Crop diversification vis-á-vis shifting cultivation in Karbi Anglong district of Assam: an empirical analysis

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The present study estimates crop diversification in the Karbi Anglong district, Assam, North East India, as well as the cost and returns from shifting cultivation in the hilly areas, along with policy measures for maintaining their sustainability in the long run. The study comprised both primary and secondary data. The primary data were collected from four blocks of the Karbi Anglong district of Assam. Two villages from each block were selected based on the intensive shifting practices, and 10 respondents from each village were selected randomly, making a total sample of 80 respondents. The average crop diversification in the region was greater than 0.8, indicating that the region is highly rich in diversity. The variable cost mainly consisted of hired human labour and seeds, of which labour cost was highest for cultivation because shifting cultivation is labour-intensive. Though the returns over total cost and variable cost for different crop mixes showed positive outcomes, it was necessary to recommend a policy to reduce human labour costs in hilly regions. So, a policy has been recommended to make small farm machinery (smaller than power tillers) readily available to farmers for cultivation in hilly regions. This will help reduce the human labour cost, thereby increasing the net returns of the farming community and distribution of higher-yielding seeding materials among them. This would enhance their income, so farmers in the study region must be encouraged to increase the extent of crop diversification.

Keywords: Crop diversification, farm income, hilly regions, shifting cultivation, sustainability.

INDIA is an agrarian economy, with 42.6% of its workforce being engaged in agriculture and allied sectors during 2019–20 (ref. 1). With the growing population of the country, it is necessary to achieve food security for all its people. The estimated number of shifting cultivation in Southeast Asia could range between 14 and 34 million people[2]. The origins of shifting cultivation date back to the dawn of agriculture. Jhum cultivation is a form of land use characterized by an alternation between a short span of cultivation and a comparatively long span of natural or improved fallow[3]. Slash and burn agriculture in North East India involves clearing the forest, burning dried biomass, mixed cropping for one or two years, and then reverting the land to its natural vegetation to restore soil chemical fertility and improve its physical properties[4]. In Assam, NE India, shifting cultivation is practiced in the hill districts of Karbi Anglong and Dima Hasao. The Karbis (majority tribe of Karbi Anglong district) refer to it as 'Inglong Arit Sai Katiki'. In this practice, forest areas are cleared during December–January. By mid-February to mid-March, before monsoon, the debris is dried and burnt, followed by dibbling and planting of crops and weeding in June–July. Harvesting is usually done in September–November, after which the plot is left fallow for rejuvenation, and the cultivators repeat the process in a new location. The farmers return to the fallowed plot after a few years when considerable vegetation has been regenerated. This period after which the farmers return to the same plot for cultivation, constitutes one jhum cycle[5]. The fallow period before the land is cultivated again is often short-ranging, up to 4–5 years. However, in traditional farming, when the population pressure was less, the cycle would be as long as 20–30 years[6]. The area under jhum in the Karbi Anglong district, Assam, has increased from 54,000 ha in 1976 to 63,000 ha in 2011. Around 54,500 farming families are involved in shifting cultivation in the district, cultivating 70,000 ha of land annually, with around 70% of the population in the region depending on jhum cultivation. Crops like rice, maize, sesamum, cotton, ginger, turmeric and mixed vegetables are mostly grown in jhum fields[7]. The average size of a jhum plot generally varies from 1.0 to 2.5 ha. About 8–13 crop species are usually sown together in the same field, ranging from seeds of pulses, cucurbits, vegetables and cereals[8]. Diversification towards high-value crops (HVCs) offers great scope to improve farmers' income. Interestingly, almost the same value of output as the staple food was contributed by HVCs (fruits, vegetables, fibre, condiments and spices and sugarcane), which occupied just 19% of the gross cropped area during 2013–14 (ref. 9). Crop diversification provides better conditions for food

