

Cost of Cultivation under Shifting Cultivation: A case study of West Siang District of Arunachal Pradesh.

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Abstract

Shifting cultivation involves several stages of cultivation. It's a cultivation that related with systematic rotation of plot for one to two years and thereafter, famer left the forest to regrow. Under this system, fallow period play an important role in determining productivity level of the soil. Shifting cultivation is still practiced today and provides livelihood and food security in many places of the region. In recent year, this traditional cultivation has undergone changes due to modernisation, transportation, commercialisation and also due to population pressure. This study identified thirty three jhum crops that are either manually or naturally grown and work out the cost structure based on deflated NSVA (Net State Value Added), to get the real cost.

Keywords: shifting cultivation, productivity, cost, Net State Value Added and naturally growing crops.

1. Introduction

The term shifting cultivation is also known as Jhum cultivation. The practice of jhum cultivation involves several stages of cultivation. It is associated with the regular rotation of plots. After one or two year of cultivation, the farmer shifts from older to new plot (Bam Mima, 2015). The fallow period is the abandoning period, where farmer return to same plot after decades, thus completing the 'Jhum Cycle'. This Jhum cycle is differs from place to place based on availability of the area and on population. The fallow period plays a vital role in the productivity of soil, it is also mentioned in the study of Seavoy, R. E (1973), fallow period replace the weeds that is rising and therefore protect the crops later on. The shading cycle is helpful for the cultivators as it takes out the problem of the weeds or else, the farmers would need more labour. The shifting cultivation is prevalent since from ancient time and is being carried out even today. Shifting cultivation plays an important role for providing livelihood and food security in many places. Specially, when there is no alternative other than jhum cultivation is available. For the tribal population, the significance of shifting cultivation goes beyond mere economic concerns. The study of Sati and Rinawma (2014) indicates that practice of shifting cultivation are old aged and persist due to backwardness. This Shifting cultivation is not only their livelihood but it's the way of life for the farmers in hilly region. However, the output generated per acre is insufficient. Increasing population has too put the pressure on land. The output produced from Jhum cultivation is low and fallow period has also been

reduce which in turn decreases the production. Roy, H (1994) observed that the tribals performing shifting cultivation has undergone change with introduction of transportation, modernization and population. The areas earlier practicing Jhum cultivation are changing to settled cultivation wherever possible and uses tractors and technology. In many areas the simple conception of self-sufficiency are gradually replaced by the concept of income generation. The community ownership of lands has also changed to individual ownership. In Arunachal Pradesh practicing Jhum is by compulsion due hilly topography while in some areas practicing Jhum is a source of livelihood and earning. Shifting or jhum cultivation comprises various types of activities from selection of plots to harvest. In Arunachal Pradesh, the practicing of Jhum cultivation is almost comparable in many districts. The only dissimilarities are found in crops seasons i.e. months and of crops, which is based on food habits and geographical location of the plots.

Methodology

A sample of 122 shifting cultivators were selected purposively from five different village under West Siang district. During survey it was observed that shifting cultivation is prevalent in many villages of the district, but the ratio of shifting cultivators to total household were are too low. Therefore, the minimum standard was set for sample villages. In other words, villages chosen for study had at least 35 percent of household as shifting cultivators.

About 33 crops were identified which are either manually seeded or it grows naturally. However, there is dissimilarities in crop availability in different villages due to variation in topography and food habits.

To determine the real cost, the deflated NSVA (Net State Value Added) were calculated. The real cost which is computed by deflating the nominal value (capital) with the NSVA deflators (161.66). And NSVA is computed by using the formula,

$$\text{NSVA deflator} = (\text{Nominal NSVA} / \text{Real NSVA}) \times 100$$

$$\text{Therefore, Real Cost} = (\text{Nominal value of capital} / \text{NSVA deflator})$$

Analytical Tools

The present study on cost of cultivation under shifting cultivation follows the model given under Commission for Agricultural Costs and Prices. The study of Meena et al. (2016), Murthy and Misra (2012) also used the same cost of cultivation model.

These cost structure is depicted in table 1.

Table 1
Structure of cost of cultivation for various crops.

Cost A1	Value of hired human labour
	Value of hired and owned bullock labour
	Value of hired and owned machine labour
	Value of seed (both farm seed and purchased)
	Value of manures (owned and purchased) and fertilizers
	Depreciation
	Irrigation charges
	Land revenue
	Interest on working capital

	Miscellaneous expenses
Cost A2	Cost A1 + rent paid for leased-in land
Cost B1	Cost A1 + interest on fixed capital (excluding land)
Cost B2	Cost B1 + rental value of owned land + rent for leased-in land
Cost C1	Cost B1 + imputed value of family labour
Cost C2	Cost B2 + imputed value of family labour
Cost C3	Cost C2 + 10 per cent of cost C2 as management cost.

