, so far has failed to attract adequate investment from institutional sources. The nationalized banks have shown a lukewarm response towards financing crop loans, particularly in view of the paucity of updated land records, lack of entrepreneurship development, poor-repayment status of loan, which increase the amount of non-performing assets in agriculture for commercial banks and in turn, increase the risk in agricultural financing.

The farmers in this region are mostly following the traditional agricultural practices, which are characterized by “low-input-low-output” situation. The demand for agricultural loan is expected to be induced by the availability and adoptability of suitable modern agro-technologies. But the advancement of modern agro-technologies in this region is very slow and is severely constrained by topographical features (70 per cent is hilly with 26 to 42 per cent forest area in each state). The modern agro-techniques, such as HYVs usually require high input-use (fertilizer, pesticide and irrigation, etc), in which lumpy investment is needed, which is unfavourable to the existing socio-

economic condition of the hill farmers. Most importantly, the higher yield for improved crop varieties is also associated with high yield-variability, under these typically slopy/hilly areas, which increases the risk and uncertainties of farm income, and is the major impediment for agricultural development in the NEH Region.

The present study pertains to the issues of risk and uncertainties associated with the financing of hill agriculture from the twin angles, viz. risk of farmers to utilize the credit as well as of bankers to disburse the agricultural loan. The issues related to agricultural financing in the NEH Region are: (i) why the financial institutions are reluctant to lend agricultural advances, (ii) whether the farm income or rate of return on equity and non-equity capital is sufficient to repay the loan, (iii) what are the major sources and the magnitude of risks and uncertainties associated with hill farming, (iv) nature of agricultural marketing and its affect on the farm income in this region, and (v) to explore the possibility of where and how the agricultural lending can be stepped up with positive economic return.

## **Methodology**

### **Data and Sources**

Primary as well as secondary data were used for the study. The secondary information was collected from various issues of *RBI Bulletin*, *Basic Statistics of NER* 2000 and 2002; *Economic Survey* 2003-04 and 2004-05; Directorate of Economic & Statistics, Government of Meghalaya: 2005-06, and NABARD, Meghalaya Regional Office, Shillong, and Meghalaya Co-operative Apex Bank Ltd (MCAB), Shillong, Meghalaya. The primary data were collected from 6 villages in Ri Bhoi district during 2002-03, 2003-04 and 2004-05. A total of 70 households (HH) were surveyed from the villages, namely Mawpun (18 HH), Pyllun (8 HH), Umsaw (8 HH), Sohriewblei (8 HH), Kyrdem (8 HH), and Umroi Madan (20 HH). The information on input-use, output realized from different crop enterprises, agronomic practices followed, marketing of output and farm income was collected for the present study. Detailed information on cultivation of paddy, ginger, and other major crops and the financial requirement was obtained from the sample households. Additionally, the feasibility analysis of new investment opportunity, ornamental fish, i.e. gold fish (*Carassius auratus*), was carried out using the detailed technical data obtained from the Division of Fishery, ICAR Research Complex for NEH Region, Umiam, Meghalaya.

### Analytical Framework

The risk and uncertainties of farming practices were judged through estimating the co-efficient of variation, standard deviation and average of different indicators, such as cost of cultivation, crop yield, input-use, price received and net returns of various enterprises. Farm budgeting technique was employed to calculate the input-use and output of farming. The profitability or net return of hill farming is also dependent on the area of operation besides equity and non-equity capital. It is a well-established fact that the large farms record greater profits or losses during good or bad years as compared to small farms. Farmers' credit requirement also varies with farm-size. As the hill farming is carried out at various sloppy conditions, the soil fertility status also varies across different slopes and gradients. Thus, the crop yield and in turn, the profitability is also dependent on the area of operation, i.e. net return is a function of area under crop cultivated. For the present investigation, the rate earned on equity capital, ratio of net returns to amount of equity capital invested on farm business has been taken as the proxy of uncertainty and this uncertainty is expected to be dependent on farm-size or cropped area under paddy (*Jhum*) and ginger cultivation. Quadratic form of production function was found to be the best fit to explain this relationship as compared to Linear and Cobb-Douglas type of function. The Quadratic model can be specified as Eqs(1) and (2):

$$REQ_P = a_1 + b_1 X_P + c_1 X_P^2 \quad \dots(1)$$

$$REQ_G = a_2 + b_2 X_G + c_2 X_G^2 \quad \dots(2)$$

where,  $REQ_P$  and  $REQ_G$  are the rates earned on equity capital for paddy (*Jhum*) and ginger cultivation, respectively,  $X_P$  and  $X_G$  are the cropped areas under paddy (*Jhum*) and ginger, respectively, and  $a_1$ ,  $b_1$ ,  $c_1$ , and  $a_2$ ,  $b_2$ ,  $c_2$  are the parameters to be estimated.