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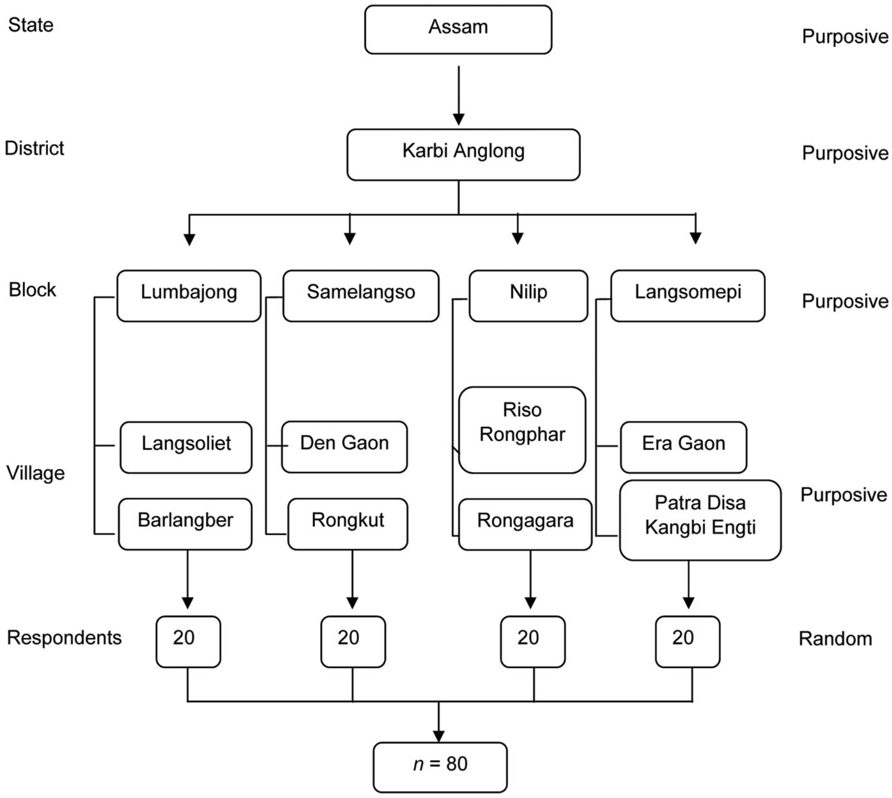

Figure 1. Sampling plan for the study area.

security and enables farmers to grow surplus products for sale at the market. Thus it helps increase farmers' income to meet their household needs[10]. The literature on crop diversification studies in India is growing rapidly, but only a few studies have been carried out in Assam. Shifting cultivation studies have been conducted on crop diversification in the Karbi Anglong region, despite being the largest district in terms of area (10,434 sq. km) among the eight in NE states India. Therefore, the present study was conducted to fill this research gap by analysing the performance of major crops grown in the study region, analysing the extent of crop diversification and estimating the cost of cultivation and returns of different crop mixes in the region.

Materials and methods

Study area and sampling

The study was conducted using both primary and secondary data in the Karbi Anglong district, Assam, where shifting cultivation is intensively practiced in the tribal areas. Four blocks, namely, Lumbajong, Samelangso, Nilipand and Langsomepi, were randomly selected from the district. Two villages from each block were selected based on the intensive shifting cultivation; thus, a total of eight villages were selected. Further, 10 farmers from each village were selected randomly to make a sample of 80 farmers using a pre-tested schedule specially designed for the study (Figure 1). The secondary data were collected from the Directorate of Economics and Statistics, the Government of Assam, and other published sources.

Analytical techniques utilized

The following analytical techniques were used:

Descriptive statistics: This was used to examine the performance of major crops grown in the study region, viz. turmeric, sugarcane, sesamum, winter rice, autumn rice, sweet potato and maize.

Parametric trend models: To get an overall movement of the time-series data of major crops grown in the study region, trend equations were fitted. Different models, like polynomial, exponential, linear, compound, etc. were examined. The cubic trend line model was found to be the best fit for the data. It can be expressed by the following equation

Cubic trend line model: $Y_t = b_0 + b_1 t + b_2 t^2 + b_3 t^3$.

where Y_t is the area/production/productivity of major crops, viz. turmeric, sugarcane, sesamum, winter rice, autumn rice, sweet potato and maize, b_0 the intercept term, b_1–b_3 the regression coefficients and t is the time.

