

Adaptation Strategies Through Mining Compensation in Mabayi Commune, Burundi

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Abstract

One of main effects of mining on rural agriculture is the loss of farmland by households living near mining sites. In return, these households should receive compensation. This compensation, if well invested, may lead to improved livelihoods for these farming households. If not, these households may find their livelihoods deteriorating if the compensation is not properly managed. This paper aims to analyze household compensation investment strategies in Mabayi commune (Burundi) and their effects on the livelihoods of households affected by mining activities. A survey of 140 households, interviews with key informants, and observations were conducted in July and August 2022 on Gahoma and Ruhororo hills where foreign company “Tanganyika Mining Burundi (TMB)” and local cooperative “*Dukorere Hamwe Dusoze Ikivi (DHDI)*” were carrying out their activities respectively since December 2018, in Mabayi commune. Results showed that 17 out of 20 households (85%) and 13 out of 17 households (76.5%) had invested their compensation well, in Gahoma and Ruhororo hills respectively. They had improved or maintained their overall quantity of agricultural production, and improved their livelihoods in general. On other hand, 3 households (15%) and 4 households (23.5%) had invested their compensation inappropriately, in Gahoma and Ruhororo respectively. They had suffered reduction in their overall quantity of agricultural production, and experienced deterioration of their livelihoods in general. Fair and up-front compensation for households, assistance in how to invest compensation, capacity-building in agriculture and alternative activities, should maximize opportunities for improved livelihoods. The mining company and cooperative must also comply with environmental regulations.

Keywords: Agricultural production, compensation, livelihoods, mining, Burundi

1. Introduction

Mining is often associated with the capture and destruction of land on which essentially agricultural activities are undertaken for the livelihood of households in rural communities living in the vicinity of mining sites (Musokotware, 2016; Zabsonr éet al., 2016; Nsabimana, 2019). These negative effects on agriculture place many households in these communities under pressure and tension with regard to their livelihoods. As a result, they have to develop coping strategies, investing in alternative means of survival through compensation for those who receive it (Adjei, 2007). Success is not always guaranteed for all, as it depends on the investment chosen and the management capacities of each household (Rubbers, 2006).

Burundi is one of the most densely populated countries in Africa (Commission Economique des Nations Unies pour l’Afrique, 2016). In this country, land is, and has always been, the most important source of livelihood for rural communities (Pedro, 2011; Organisation for Economic Cooperation and Development [OECD]/Food and Agriculture Organisation [FAO], 2016; Ministère de l’Agriculture et de l’Elevage [MAE], 2016; Ndagijimana, 2021). It is the asset (capital) on which other assets are based. Effects on this asset or on farms therefore create dynamics for livelihoods in general for these communities, and can make them vulnerable in the event of a major negative aspect (dominant negative effects). To stimulate its economy and tackle poverty, the Burundian government decided in 2005 to diversify its sources of revenue, focusing on the mining sector as a potential source of income (Vircoulon, 2019). This sector was still considered to have untapped economic potential. It was subject to unorganized artisanal exploitation by local communities. In 2005 the country was opened up to mineral exploration (*Ibid.*, 2019). But the 1976 mining and petroleum code was still in vigor. Since then, mining

activities have continued to be carried out on a quasi-informal basis by individuals recognized or not by the State, as this code was less liberal to foreign investment (*Ibid.*, 2019). These individuals could easily evade taxation (ActionAid International Burundi [AAIB], 2019). The reform liberalizing the sector to adapt it to new orientations, especially to Burundi Vision 2025- “*the mining sector must be a developed extractive sector that contributes significantly to the country's sustainable socio-economic development*”, and to foreign investment, came a little later with Law n° 1/21 of October 15, 2013 on the Burundi Mining Code (AAIB, 2019; Vircoulon, 2019). With this code, there was an inrush of international mining companies, but also of local mining cooperatives. The creation of mining cooperatives' in artisanal operations was intended to combat illegal mining (AAIB, 2019). Thus, until 2018, eight (08) international mining companies were present, including five (05) approved with operating licenses. The latter had obtained concessions. More than thirty-eight (38) formal local artisanal mining cooperatives had also been established (World Bank [WB], 2016; Vircoulon, 2019). Some of these companies and cooperatives had even begun mining operations in 2014 (AAIB, 2019). Today, mining is practiced in eleven (11) provinces (out of the country's 18 provinces), including Cibitoke. Cibitoke province covers an area of 1,636 km². It alone has ten (10) mining cooperatives operating on thirteen (13) sites, out of the thirty-eight (38) mining cooperatives formally existing at national level (Office Burundais des Mines et Carrières [OBM], 2021). In the Mabayi commune of the aforementioned province, the Russian mining company Tanganyika Mining Burundi [TMB] and the local mining cooperative *Dukorere Hamwe Dusoze Ikivi [DHDI]*, have been operating on an area of 87.87 km² (25.3% of the commune's total area), on the Gahoma and Ruhororo hills respectively, since 2018.