From the estimated quadratic response function, the rates earned on equity capital were estimated under varying cropped area under the specified crops. Additionally, with the rate earned on amount invested as equity capital, also the uncertainty of rate earned on non-equity capital (money borrowed from institutional sources) was estimated and the magnitude of profit or loss calculated. The financial risk of farmers for non-equity capital was examined at different leverage ratios. Leverage ratio is defined as the ratio of non-equity capital to equity capital invested in farm business.

### Financial Analysis

Besides measuring various risks and uncertainties associated with agricultural crops, and viability of new investment opportunity, a case study

of ornamental fish farming was conducted. The financial feasibility was estimated by using the discounted method, namely, Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR) and Net Present Value (NPV). The economic life was considered to be 10 years for the present analysis. Once the fish-farm is established, it is expected to be viable over a long period of time, but for the present study, economic life was considered to be 10 years to have a more realistic estimation. A 14 per cent discount rate was considered for this study, which is the maximum interest rate charged by the bankers for agricultural loan in the study area. As the time value of money is not possible to measure exactly, borrowing interest rate charged by the bankers is taken as a proxy for discount rate. The financial analysis was carried out for four different situations with varying degree of risks and uncertainties associated with the gold fish cultivation to examine the sensitivity of profitability. The situations considered were: (i) without any risk or uncertainty, (ii) with 10 per cent disease mortality risk of fingerlings, (iii) with uncertainty of 50 per cent fall in market price of fingerlings, and (iv) with combined risk and uncertainty (10 per cent mortality of fingerlings and 50 per cent fall in the market price).

## **Results and Discussion**

### **Status of Agricultural Credit in the NEH Region**

Commercial Banks, Regional Rural Banks and Cooperative Banks are the three prominent financial institutions providing financial assistance for agriculture and rural development in the Northeastern India. A few studies on macro aspects of agricultural credit have been undertaken, yet the specific studies to highlight the status of agricultural finance in the Northeastern India are lacking (Baruah and Sarma, 1990). The financial position and health of regional rural banks and cooperative banks is precarious and the aggregate accumulative losses are very high. Moreover, the business level of these banks is low, thereby affecting their viability; and due to various reasons the recovery level of advances is extremely poor. By and large, the financial losses in most of these banks in the region are mounting. Due to the weak financial position of these banks, constraints were also being faced in the flow of refinance from NABARD. Innovative schemes such as Kisan Credit Cards (KCCs), creation of Self-Help Groups (SHGs) and other micro credit schemes have not gained ground in these states. It is significant that whereas the average flow of agricultural credit is around Rs 5,000 per ha in Kerala, it is merely Rs 25 in the North-East India. Primary Agricultural Credit Societies (PACS) are the vital link in the cooperative credit structure.

The PACS system in the region, however, is financially and operationally weak and far from becoming self-reliant in respect of mobilization of resources through deposits. The PACS transacts small volumes of business and its membership is declining, resulting in high cost of its management and imbalances in outstandings.

The analysis of credit availability has indicated that direct short-term credit per ha in the North-Eastern India was less than Rs 100 against the national average of Rs 422 per ha. This is a meager amount in the context of modern agricultural technology, which is basically a capital-intensive activity. While credit availability per hectare in Kerala is more than Rs 5,000, in Bihar it is only Rs 50 and in the North-Eastern States as a whole, it is about Rs 25. State-wise credit-deposit ratio (Table 1) clearly indicated that in the case of Arunachal Pradesh (A.P.), only 11-13 per cent of the deposited amount was invested in the state till 1998 whereas it was on moderately higher (32.61 per cent) side from 1999 onwards. In the case of Assam, it was in the reverse direction, as it declined in 1999 to 19.25 per cent from 32-39 per cent earlier. In the case of Manipur, the credit deposit ratio depicted a slightly declining trend; it became 47.60 per cent in 1999 as compared to 54-59 per cent during 1995-1998. At least, compared to other NEH states, the condition of credit deposit ratio (C-D) in Manipur was favourable and reasonably comparable with the all-India figures, which ranged between 55 and 62 per cent during this period. The worst state within the NEH in terms of C-D ratio was found Meghalaya where it ranged between 14 and 19 per cent (Table 1). Overall in the NEH region, the trends of C-D ratio have been found declining from 35.6 per cent to 30.29 per cent during 1995-1999.