Compound annual growth rate: The area, production and productivity data of major crops grown in the study region were computed between 1999–2000 to 2017–18 to be examined by estimating the compound annual growth rate using the formula below.

$$Y_t = ab^{t},$$

where Y_t is the area/production/productivity of major crops, a the constant, b the regression coefficient and t is the time variable.

After log transformation and estimation of the eq. (1)

$$\ln Y_t = \ln a + t \ln b.$$

The compound annual growth rate was estimated as

$$G = (\text{antilog}\ (\ln b) - 1) \times 100.$$

Measuring instability index: An instability index was computed to examine the nature and degree of instability in the area, production, and productivity of major crops grown in the study region. The coefficient of variation (CV) was determined for area, production and productivity to measure the variability of the major crops. The CV around the trend (CV_t) rather than CV around the mean (*CV*) has been suggested as a better measure of variability by Cuddy and Della[11], and thus was used in this study. The index of instability was estimated as follows

$$CV_t = CV \times \sqrt{1 - R^2},$$

where CV is the coefficient of variation (%) and R^2 is the coefficient of determination from a time-trend regression adjusted by the number of degrees of freedom.

The corresponding range and interpretation for the index are as follows: low instability: 0–15, moderate instability: >15 and up to 30, and high instability: above 30.

Diversity analysis

Simpson diversity index: Simpson diversity index (SDI) was used to assess the extent of crop species diversity in the study area[12]. Crop diversity was calculated using the following formula

$$SDI = \frac{\sum n(n-1)}{N(N-1)},$$

where n is the number of individuals of each species and N is the total number of individuals of all species.

Tabular analysis: Tabular presentation was utilized to assess the cost, returns and profits of crop mixes in the study area where shifting cultivation was extensively practiced. The percentage and average were computed to draw meaningful inferences. The cost concept was used as described by the Commission of Agricultural Cost and Prices by the Government of India in 1979.

Results and discussion

Growth rate of major crops produced in Karbi Anglong

During the selected time period, a positive growth rate was observed in the area, production and productivity of turmeric as 7.38%, 10.91% and 3.28***% respectively, in the Karbi Anglong district of Assam (Table 1). Similarly, a positive growth rate was observed in sugarcane for area and production at 4.11% and 2.82**% respectively, but a negative growth rate was found in productivity (1.24%). The growth rate in sesamum was positive for area, production and productivity, at 1.76%, 2.64% and 0.85**% respectively. Similarly, the growth rate of winter rice area, production and productivity was positive and highly significant as 0.48**%, 1.78***% and 1.29**% respectively. Whereas the growth rate of autumn rice was negative for areas (–2.09%) but positive for production and productivity (0.09% and 2.23% respectively). The growth rate for sweet potato for area, production and productivity was found to be positive and significant at 2.04***%, 5.89% and 3.27***% respectively. Maize showed a negative growth rate of –0.78 with a 5% level of significance, while production and productivity showed positive growth (7.58% and 7.66% respectively), with a 1% level of significance. The effect of expansion in the area indicates substantial growth in the production and productivity of the crops. The increase in rice production was mainly due to an increase in yield and no expansion in the area under rice cultivation. Among the various determinants influencing rice production in Assam, the yearly average temperature, the area used under rice cultivation (ha); area covered by HYV seeds (ha) and fertilizer (kg/ha) were found to have a significant impact[13].

Table 1. Growth rate of different performance indicators

Particulars	Area (ha)	Production (tonnes)	Productivity (kg/ha)
Turmeric	7.38	10.91	3.28***
Sugarcane	4.11	2.82**	–1.24
Sesamum	1.76	2.64	0.85**
Winter rice	0.48**	1.78***	1.29**
Autumn rice	–2.09	0.09	2.23
Sweet potato	2.04***	5.39	3.27***
Maize	–0.78**	7.58***	7.66***

*Significant at 10% probability level, **Significant at 5% probability level, ***Significant at 1% probability level.