Before starting of exploration activities, mining companies and cooperatives must provide compensation to landowners, in accordance with the agreement signed with the government (articles 11, 40 and 41 of the agreement). To date, no studies have been carried out on household compensation and its use. The purpose of our paper is to analyze the investment strategies of affected households, and the effects of this investment on their livelihoods.

2. Materials and Methods

2.1 Description and Choice of Study Area

The study was carried out in the commune of Mabayi. This commune has a very rugged relief, with altitudes varying between 1,500 and 2,652 m (Nsabimana, 2019). It also has abundant rainfall, often reaching 200mm per month (*Ibid.*, 2019). These natural features of the area make the land vulnerable to erosion, and thus more vulnerable to the environmental effects of mining activities. The commune is overcrowded - between 500 and 650 inhabitants/km² according to the location - (MAE, 2016), making access to land in this commune more difficult compared to other mining areas. Furthermore, with a population of approximately 103,623 (Institut National des Statistiques du Burundi [NSB], 2020) and a total area of 347.54 km² (Nsabimana, 2019), the population density shows that around half of this commune area is not potentially arable. This is an agricultural area where bananas are the main crop. Other crops grown by the majority of the population include corn, beans, cassava, sweet potatoes, potatoes and colocasia. Rice, coffee, tea, wheat, tomatoes, pineapples, etc. are also grown by some households. Livestock farming generally involves small livestock due to the very rugged landscape (MAE, 2016). Animals raised include goats, pigs, sheep, rabbits, chickens, etc. (*Ibid.*, 2016). Small businesses selling a variety of products and services are also practiced. The other activity practiced is informal gold mining, through which some miners still exploit the richness of the land (AAIB, 2019; Nsabimana, 2019; Vircoulon, 2019).

Overcrowding and specific physical conditions increase the vulnerability of the agricultural sector to the environmental effects of mining activities. In addition, the land grabbing by mines raises questions about the future of region's farmers, since farming is their main livelihood.

2.2 Data Collection

The paper is based on an in-depth review of primary and secondary data. Primary data were collected in July and August 2022. We used a questionnaire, two individual interview guides (one for opinion leaders, and other for the communal agronomist and public and community relations officers at TMB company and *DHDI* cooperative), and observations. With the help of two local interviewers, the questionnaire was sent to the heads of 140 households in their homes: 70 households including 35 who had lost land in Gahoma, and 70 households including 17 who had lost land in Ruhororo. With this sample, we collected quantitative data on agricultural production and general income from before and after the investment of offsets (2017-2018 campaign and 2020-2021 campaign). General income includes farm income, animal income, and income from alternative activities (trade in goods and services and employment). Individual interviews were conducted with opinion

leaders (2 – man and woman per hill), and with public relations and community managers, for qualitative data. For the Gahoma hill, the 35 households were randomly selected from a total of 80 households that had lost land. Only 20 of the 35 households in the sample had received compensation. For the Ruhororo hill, the 17 households were those who had lost land in total, and had all received compensation. The twenty households and the seventeen households that had received compensation were questioned about their use, in Gahoma and Ruhororo respectively. All survey participants were aged 18 or over. They had to have lived in the two communities prior to 2018, with the exception of public and community relations officers. Secondary data were collected through books, articles and other documents related to our theme. For data relating to agricultural production, the country has a single national institution - l'INSB - which has been operational since 1990. It is responsible for collecting and analyzing data down to provincial level. It does not have data at hill level. It was therefore necessary to use primary data, especially quantitative data, for household livelihoods.