Source: *Commission for Agricultural Costs and Prices.*

Based on the above given cost structure, the study computed the cost of cultivation for various crops. However, this cost structure is mostly appropriate for permanent cultivation. As for shifting cultivation, no study or model for cost calculation has been under taken yet, As such we followed the above given cost structure for calculating the cost of cultivation for various crops under shifting cultivation.

It was observed that, few element like Value of hired and owned bullock labour, Value of hired and owned machine labour, Irrigation charges, Value of manures (owned and purchased) and fertilizers, Land revenue, Value of hired human labour and interest on fixed capital (excluding land) were not applicable in determining cost of cultivation. In the case of cost on working capital, it is included under miscellaneous cost, as there are no proper capital involved under shifting cultivation except of the inputs like tools, for which the cost are mostly imputed and are counted in working capital.

The costs which are applicable to be included under shifting cultivation are, Value of seed, Depreciation (here it refers to the used amount of fixed capital per crop cycle under shifting cultivation), rental value of owned land, imputed value of family labour, rent value for leased-in land, miscellaneous cost. To calculate the real value of input cost, the study undertakes by apportioning the market value of input price. Using the NSVA price deflator helps in comparing the levels of real economic output from one to another year.

Therefore, selected costs structure that are available and applicable in determining the cost of cultivation in shifting cultivation are

Cost of Cultivation = {Value of seed + Depreciation + (rent value for leased-in land + rental value of owned land) + imputed value of family labour + miscellaneous costs (included the working capital)}

The value of the seeds which are available in the concern market is taken as its price and for those not available in market, have been imputed on the basis of amount of labour time involvement in management of seed inventory by per day wages of concerned area.

Depreciation here refers to the used amount of fixed capital per crop cycle under shifting cultivation. It includes Axe, Dagger/Dao etc.

As there is no proper regulated land market for determining the rent. This value too has been imputed and a lump sum offer (Animals or other food items) is converted and calculated as the basis of value of rent.

Hiring of labour is unfound under shifting cultivation. However, there exist the exchange of labour in all the surveyed village. Under this case, the value of labour is imputed based on prevailing wages rate of the area.

The value of working capital is also incorporated under miscellaneous cost, as there are locally available tools (hoe, Weeder etc.) which are used in shifting cultivation. As such the working capital includes those capitals that are either used up by the end of production cycle or are used up before the end of production cycle. The miscellaneous cost includes the value of refreshment or food items, which are incurred during the process of hut making, fence making, rites/ritual performance (Chicken, Pigs etc., sacrifice) and other expenses incurred during the operation of one crops cycle from sowing to stocking of crop.

Depreciation in standard conceptualisation refers to wear and tear of the fixed capital. In the study it is however perceived in a broader way so as to improve the used up capital. The used up capital here includes Axe, Machete etc. (Dao; inclusive of iron knives and weeders). As fixed capital spreads out evenly; the cost of fixed capital is taken at a deflated or real value as distributed evenly across its lifetime. The fixed capital is, therefore, presumed to spread across 10 years equally. Hence, the value of depreciation is taken only of a year.

Cost of production:

The Cost of production per rupee of output is computed by using the formula,

$$CP/Q = \frac{CoC/Acre}{Q/Acre}$$

Where, Q= total value of output

CP/Q = Cost of Production per rupee of output

CoC/Acre = Cost of Cultivation per Acre

Q/ Acre = value of output per Acre

Result and Discussion

Table 2. Shows the compile cost of cultivation for different crop which are naturally or manually grown under shifting cultivation.

Table 2
Cost of cultivation for various crops.

(Rupees in per acre)

Villages	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Jinyo Tarsu Mobuk	1329.56	1444.01	1329.56	1844.57	3983.57	4498.58	4948.44
Degi Potom	808.17	856.64	808.17	989.92	2685.27	2867.03	3153.73
Kambu	1772.35	1881.39	1772.35	2426.55	5911.26	6565.46	7222.00
Lipu Bagra	1043.23	1177.59	1043.23	1553.79	4197.67	4708.23	5179.06
Karbak Geyi	644.79	680.53	644.79	841.40	3212.36	3408.97	3749.86
Total	1119.62	1208.03	1119.62	1531.25	3998.03	4409.65	4850.62

Source: data computed based on field survey 2019-20.

On an average rupees 1119.62 was spent on Cost A₁ which includes Value of hired human labour, Value of hired and owned machine labour, Value of hired and owned bullock labour, Value of manures (owned and purchased) and fertilizers, Value of seed (both farm seed and purchased), Depreciation, Irrigation charges, Land revenue, Interest on working capital and Miscellaneous expenses. Cost A₁ found highest in Kambu Village with rupees 1772.35 followed by Jinyo Tarsu Mobuk and Lipu Bagra village

with rupees 1929.56 and 1043.23 respectively. Cost A₂, which comprises of Cost A₁ and rent paid for leased-in land, found to be highest in Kambu and Jinyo Tarsu Mobuk with rupees 1881.39 and 1444.01 separately. Here, Cost B₁ represent as same as Cost A₁. It is summation Cost A₁ and interest on fixed capital (excluding land), where, interest on fixed capital is Zero. An average of rupees 1531.25 of cost B₂ was observed, where, Kambu with 2426.55 rupees was found to be highest, it was followed by Jinyo Tarsu Mobuk and Lipu Bagra with rupees 1844.57 and 1553.79 respectively.