Source: Authors' computation based on the data from Directorate of Economics and Statistics (DES), Government of Assam (1999–2000 to 2017–18).

Table 2. Descriptive statistics of performance indicators of different crops

Crops		Particulars					
		Mean	Kurtosis	Skewness	Minimum	Maximum	Growth (%)
Turmeric	Area	738.05	–1.27	0.5	385	1243	170.65
	Production	732.37	2.06	1.43	288	2127	638.54
	Productivity	0.93	12.75	3.34	0.75	2.04	172.88
Sugarcane	Area	6332.74	–1.66	–0.52	4230	7954	86.67
	Production	257,086.8	–1.47	–0.21	170,002	332,869	40.74
	Productivity	40.95	–0.39	–0.35	30.89	47.22	–24.61
Sesamum	Area	2807.105	–1.58	0.02	2420	3260	34.71
	Production	2091.526	–0.71	–0.04	1444	2584	78.95
	Productivity	0.74202	3.95	–1.05	0.59	0.83	14.49
Winter rice	Area	114,503	1.09	–0.79	101,518	121,499	18.79
	Production	185,619	–0.86	0.71	153,253	232,902	49.69
	Productivity	1.62	0.27	1.12	1.41	2.09	26
Autumn rice	Area	10,082	0.15	–0.99	6829	11,542	–29.47
	Production	12,845	0.57	–0.19	9986	15,825	–5.29
	Productivity	1.29	–0.32	–0.1	0.97	1.63	34.28
Sweet potato	Area	299.53	–0.73	0.64	239	390	59.26
	Production	1145.5	1.11	1.47	764	2212	219.7
	Productivity	3.74	0.36	1.5	3.14	5.68	468
Maize	Area	10,539	–0.75	–0.52	10,206	10,782	–0.77
	Production	13,412	1.78	1.63	7952	37,969	188.69
	Productivity	1.27	1.98	1.67	0.76	3.66	190.92

Source: Authors' computation based on data from DES, Government of Assam (1999–2000 to 2017–2018).

Table 2 depicts that from a mere 288 tonnes, turmeric production has reached 27 metric tonnes (MT) during 2017–18, registering a growth of 638.54%. The kurtosis value (2.06) of production indicates its platykurtic nature. Increased production of turmeric would not have been possible without an increase in per-hectare productivity. Starting with only 0.75 tonne/ha, it has reached 2.04 tonne/ha during 2017–18. Positive values of skewness (1.43) revealed that starting from the initial years of the study period, a continuous effort has been made to increase the yield of turmeric. Thus, the joint effect of expansion in area and yield has positively impacted turmeric production in Karbi Anglong, showing increased growth. In the case of the other major crops grown in Karbi Anglong, there is an irregular trend in area, production and productivity. The kurtosis values of all the crops are below 3, indicating that they are platykurtic in nature. The skewness value is positive and negative, thus implying that the effort has resulted in both an increase and decrease in the area, production and productivity of the crops.

To determine the trends in the production of major crops in the Karbi Anglong district, Assam, parametric trend models were used. Figure 2 *a–g* depicts the trend in production for the past 18 years for various crops. In all cases, the cubic model was applied as it was found to be the best-fitting parametric model. It is evident from Figure 2 that production has increased steadily over the past 18 years, which has resulted in higher availability of crops for the growing population. The production of all the selected crops shows a positive, sustained growth from 1999–00 to 2017–18, except for sugarcane and maize, which have shown a decrease in production in the recent past in the study region. The increasing trend in the production of crops can be attributed to the increase in area under crop cultivation during the study period. The production was also enhanced in Karbi Anglong due to improvement in the productivity of the crops, mainly due to the selective use of high-performing varieties and the adoption of better cultivation practices. Various studies have concluded that farmers are using primitive methods of cultivation to grow ginger. Scientific and modern methods of cultivation are rarely used. Hence, production is not reaching the highest level. In Karbi Anglong, even though ginger is produced on a large scale, fluctuating prices have affected the farmers[14]. The area and production of vegetables have been showing an increase in recent years, which might be due to the initiatives taken by the Government of Assam and the state Agriculture Department by providing financial and technical support to the farmers. However, the area under sweet potato showed a decline. This may be due to a lack of commercial importance and market value.