**Table 1. Credit–deposit ratio of scheduled commercial banks in the NEH region: 1995-1999**

State	1995	1996	1997	1998	1999
Arunachal Pradesh	12.4	10.4	10.7	13.1	32.61
Assam	38.7	39.3	35.2	32.9	19.25
Manipur	58.2	53.7	57.5	58.8	47.60
Meghalaya	15.8	14.4	14.3	15.2	16.68
Mizoram	16.5	16.2	14.0	23.2	23.40
Nagaland	37.8	27.4	24.0	18.3	21.25
Tripura	47.5	42.1	37.7	34.0	35.00
NEH Region	35.6	34.5	31.2	29.9	30.29
All-India	55.6	61.9	57.3	55.5	

*Source: Basic Statistics of North Eastern Region, 2000*



Examination of the C-D ratios bankwise, revealed that the performance of Co-operative Banks for different states in the NEH region was better as compared to Commercial Banks and Regional Rural Banks. The C-D ratio of Co-operative Banks within the NEH states ranged from 35 to 64 per cent, whereas in NEH as a whole, it was 52 per cent (Table 2). The lowest C-D ratio from the Commercial Banks was in Mizoram (35.40 per cent) followed by 35.7 and 37.86 per cent, respectively in Arunachal Pradesh and Meghalaya. In Arunachal Pradesh, the C-D ratio was highest, 97.93 per cent from Regional Rural Bank and lowest in the case of Mizoram (28.48 per cent) and Meghalaya (28.55 per cent). In case of Commercial Banks, the performance of C-D ratio was better in Manipur and Assam (45 and 32 per cent, respectively) as compared to other states of the region. Overall, the consistency of all the financial institutions in terms of C-D ratio was better in Manipur (Table 2).

The network of financial institutions in the NEH states within the rural and urban sectors covering average thousand populations per bank is given in Table 3. The number of bank branches was maximum in Manipur (28) followed by Nagaland (22) and Tripura (20), whereas it was minimum in Mizoram (12) and Meghalaya (13). The maximum number of bank branches in rural areas within the NEH states are located in Assam (857) followed by Tripura (145) and Meghalaya (141). Sector-wise advances, especially to the agricultural sector by different branches of financial institutions in the NEH states were also blinking (Table 4). All banks together allotted advances to the tune of 26 to 12 per cent out of their total advances. The percentage of total advances in the agricultural sector by co-operative banks was relatively higher in the case of Tripura (37.70 per cent) followed by Manipur (30.75 per cent). The performance of agricultural advances by regional rural banks was better in Meghalaya (45.03 per cent) followed by Manipur (30.55 per cent).

**Table 2. Bankwise credit-deposit ratio of the NEH states as on March 1999**

State	Commercial Banks	RRB	Cooperative Banks
Arunachal Pradesh	11.54	97.93	35.70
Assam	31.46	30.74	59.55
Manipur	45.00	43.00	64.00
Meghalaya	14.80	28.55	37.86
Mizoram	19.82	28.48	35.40
Nagaland	19.10	37.62	41.57
Tripura	28.00	38.00	38.00
NEH Region	27.94	33.83	52.08

*Source: Basic Statistics of North Eastern Region, 2000*



**Table 3. Area-wise bank branches in the NEH states as on March 1999**

State	Rural	Urban	Average Population (in'000) per Bank
Arunachal Pradesh	73	26	17
Assam	857	165	21
Manipur	59	27	28
Meghalaya	141	52	13
Mizoram	NA	NA	12
Nagaland	51	07	22
Tripura	145	41	20

*Source: Basic Statistics of North Eastern Region, 2000*

**Table 4. Agricultural advances by banks in the NEH states (% of total advances)**

State	Commercial banks	RRBs	Cooperative banks	All banks
Arunachal Pradesh	25.00	23.00	20.00	20.00
Assam	9.95	28.35	11.75	11.75
Manipur	13.95	30.55	30.75	17.35
Meghalaya	11.14	45.03	NA	18.36
Mizoram	9.42	NA	NA	NA
Nagaland	17.93	10.18	16.38	14.66
Tripura	23.05	24.06	37.70	26.28
NEH Region	11.86	NA	NA	NA