An average of rupees 3998.03 was observed for cost C₁, where highest was observed for Kambu and Lipu Bagra with rupees 5911.26 and 4197.67 respectively. Cost C₂ was found highest in Kambu with 6565.46 rupees in per acre, followed by Lipu Bagra and Jinyo Tarsu Mobuk with rupees 4708.23 and 4498.58 respectively.

Finally, the cost C₃ which is the compile form of cost structure, where Kambu Village was found to be highest with rupees 7222, it was followed by Lipu Bagra and Jinyo Tarsu Mobuk with 5179.06 and 4948.44 respectively.

Therefore, the Value of seed, depreciation, rent value for leased-in land and rental value of owned land, imputed value of family labour, miscellaneous costs (included the working capital) are the major factor in determining the cost.

Cost of production

The cost of production for various crops under shifting cultivation is given in the table 3. The cost of production per rupee of output was found to be highest in Kambu village with 16 paisa, this indicate that 84 paisa is the benefit in per rupee of output. It was followed by Jinyo Tarsu Mobuk and Lipu Bagra with 14 paisa per rupee each. The lowest production cost per rupee was observed for Degi Potom Village with rupees 1 paisa, which means that in total value of output worth one rupee there is 99 paisa worth output is generated in Degi Potom. The output yield and their value, cost of cultivation, area under cultivation and availability of crop plays an important role in determining the production cost per rupee.

The yield per acre play vital role in determining the cost of production under shifting cultivation.

Table 3
Cost of production per rupee of output

Villages	Cost of Cultivation for various crops (In Rupees)	Value of total output (In Rupees)	Area under shifting Cultivation (In acres)	Cost of production per rupee of output (In Rupees)
Jinyo Tarsu Mobuk	53492.59	395362.37	10.81	0.14
Degi Potom	64399.18	626202.53	20.42	0.1
Kambu	61459.25	391087.45	8.51	0.16
Lipu Bagra	119221.89	849826.8	23.02	0.14
Karbak Geyi	155731.88	1204330.4	41.53	0.13
Total	90860.96	693361.9	20.86	0.13

Source: data computed based on field survey 2019-20.

Policy implication

The cultivators under shifting cultivation lack experiment regarding addition of new seeds. They only focused on the particular crops which is cultivated since ages. As such, there are various tropical crops which are yet to be introduced in the study area. The value of jhum produce is high as it is organic in nature but farmers lack complete commercialization of crop, they only focused to meet their own requirements. The output produce from jhum such as *Heibe* (*Zanthoxylum Armatum*), *Hubbsi* (*Schizophyllum commune*), *Tayin* (Oyster mushroom), *Takuk Meruk* (*Auricularia auricula-judae*, Jelly Ear fungus) *Oyik* (*Pouzolzia Hirta*), *Osik* (*Pouzolzia Sanguinea*), *Oyin* (*Clerodendrum Colebrookianum*) have high market demand and are generally found to be naturally grown, which are not fully targeted for commercialization purposes. There are many crops under shifting cultivation that grows naturally and therefore, seeds cost of naturally growing crops are zero, these can be beneficial and the source of income if the farmer specialize and commercialise the jhum produces. However, the commercialization is also dependent on transportation and regular market, which is not the case for some of the study areas.

Conclusion:

Jhum cultivation is an ancient agricultural practice essential for the livelihood and food security of tribal communities in India's hilly regions, where other alternatives may be unavailable. However, the practice is in transition due to modern influences and population pressure. While traditionally sustainable with long fallow periods, increased population has led to shorter Jhum cycles, resulting in reduced soil productivity and insufficient yields. This has created a complex situation with significant socio-economic and environmental implications.

The study shifting used a purposive sampling method with 122 cultivators in West Siang district and adapted the standard Commission for Agricultural Costs and Prices model for settled cultivation to determine cultivation costs under shifting cultivation. Due to the unique nature of Jhum farming and limited market transactions, they excluded irrelevant cost components which is not application under shifting cultivation and imputed monetary values for elements like seed, land rent, labor, working capital and tools, while also using an NSVA deflator to calculate real costs.

An analysis of Jhum cultivation in the West Siang district found significant variations in production costs across villages, heavily influenced by factors such as output yield, seed costs, imputed labor, depreciation, and land rent. While Jhum produce has high market value, farmers' focus on subsistence and poor market access limit their income potential. Policy recommendations include supporting new high-value crops, improving market infrastructure, promoting commercialization of naturally grown produce, and integrating traditional knowledge with scientific methods.

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