Instability in the production of major crops in Karbi Anglong

Fluctuations in the production of all crops are related to the area under cultivation, as a wider area result in greater production. However, variations in productivity may also be due to weather conditions, technological changes, etc. Table 3 shows the instability in the production of various

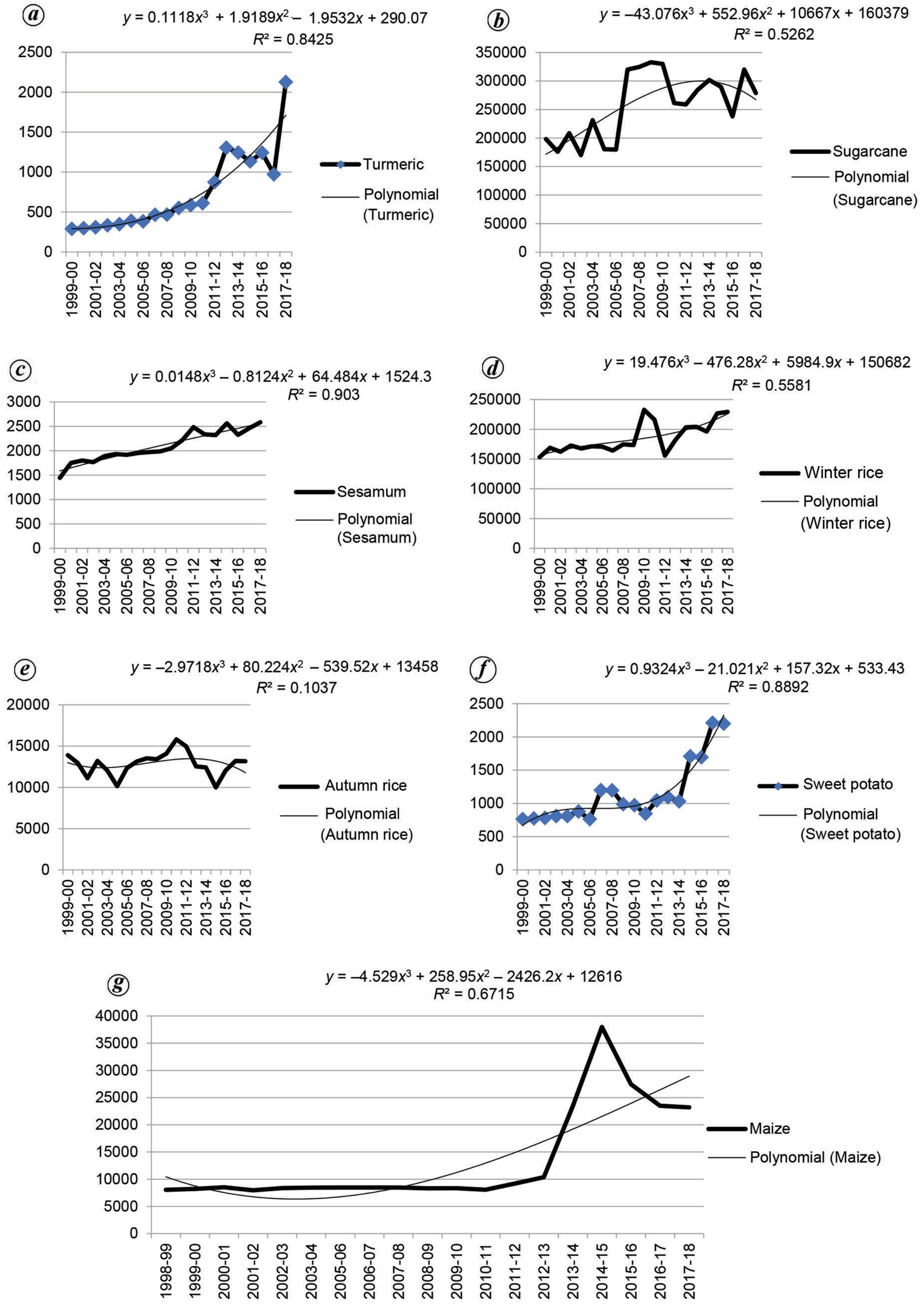

Figure 2. Trends in the production behaviour of (***a***) turmeric, (***b***) sugarcane, (***c***) sesamum, (***d***) winter rice, (***e***) autumn rice, (***f***) sweet potato and (***g***) maize.

crops in Karbi Anglong. The production of turmeric during the whole study period shows the highest coefficient of variance of 67.18 and has an instability of 12.76, which implies a moderate degree of instability. The highest instability in production is shown by maize at 44.24, followed by autumn rice (40.62) and sweet potato (20.72), indicating high instability in the production of these crops. This is mainly due to the high dependence on monsoon and high price volatility forcing farmers to move to other crops to derive more benefits. In contrast, crops like sesamum, winter rice and autumn rice show low instability. The average production in Assam from 1972 to 2014 (ref. 13) was less stable than in all-India levels, with an average production of 3113.79 thousand hectares and a CV of 29.44%.

Trends in the production behaviour of major crops

Crop diversification analysis: In the study area, we found that in all the surveyed villages, crop diversification was high, with the SDI value recorded to be >0.7 (Table 4). Among all the surveyed villages, Rongagara village of Nilip block was found to be the most diversified, with an SDI value of 0.90. This was followed by Rongkut and Era Gaon villages with SDI values of 0.86 and 0.85 respectively. The SDI value was lowest (0.77) in Patra Disa Kangbi Engti village of Langsomepi block. The average SDI value for the North East hills states on shifting land cultivation was 0.79. The average SDI value in the study area was slightly higher (0.83), indicating the high diversity of crops[6].