*Source: Basic Statistics of North Eastern Region, 2000*

### Evaluation of Agricultural Credit in the NEH Region

The correct way to evaluate the performance of agricultural credit is to look at the ratio of agricultural credit to state agricultural value added, but it is difficult to obtain these data. So, as the next best, we looked at agricultural credit as a proportion of net state domestic product (NSDP). This ratio for NEH Region remained stationary (0.2) during the period 1991-95 and 1996-2001 (Table 5). This region clearly got a very low share in the agricultural credit to the total amount disbursed in the region. Similarly, the per capita extension of agricultural credit in the North-Eastern Region was extremely low, only Rs 9 during 1991-95 and Rs 17 during 1996-2001, which was far below the corresponding national averages of Rs 67 and Rs 128, respectively. For comparison, the Southern region realized the per capita credit in the agriculture and allied sector to the tune of Rs 157 and Rs 280 during this period. This finding clearly indicated that commercial banks were quite reluctant to lend the agricultural credit to the NEH region but acted differently in other parts of India (e.g. southern region). The possible

**Table 5. Evaluation of agricultural credit in north east region vis-à-vis India**

Particulars	During 1991-95 (Average)	During 1996-2001 (Average)
<b>A. Ratio of agricultural credit to NSDP (%)</b>		
a. NEH Region	0.20	0.20
b. All India	0.90	1.00
<b>B. Trends in agricultural &amp; allied sector credit per capita (Rs)</b>		
a. NEH Region	9	17
b. All-India	67	128

- Notes:* 1. Agricultural credit relates to direct finance to agricultural and allied activities by all scheduled commercial banks (disbursements – Short-term and Long-term).
2. Ratios were obtained by dividing the average direct finance to agricultural and allied activities of all scheduled commercial banks (Disbursements – Short-term and Long-term) during the period 1991-95 and 1996-2001 by the total region-wise population in 1991 and 2001, respectively.
3. NSDP is at current prices.

*Source:* Reserve Bank of India and Economic Survey: Various issues

reason is the high risk and uncertainty associated with the agricultural credit disbursed in the NEH region due to factors such as: (i) lack of investment-friendly atmosphere, (ii) scattered lending - area approach not adhered to, thereby making post-sanction, post-disbursement and recovery and follow-up not only difficult but also costly, (iii) high risk and high transaction cost, (iv) location of bank branches highly skewed towards specific pockets, (v) poor recovery, (vi) lack of entrepreneurial ability, (vi) lack of information about bank schemes, and (vii) multiplicity of documents and procedural formalities (NABARD, 2005). The increasing amount of non-performing assets (NPAs) in the agricultural loan for Commercial Banks is the core issue of risk in agricultural financing. Though the precise estimates for NEH region were not available, the all-India level data showed that, on an average, the amount of NPAs for the public sector bank for agricultural credit was to the tune of Rs 7635 crore during 2001-03, which accounted for nearly 12 per cent of the average outstanding advances (in agriculture). Certainly, this was substantially higher as compared to NPAs under the non-priority sector (9.4 per cent). For the NEH Region also the poor recovery and high NPAs are the major issues for risk in the agricultural financing which could be attributed to factors such as: (i) beneficiaries treat loan as grant and hence do not consider it to be paid, (ii) diversion of loan towards consumption purposes, (iii) lack of monitoring and poor follow-up by the banks, and (iv) failure or damage of crops due to uncertain weather (NABARD, 2005).

## **Risk and Uncertainties in Hill Farming: A Case Study of Meghalaya**

### **Uncertainties in Profitability of Paddy and Ginger Cultivation**

The paddy is cultivated in three distinctly different situations in the hilly terrains of Meghalaya. They are: (i) paddy in *jhum* area (i.e. shifting or slash and burn method), (ii) paddy in upland area (in sloppy or undulated hillside, terrace area, not primitive as in *jhum* cultivation), and (iii) paddy in the valley area (between hills and most fertile land). The magnitude of co-efficient of variation in the total returns, net returns and rate earned on equity capital showed that the uncertainties of these variables were quite high under *jhum* as well as upland conditions and these had direct relationship with the improved method of cultivation (Table 6). The CV was estimated to be very high for various parameters under paddy cultivation in the valley area. It is explicit from Table 6 that the profitability in terms of rate earned on equity capital was quite high under modern method of cultivation but at the cost of higher uncertainties. This can be explained as: First, the *jhum* cultivation is characterized by low-input and low-output agricultural practice and is quite suitable for this hilly terrain, which has been developed from the natural wisdom and from the experience of thousands years. Second, *jhum* cultivation practice is heavily dependent on the single input, labour (accounts for 80-85 per cent of total cost) which is locally available, but in contrast, improved method of cultivation requires modern varieties of seeds, fertilizers, pesticides and irrigation, and the access of these inputs is severely constrained by availability (like suitable HYV seeds) as well as improper delivery system. Third, like the input delivery system, there is also lack of output delivery system, i.e. marketing of the surplus produce is a major impediment contributing to the uncertainties of hill farming. Additionally, the Minimum Support Price (MSP) scheme is totally ineffective in this region in view of the higher unit cost of production as compared to the announced MSP (Table 6). Farming in the hilly region is completely different from that in the plain land. The hill farmers cannot enjoy scale economies due to limited scope of substitutability among the factors of production, the opportunity of mechanization is also limited, and therefore scope for reduction in unit cost is also restricted. To reduce the risk in hill farming and to promote the modern agro-technologies, government should streamline the appropriate input as well as output delivery system through suitable public support system. Since MSP declared by the Government of India (GOI) is absolutely ineffective in this region, a separate commission could be considered for this region.