2.3 Data Analysis

Data analysis was carried out using "mixed triangulation", which involves reasoning by crossing qualitative and quantitative data. Mixed triangulation enables reliable results both quantitatively and qualitatively verified (De Sardan, 2003; Musokotware, 2016). The analysis was also carried out by comparing situations before (2017-2018 campaign) and after (2020-2021 campaign) the investment of offsets. Data was collected on paper and entered into Excel. Quantitative data were processed using descriptive statistics, and qualitative data were processed using content analysis (Patton, 2002; Duriau *et al.*, 2007, Srivastava & Thomson, 2009).

3. Results

3.1 Corruption in Compensation

The granting of compensation to rural households in the study area was characterized by many suspicions. They did not correspond either to the real value of the losses, or to the amounts that these households had signed for at the time of the loss inventory. In Gahoma, fifteen (15) of the thirty-five (35) households that had lost land had not received compensation. When asked about the failure to compensate these households, the TMB public and community relations manager said that it was simply a technical problem. Regarding these irregularities, the heads of the households concerned and opinion leaders pointed the finger at the corruption of certain local authorities, including the communal administrator. They also stressed that the cause of such irregularities in the granting of compensation would eventually be the mining company itself.

3.2 Compensation Investment

In the two communities covered by the study, five (05) different types of compensation investment by households were identified: agriculture and livestock farming, alternative activities to agriculture, alternative activities combined with agriculture and livestock farming, non-income-generating activities, alternative activities and non-income-generating activities (Table 1).

Table 1. Household investment in compensation schemes

Type of investment	GAHOMA		RUHORORO	
	Frequency	Percentage	Frequency	Percentage
Agriculture and livestock	11	55	9	53
Alternative activities	1	5	2	12
Agriculture and livestock and alternative activities	6	30	4	23
Non-income-generating activities	1	5	1	6
Alternative and non-income-generating activities	1	5	1	6
Total	20	100	17	100
Households not compensated				
Sale of animals and labor in other people's fields	15		0	

Source: Designed by authors based on survey results (July and August 2022)

3.2.1 Agriculture and Livestock

In the two communities (Gahoma and Ruhororo) covered by the study, seventeen (17) households out of twenty (20), i.e. 85%; and thirteen (13) households out of seventeen (17), i.e. around 76% who lost land and received

compensation, were able to acquire other land for farming. They also bought domestic animals (goats and pigs) for breeding. Of these households, eleven (11) and nine (09), i.e. 55% and around 53% in Gahoma and Ruhororo respectively, were engaged solely in farming and livestock breeding. They continued their farming activities almost as usual. The purchase of additional land provided them with an opportunity to have farms located far from mining operations, and thus to escape the negative effects associated with these operations. In Gahoma, thanks to this type of investment, eight (08) households increased their quantity of agricultural production, and three (03) maintained it at the same level. In Ruhororo, seven (07) households improved their production and two (02) maintained it thanks to this type of investment. According to the heads of the households, these compensations have enabled them to improve their livelihoods in general, despite the negative external factors, the long distances they have to travel to reach the new mining sites, pollution, erosion, and the destruction of the rest of the old land located next to the mining operations.

3.2.2 Alternative Activities

Some households who have lost land and received compensation have invested in alternative activities to farming. They have invested in building commercial infrastructures (rented houses; rented shops, restaurants and bistros or for own business), purchasing means of commercial transport (vehicles, motorcycles, bicycles) and in small businesses (welding, masonry, carpentry, etc.). By their own choice and due to insufficient compensation, only one (01) of the twenty (20) households in Gahoma, and two (02) of the seventeen (17) households in Ruhororo, engaged solely in this type of investment. They have not been able to improve or maintain their overall quantity of agricultural production, nor their livelihoods in general. Indeed, while investment in alternative activities can provide the financial means, there is no guarantee that it can be profitable in the long term, without the possession of another secure source of livelihood in the same way as land, for households that are still very professionally agricultural (Adjei, 2007). In Gahoma, the household that engaged in this type of investment bought a commercial transport vehicle in addition to building a rented house. In Ruhororo, the two households involved bought commercial motorcycles. Unfortunately, these means of transport broke down after a short period of its use. This meant that they had to pay additional, unscheduled repair costs. As a result, they were unable to maintain these high-maintenance assets for long. One of the households that invested solely in alternative activities in Gahoma commented: *"I lost 0.3 hectare of arable land. With the compensation, I bought a second-hand vehicle (Toyota probox) for commercial transport and built a house to rent. After three months, the vehicle broke down. I had to sell four goats to cover the cost of repairs. After two months, my vehicle broke down again and I couldn't get it repaired. At the moment, I'm desperately looking for a customer to sell it, even though the Burundian Franc 20,000 (approximately \$ US 98 in 2022) I receive from renting my house can't cover the loss I've incurred"*.