Table 3. Variability in the production of various crops

Particulars	Measurement statistics CV	R^2	CV_t
Turmeric	67.18	0.91	12.76
Sugarcane	22.59	0.43	19.15
Sesamum	15.14	0.89	3.15
Winter rice	13.88	0.52	10.13
Autumn rice	11.25	–0.06	11.22
Sweet potato	40.62	0.7	20.72
Maize	66.66	0.58	44.24

Note: CV, Coefficient of variation; R^2, Coefficient of determination; CV_t, Instability index.
Source: Authors' computation based on data from DES, Government of Assam (1999–2000 to 2017–18).

Table 4. Simpson diversity index (SDI) of the surveyed villages

Village	SDI value
Patra Disa Kangbi Engti	0.77
Era Gaon	0.85
Langsoliet	0.78
Barlangfer	0.81
Den Gaon	0.83
Rongkut	0.86
Riso Rongphar	0.84
Rongagara	0.90
Average	0.83

Source: Computed from field survey data, 2021–22.

Crops grown under shifting cultivation in Karbi Anglong

In the study area, it was found that the farmers practiced a diversified cropping system in the jhum field. Paddy and maize were the main cereal crops cultivated. The vegetables and fruits grown were brinjal (*Solanum melongena*), tomato (*Solanum lycopersicum*), pineapple (*Ananas comosus*), etc. Tubers included colocasia (*Colocasia esculenta*) and sweet potato (*Ipomoea batatas*). Oilseed crops like sesamum (*Sesamum indicum*) and spices like ginger (*Zingiber officinale*), turmeric (*Curcuma longa*) and chilly (*Capsicum frutescens*) were also cultivated by the respondents. A similar study conducted in 2019 revealed that the most densely cultivated crop species were rice and maize in the case of field crops in the hilly region of North East India[15]. Vegetable crops included pumpkin (*Cucurbita pepo*), potato (*Solanum tuberosum*) and ash gourd (*Benincasa hispida*), and fruit crops included banana, pineapple and citrus. Also, spices like ginger, chilli and turmeric were grown on shifting cultivation land.