Ginger is the main cash crop for Meghalaya and has good demand in domestic as well as international markets. It is cultivated in sloppy tracks

**Table 6. Risk and uncertainties in profitability of paddy cultivation in Meghalaya under different situations during 2002-03**

Particulars	Paddy cultivation in		
	<i>Jhum</i> area (n = 55)	Upland area (n = 20)	Valley area (n = 25)
Total cost (Rs/ha)	15181 (37.85)	16870 (45.05)	18338 (47.23)
Total return (Rs/ha)	21883 (45.98)	25513 (50.41)	39554 (52.43)
Net return (Rs/ha)	6702 (38.20)	8643 (53.22)	21216 (49.05)
Yield (kg/ha)	1614 (48.48)	2500 (45.63)	3057 (46.29)
Rate earned on equity capital (per cent)	44.15 (62.88)	51.23 (44.20)	116 (53.62)
Unit cost of production (Rs/kg)	9.40	6.75	5.99
Minimum support price (Rs/kg) <sup>§</sup>			
2002-03	5.50	5.50	5.50
2003-04	5.80	5.80	5.80

*Note:* Figures within the parentheses show coefficients of variation (CV) in per cent,

<sup>§</sup> MSP for common rice

through indigenous method of practices (making *bund*, a raised bed along the slope) and is subjected to very high uncertainties (CV) in total return (71 per cent), net return (68 per cent), yield (72 per cent) and rate earned on equity capital (75 per cent) (Table 7). In spite of high uncertainties, ginger continues to be a highly preferred cash crop for this region, because (i) it helps the farmers through supplementing the day-to-day cash requirement throughout the year, (ii) it is easy to store underground, and (iii) it is not perishable in nature like other vegetable crops such as tomato, brinjal, capsicum, etc. The unit cost of production of ginger is Rs 5.44 per kg only while its retail price ranges from Rs 40-60 per kg in the domestic market. Clearly, ginger has the comparative advantage to be grown in this region. Several steps are necessary to strengthen the backward linkages and standards to meet the global market demand. First, as the bulk production is consumed domestically, there is an urgent need to improve production standards. Second, although the Spices Board is encouraging use of logo and brands through certain schemes, there is a need for more innovative schemes to speed up this process. Third, as the standards differ significantly between professional corporate bodies and proprietary concerns, government policy must encourage the former. Finally, the corporate sector has to

**Table 7. Risk and uncertainties of ginger cultivation in Ri-bhoi district of Meghalaya during 2002-03**

Sources of risk	Average	Coefficient of variation (CV in per cent)
Total cost (Rs / ha)	27246	76.25
Total returns (Rs / ha)	45072	71.46
Net returns (Rs / ha)	17826	68.64
Yield (kg/ha)	5008	72.77
Rate earned on equity capital (per cent)	65	75.75
Unit cost of production (Rs/kg)	5.44	-

*Note:* No Minimum Support Price (MSP) is announced for ginger

seriously think in terms of paying farmers partially in terms of bonus share (Datta *et al.*, 2002).