3.2.3 Agriculture and Livestock and Alternative Activities

Six (06) households out of the twenty (20), and four (04) households out of the seventeen (17), in Gahoma and Ruhororo respectively, are engaged in both agriculture and livestock farming and in alternative activities. For alternative activities, these households have purchased bicycles, which cost less and require less maintenance, for commercial transport, in addition to engaging in small businesses. This second type of investment enables households to purchase chemical fertilizers, pay for farm labor, buy small animals and send children to school. One head of a household explained: *"With the compensation I received, I purchased additional land. I also purchased a bicycle to transport customers and their goods. I also purchased some masonry equipment because I occasionally do this job. This bicycle and this small business enable me to have a supplementary income to buy chemical fertilizer, pay for farm labor when needed, and send my children to school"*. Investment in agriculture and livestock farming has enabled farms to be located away from mining operations. Thus, thanks to this combination of the two types of investment, four (04) households increased agricultural production and two (02) households maintained it in Gahoma. Three (03) households improved and one (01) maintained it in Ruhororo. These households all improved their overall livelihoods, despite the negative factors mentioned above.

3.2.4 Non-income-generating Activities

With no other secure source of livelihood, the fourth aspect that has characterized the use of compensation is really not a suitable investment for households that have lost the land that constituted their immeasurable livelihood asset. The fourth aspect is the commitment to non-income-generating activity like the purchase of family transportation means (vehicles), and to non-directly income generating activity like schooling of children. Households that engaged in this type of investment previously had appreciable social status, because they had sufficient livelihood assets such as agricultural produce and animals. One (01) household out of twenty (20) in Gahoma and one (01) household out of seventeen (17) in Ruhororo have each purchased a vehicle (Toyota

probox) for family transport, in addition to paying school fees for children. This asset does not provide them with an income to replace the one they lost when they lost the land. It requires considerable financial resources for maintenance. The heads of these households lamented that they had made a mistake by not thinking of reinvesting in agricultural activities. One of the heads of households who invested in non-income-generating activities in Ruhororo explained: "I lost 0.4 hectare, and I purchased a vehicle (Toyota probox) with the compensation I received, for family transport. I've lost almost half the agricultural production I used to receive. All my animals have been sold to maintain the vehicle, the family's survival and the children's schooling. Today, I don't see anything that could guarantee my family's survival in the next few days". Having disinvested partly in agricultural activity, these households have not been able to improve or maintain their overall quantity of agricultural production, nor their livelihoods in general.

3.2.5 Alternative and Non-income-generating Activities

Investment combining engagement in alternative activities and engagement in non-income-generating activities was also adopted by two (02) households: one (01) household in Gahoma, and one (01) household in Ruhororo. They have each built a family house, and bought motorcycles and bicycles for commercial transport. Having disinvested partly in agricultural activity, heads of households concerned declared that the income from these transport' means is far lower than the income lost. They too have not been able to improve or maintain their overall quantity of agricultural production, nor their livelihoods in general.

3.3 Summary of Different Types of Investment

Some households have used their compensations only in one type of investment, either in agriculture (and livestock), in alternative activities, or in other investments (non-income-generating activities). Others used their compensations in a combination of two types of investment at once, either in agriculture (and livestock breeding) and in alternative activities at the same time, or in other investments (non-income-generating activities) and in alternative activities at the same time (Figure 1).