Identified crop mix under shifting cultivation

Table 5 shows that 16.25% of the respondents followed the crop mix I, pattern, which includes cereals + vegetables + spices and the average farm size was found to be 0.82 ha. Also, 12.50% of the respondent followed crop mix II, which includes cereals + fruits + spices + oilseeds, with an average farm size of 0.58 ha; 43.75% of respondents followed crop mix III, which includes cereals + vegetables + spices + oilseeds + tubers, with an average farm size of 0.88 ha; 8.75% of the respondent followed crop mix IV, which includes vegetables + spices, with an average farm size of 0.63 ha, and 18.75% respondents followed crop

Table 5. Identified crop mix under shifting cultivation in Karbi Anglong

Crop mix	Respondent (%)	Area (ha)
I – Cereals + vegetables + spices	16.25	0.82
II – Cereals + fruits + spices + oilseeds	12.5	0.58
III – Cereals + vegetables + spices + oilseeds + tubers	43.75	0.88
IV – Vegetables + spices	8.75	0.63
V – Cereals + cash crops	18.75	0.77

Note: Figure in parenthesis indicates the percentage to total respondents.
Source: Computed from field survey data, 2021–22.

Table 6. Cost and returns of different crops mixes under shifting cultivation (Rs/ha)

Particulars	Crop mix I	Crop mix II	Crop mix III	Crop mix IV	Crop mix V
Human labour cost	43,270.13 (84.36)	59,973.87 (61.21)	121,943.06 (71.19)	16,465.07 (183.24)	47,400.44 (65.37)
Cereals seed cost	580.00 (1.13)	430.67 (0.44)	1204.00 (0.70)	–	474.67 (0.65)
Vegetables seed cost	148.00 (0.29)	–	94.53 (0.06)	23.47 (0.09)	–
Spices seed cost	162.67 (0.32)	133.33 (0.14)	27,960.00 (16.32)	4642.13 (17.95)	–
Tubers seed cost	–	–	533.33 (0.31)	–	–
Oilseeds seed cost	–	493.33 (0.50)	1373.33 (0.80)	–	–
Fruits seed cost	–	25,627.20 (26.15)	–	–	–
Cash crops	–	–	–	–	15,586.67 (21.50)
Total seed cost	890.67 (1.74)	26,684.53 (27.23)	31,165.19 (18.19)	4665.60 (18.04)	16,061.33 (22.15)
Interest on working capital @ 10%	4416.08 (8.61)	8665.84 (8.84)	15,310.82 (8.94)	2113.16 (8.17)	6346.27 (8.75)
Total variable cost	48,576.88 (94.70)	95,324.24 (97.28)	168,419.086 (98.32)	23,243.83 (89.86)	69,808.04 (96.28)
Depreciation @ 10%	180.8 (0.35)	130.66 (0.13)	322.45 (0.19)	95.2 (0.37)	163.6 (0.23)
Land revenue	39.74 (0.08)	39.74 (0.04)	39.74 (0.02)	39.74 (0.15)	39.74 (0.05)
Rental value of owned land	2250.00 (4.39)	2250.00 (2.30)	2250.00 (1.31)	2250.00 (8.70)	2250.00 (3.10)
Interest on fixed capital @ 10%	247.054 (0.48)	242.04 (0.25)	261.219 (0.15)	238.494 (0.92)	245.334 (0.34)
Total fixed cost	2717.594 (5.30)	2662.44 (2.72)	2873.409 (1.68)	2623.434 (10.14)	2698.674 (3.72)
10% managerial cost	5136.55 (10.01)	9805.77 (10.01)	17,136.352 (10.00)	2593.829 (10.03)	7257.774 (10.01)
Total cost	51,294.47 (100.00)	97,986.68 (100.00)	171,292.5 (100.00)	25,867.264 (100.00)	72,506.714 (100.00)

Note: Figures in parenthesis indicate the percentage of total cost. Source: Authors' calculation from field survey data, 2021–22.