### Relationship of Profitability and Farm-size

Quadratic form of production function was employed to explain the relationship between profitability (rate earned on equity capital) and farm-size (cropped area under ginger or paddy) (Table 8). The specified function was found to be good fit only for ginger and overall 29 per cent of the total variation in profitability was explained by the variation in cropped area. The estimated parameters indicated that as the cropped area under ginger cultivation increased, the rate of return earned on capital also increased, but subsequently started declining after some critical cropped area. This can be explained as follows: Ginger is mainly cultivated through traditional practices and is subjected to wide yield uncertainty and in turn, to profitability. As the cropped area increases the yield uncertainties also increase because of different fertility statuses at varying slopes in the hilly tracks. Additionally, the crop management, particularly the inter-cultural operation becomes difficult. The human labour is the most important factor of production accounting for more than 60-65 per cent of total cost of cultivation. The size of available family labour determines the area under ginger to be cultivated. The yield uncertainty leads to higher risk in terms of lowering the rate earned on capital investment for ginger cultivation. Moreover, the price elasticity of demand for ginger is expected to be very low because the share of consumers' expenditure for ginger in total consumer basket is negligible. The producer's share in consumer rupee has been low, meaning thereby that most value-addition takes place beyond the farm gate. All these weaknesses need to be removed for making the ginger economy viable and buoyant (Datta *et al.*, 2002).

Under high uncertainty situation, the risk of investing additional amount of non-equity capital also increases considerably and expansion of area under particular crop becomes difficult. The tendency for risk to become greater at an increasing rate as the relative amount of non-equity capital used in a business expands is referred by Kalecki as the principle of increasing risk” (Pandey, 1990). This principle can be understood from the results reported in Table 9, where the rate earned on equity capital has been calculated under different leverages. The average cost of cultivation of ginger on the sample farmers has been found as Rs 27246 per ha. As per the banking guidelines, the scale of finance for ginger cultivation is Rs 34185 out of which Rs 25789 is disbursed as kind and Rs 8400 as cash component. Since the sample farmers were following the traditional method of ginger cultivation, they were entitled for the cash component (Rs 8400) only. Let us assume that farmers obtained a loan of Rs 5000 for ginger and this additional capital amount (non-equity) is being invested for its cultivation along with his equity capital (Rs 27246). With full equity in the farm business, both rate of return and rate of loss (may arise due to heavy rainfall, heavy fungal disease infestation or hailstone) from the investment are 25 per cent because the cost of non-equity capital is zero. However, the situation changes when non-equity capital is also used in the farm business. With Rs 5000 as non-equity capital, the rate earned is only 27 per cent while the loss is 32 per cent. Thus, with the use of non-equity capital along with equity capital, the return to equity capital increases by only 2 per cent (i.e. from 25 per cent to 27 per cent), but under adverse conditions it has 7 per cent loss. As the leverage ratio increases to 0.30, the return to equity capital under favourable condition is 28 per cent while the loss is 36 per cent. So, the financial risk for equity capital increases along with the leverage ratio under adverse or unfavourable conditions. Thus, (a) as leverage increases, there is a tendency

**Table 8. Quadratic production function of responsiveness of profitability to cropped area for ginger and paddy cultivation in Meghalaya**

Variables	Rate earned on equity capital	
	Ginger	<i>Jhum</i> paddy
Intercept	1.3584*** (0.4131)	0.6963 (0.4137)
X (cropped area)	0.6839* (0.4301)	-0.1488 (0.9806)
X <sup>2</sup> (cropped area)	-0.2680** (0.1368)	-0.0386 (0.4765)
R <sup>2</sup>	28.74	19.24
No. of observations (n)	55	20

\*\*\*, \*\*, \* denote significance at 1, 5 and 10 per cent levels, respectively.

**Table 9. Estimation of risk for capital investment in ginger cultivation in Meghalaya under different leverage ratios**

Particulars	Leverages		
	(No-equity / Equity capital)		
	0.00	0.19	0.30
Amount of equity capital used (Rs)	27246	27246	27246
Amount of non-equity capital used (Rs)	0	5000	8000
Total capital used (Rs)	27246	32246	35246
<b>Profitability when rate of return on investment is + 25 %</b>			
Gross return to total capital (Rs)	6812	8062	8812
Cost on non-equity capital @ 14 % (Rs)	0	700	1120
Net return on capital used (Rs)	6812	7362	7692
Rate earned on equity capital (%)	25.00	27.02	28.23
<b>Profitability when rate of return on investment is - 25 %</b>			
Gross loss to total capital (Rs)	-6812	-8062	-8812
Cost on non-equity capital @ 14 % (Rs)	0	-700	-1120
Total loss on capital used (Rs)	-6812	-8762	-9932
Rate of loss on equity capital (%)	-25.00	-32.16	-36.45

for the spread between possible gain and losses to increase; (b) with an equal percentage gain or loss on total capital used in the business, the magnitude of loss is greater than the magnitude of gain on owner's equity. Therefore, to increase the use of non-equity capital in farming business, agro-technologies like high-yielding varieties suitable for local conditions, need to be developed. Besides, appropriate and functional crop insurance scheme should be made available to mitigate the risk and uncertainties.

### Uncertainties due to Market Imperfection

In earlier sections the analysis of risk in financing hill agriculture (equity as well as non-equity) was confined to factors of production only. The uncertainty at product market is also equally important which arises due to market imperfection in this hilly region. Highly undulated topography and lack of easy transportation linkages are the major impediments for free mobility of marketed surplus. Several factors can be attributed for this imperfect marketing situation in this region, such as: (i) most of the farmers produce at the subsistence level where marketable surplus for the individual farm is very meager; (ii) the opportunity of developing entrepreneurship in market services is very limited due to low marketable surpluses, (iii) the transportation cost is too high and the product from this region hardly fetches the competitive price in the main land market. But the region has enormous potential for the products like, off-season vegetables, ginger, pineapple, citrus,



etc., and it urgently demands highly focused attention. Value-addition certainly will fetch good return from these crops. The region needs proper public support mechanism for procuring and marketing of these products.

The NEH Region is characterized by very low population density, ranging from the highest in Assam (340 per sq km) to the lowest in Arunachal Pradesh (13 per sq km). The population density in other states is also very low: Manipur (107 per sq km), Meghalaya (103 per sq km), Mizoram (42 per sq km), Nagaland (120 per sq km) and Sikkim (76 per sq km). Under the liberalized economy, our expectation is that the markets will lead agricultural growth. The fundamental question is whether and how we can create market that will, in fact, deliver what we expect from it. In a market economy we are starting with markets rather than ending with markets, and that is the paradigm shift that we have embarked upon. Where growth must be demand-driven in the changing global agro-food system, markets must enable producers to respond to these growth opportunities. We are able to disseminate technologies that are highly market-dependent and that enable us to achieve highly productive agricultural transformation. If we don't have input markets that work, let's move into low-external-input agriculture; let's move into conservation farming, where market is less effective and responses are different. Of course, the other response occurs when output side is functioning and will get price collapses and regression into low-productivity agriculture like NEH agriculture.

### **Scope and Opportunity of New Investment**

Several opportunities exist and new approaches are requested to promote the region to take advantage of its own strengths and to turn some perceived weaknesses into assets. In fact, the region can be termed as the 'sleeping giant' for agricultural development. Some of the opportunities are: (i) developing the region as the producer of organic food products which have high demand in the international market, (ii) establishing light industries such as, food processing, floriculture, sericulture, etc. (iii) encouraging allied agricultural activities, like silk fabrics (silk worm, mulberry, tussar, muga, eri) fishery, particularly ornamental fish rearing, (iii) traditional handloom weaving, (iv) establishing forest-based industries, like, collection or growing of medicinal and aromatic plants (at least 120 medicinal plants are known to grow wild in this region), and (v) there are prospects for essentially oil-based industries, such as *agarwood* oil, lemon grass oil, cinnamon leaf oil, and citronella oil (Mohan, 2003). The financial viability of ornamental fish-rearing and opportunity of organic food products are reported in the subsequent sections.

### Investment Opportunity — A Case of Ornamental Fish-rearing

The financial viability of ornamental fish-rearing, gold fish (*Carassius auratus*) was studied in detail and the results are reported in Table 10. The financial viability was estimated under various risk and uncertainty situations to examine the sensitivity of the investment. The total number of fingerlings production from the unit was found as 36000 per annum and the average price received was Rs 6 per piece. The analysis was carried out under four different risk/uncertainty situations, namely (i) without any risk or uncertainty, (ii) with 10 per cent disease mortality risk of fingerlings, (iii) with uncertainty of 50 per cent fall in market price (from Rs 6 to Rs 3 per piece) of fingerlings, and (iv) with combined risk and uncertainty (10 per cent disease mortality and 50 per cent fall in market price). The results showed that the NPV ranged from Rs 6,37,082 when there was no risk (Situation I) to Rs 1,21,618 when there existed risk and uncertainty in the business (Situation IV). Similarly, IRR was estimated to be 111 per cent and 35 per cent, respectively, under Situation I and Situation IV respectively. The financial analysis clearly indicated that the project was not only viable but was an attractive investment proposal, despite high risk and uncertainty.