Table 7. Economic returns of different crop mixes under shifting cultivation in Karbi Anglong (Rs/ha)

Particulars	Crop mix I	Crop mix II	Crop mix III	Crop mix IV	Crop mix V
Gross return	95,502.67	144,127.47	248,413.33	36,416.00	159,861.13
Net return	44,137.17	46,069.76	77,049.81	10,477.71	87,283.393
Return over total cost	1.86	1.47	1.45	1.41	2.20
Return over variable cost	1.97	1.51	1.47	1.57	2.29

Source: Computed from field survey data, 2021–2022.

mix V, which includes cereals + cash crops, with an average farm size of 0.77 ha.

Estimation of cost and returns of different crop mixes

It was observed that the jhumias in the Karbi Anglong district, Assam, mainly hired human labour because of the small number of family members and the youth mainly migrating to the urban areas in search of better opportunities. Machines and bullocks were not used due to the hilly terrain. From Table 6, it can be observed that the operational cost mainly consists of human labour cost and seed cost, because other costs, such as the use of bullocks or machines, manure, fertilizer and plant protection chemicals on the plants was not found in the study area. The labour costs were found to be high for all of the five crop mixes because jhum is a labour-intensive type of farming. The total human labour cost for crop mix I, crop mix II, crop mix III, crop mix IV and crop mix V was estimated as Rs 43,270.12, Rs 59,973.87, Rs 121,943.06, Rs 16,465.07 and Rs 47,400.44 respectively. The human labour cost in crop mix III was the highest because the number of crops grown in an area was higher in this compared to all other crop mixes. The total seed cost for crop mix I, crop mix II, crop mix III, crop mix IV and crop mix V was Rs 890.67, Rs 26,684.53, Rs 31,165.19, Rs 4665.60 and Rs 16,061.33 respectively.

The gross return for crop mix I, crop mix II, crop mix III, crop mix IV and crop mix V was Rs 95,502.67, Rs 144,127.47, Rs 248,413.33, Rs 36,416.00 and Rs 159,861.13 respectively, were crop mix. The gross return of crop mix III was found to be the highest (Table 7); 43.75% of the total respondents followed this pattern. The average farm size was also the highest in this crop mix, with an area of 0.88 ha. However, the net return was higher in crop mix V (Rs 87,283.39), as the production of sugarcane was high, and the price obtained was higher than that of the other crops. Sugarcane being a cash crop, gives more profit to the farmers with the return over total cost and over variable cost as 2.20 and 2.29, which is higher than any other crop mix. A study revealed that the return over total cost and over variable cost of sugarcane for the owner farms was Rs 8.02 and Rs 10.09 respectively, which was found higher to the present study due to the use of modern techniques of cultivation[16].

Conclusion

From this study, it was observed that there was high crop diversification in the surveyed villages of the Karbi Anglong region, with Rongagara of Nilip block being the most diversified village with an SDI value of 0.90. The lowest diversity was found in Patra Disa Kangbi Engti village of

Langsomepi block with an SDI value of 0.77. Rice was the major crop grown in the study region, followed by vegetables/fruits like brinjal, tomato, pineapple and spices like turmeric, ginger, chilli, and cash crops like sugarcane, which indicates that the region has a rich biodiversity of crop species. The variable cost mainly consists of hired human labour and seeds, of which labour costs constitute the major share because shifting cultivation is a labour-intensive practice. Though the return over total cost and variable cost for different crop mixes showed positive outcomes, it is necessary to frame a policy to reduce human labour costs in the hilly region. So we recommend that small farm machinery (smaller than power tillers) be made readily available to the farmers for cultivation in the hilly region. This will help reduce human labour costs, thereby increasing the net returns of the farming community. The distribution of higher-yielding seeding materials among farmers of the hilly region would enhance their income. Therefore, they will be encouraged to increase the extent of crop diversification in the region.

Conflict of interest: The authors declare that there is no conflict of interest.

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