### Scope for Organic Farming — New Opportunity for Investment

The North-Eastern Region is probably the most suitable area of India for organic farming because of its number of advantages. This region is said to be, by and large, organic by default. The farmers of this region are *de facto* organic producers as they use no or minimal inorganic inputs, fertilizers and pesticides. Almost in all the seven states of this region, farmers are practicing traditional agriculture even today. This low input-use status

**Table 10. Financial viability of gold fish (*Carassius auratus*) rearing under different risk and uncertainty situations in Meghalaya (at 2004-05 constant prices)**

Investment criteria	Without any risk or uncertainty (Situation I)	With 10 % disease mortality risk of fingerlings (Situation II)	With uncertainty of 50 % fall in market price of fingerlings (Situation III)	With combined risk and uncertainty (Situation IV)
Net present value (Rs)	637082	543361	168479	121618
Internal rate of return (%)	111	98	43	35
Benefit-cost ratio	3.11	2.79	1.57	1.40

(inorganic input) is the biggest strength for the possibility of organic agriculture in this hilly region. The conversion to organic from inorganic agriculture can be achieved easier and in a much shorter period in this region than in any other part of the country. This conversion process will be highly supported by the readily available huge forest biomass and the residues of diverse livestock population. Experiments have shown that during the transition period, the farmers face the problem of yield losses which also will be minimum in this region, as the farmers use very low level of inorganic inputs. The organic products usually fetch higher prices, nearly 20-25 per cent more. This will also compensate the yield losses during the early period of conversion and will increase the level of income later. So, there is a need to know how much will be the yield losses and, whether, these losses can be compensated by the extra premium obtained through selling of organic products. The transportation of the produce takes a long time to reach even in the domestic markets. As the international market (particularly the USA and European Union) is the major buyer of the organic produce, the supply of perishable organic product from this region will be a difficult task. Therefore, the government should focus on the domestic market for creating the demand for organic produce of the NEH Region. The domestic food market of India is immature and may be skewed to a particular type of quality-conscious consumer as far as organic products are concerned. The estimation of probable market share of organic products as well as the responses of consumers towards the organic products is not well known. The analysis of the buyers' behaviour is most important. Who are the buyers or who will be the potential buyers? How does the buyers' behaviour depend on the educational level and change across different income groups? Will the buyer be ready to pay the extra premium for organic products? What will be the consumers' response to the price change of organic products? To answer these questions, a behavioural study of consumers towards the organic products is essential. Transforming the region into an organic food producing zone and simultaneously connecting it with the domestic as well as international markets may lead to a better welfare for the underprivileged north-east farmers through ensuring higher return from agricultural produce.

### **Conclusions**

Hill farming in the north-east region of India is severely constrained by high risk and uncertainty arising out of various factors. Under the prevailing conditions, the expectation of steady and assured income from agriculture has been found quite limited; hence, the hill farming fails to attract considerable private investment. Moreover, the farmers in this region have very low

investment-capacity as well as low risk-bearing ability. So, the prevailing risk and uncertainty situation compels them to operate at low-input and low-output subsistence farming with low volume of marketable surplus. On the one hand, the farmers of this area are constrained by insufficient equity capital to invest in agricultural operations, and on the other, investing non-equity capital in farm business increases the existing level of risk. Investment of non-equity capital would be a viable option for this region when the sufficient incremental net return would be stemming from incremental capital cost. The attainment of positive economic return to capital investment is possible through pushing the available modern agro-technologies, developing suitable technologies and simultaneously increasing the capacity building of local farmers. Financial institutions face difficulty in financing the hill agriculture because of low repayment performance and increasing non-performing assets for agricultural loans. Also, the absence/poor performance of crop insurance scheme (presently only Meghalaya and Sikkim have the National Agricultural Insurance Scheme) increases the risk of hill farming considerably. Non-availability of reliable agricultural database (time series as well as cross-section) on area, production and yield, cost of cultivation is the major impediment in implementing the crop insurance scheme efficiently.

The agricultural situation in this region is highly heterogeneous; variability is extremely high even within a few kilometres of radial area. Thus, generalization of the scenario is not possible and the development of agricultural database is utmost important for policy framework. The potential of horticultural crops is well-known and has been widely discussed for these hilly states and has drawn policy attention also. But the concern is that horticultural crops, in these states are grown mostly as homestead farming and not in a commercial mode. Suitable methodologies followed by a wide database need to be developed to estimate the yield and cost of production of these crops which will be highly useful for the policymakers to formulate right policy to protect the interests of farmers and other stakeholders like, entrepreneurs, private investors, bankers and also for crop insurance implementing agencies.

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