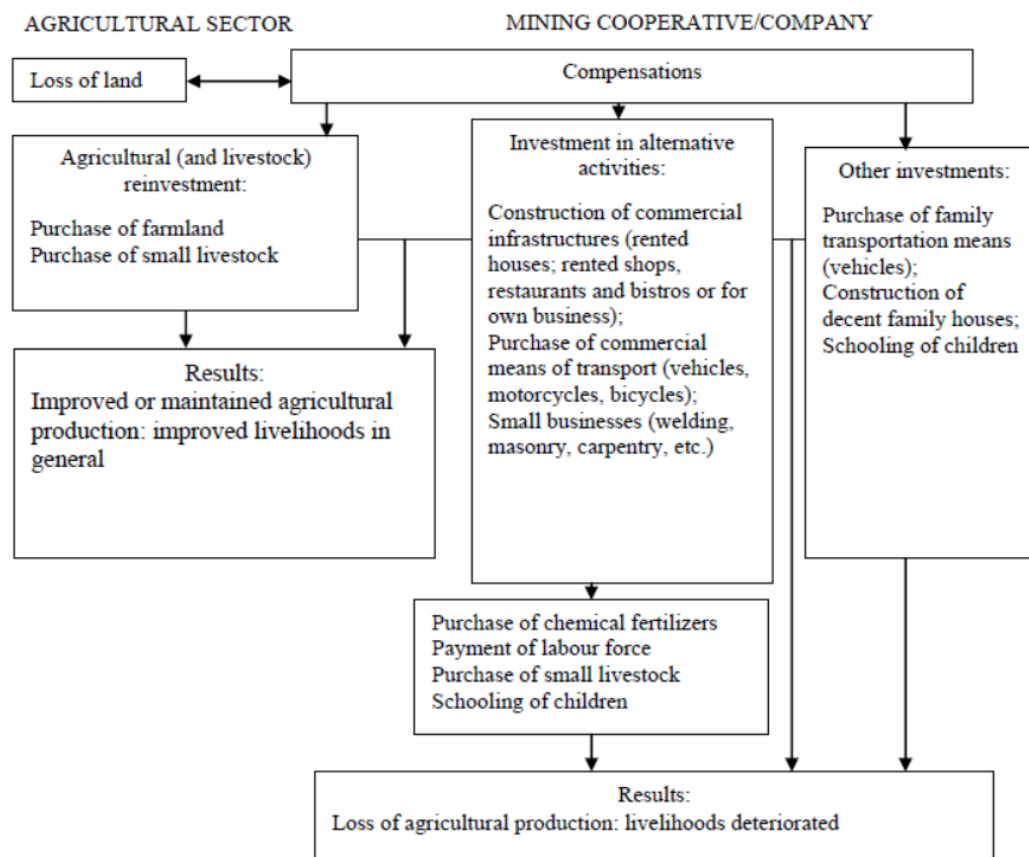


Figure 1. Household in compensation systems

Source: Developed by authors

4. Discussion

Agricultural risks and uncertainty are numerous and varied, ranging from climate change and weather conditions to fluctuations in agricultural prices and inputs, from financial uncertainties to political and regulatory risks (Ngo, 2018). External forces, such as unexpected changes, can negatively affect households, causing them to lose some of their property and capabilities (assets). The loss of these assets and capabilities corresponds to a reduction in income (Bhattarai, 2005). Mining activities are external forces often characterized by the uprooting and destruction of some households' land (Adjei, 2007; Musokotware, 2016; Zabsonré et al., 2016; Nsabimana, 2019). They amplify soil erosion, pollution (air and soil), landslides and land subsidence, etc. (*Ibid.*). The direct consequence is a loss of household agricultural production, creating risks and uncertainties in terms of household livelihoods (Bhattarai, 2005; Adjei, 2007). Managing and/or rather anticipating these shocks from mining activities requires specific mechanisms to be put in place. Effective and enforced mining regulations concerning expropriation, compensation and relocation/resettlement of affected communities are likely to improve the livelihoods of affected households. In Ghana and Mozambique, for example, regulations are implemented to ensure compliance with environmental standards, and compensation is granted to households that lose land (Koulemou, 2015). On the other hand, in the absence of an explicit governance framework in the mining sector, mining becomes arbitrary and is associated with corruption (Brollo et al., 2013; Caselli & Michaels, 2013). When land that has been taken or destroyed is not properly compensated, this situation can lead to deterioration in the livelihoods of affected households (Adjei, 2007; Musokotware, 2016; Zabsonré et al., 2016; Nsabimana, 2019). Affected farmers, resettled and with required compensation, should also be unable to maintain and continually extend their new farms due to the high cost of agricultural inputs and competition caused by mines in a context of limited agricultural land (Assan & Muhammed, 2018). These farmers must therefore develop coping strategies that enable them to obtain the necessary means of livelihood. The survival strategy characterizes households in the study area. These are households with small, low-fertility farms and limited means. They therefore have limited margin for decision-making (Gafsi, 2017). Their survival depends on the range of investment capacities and the management of the assets in their possession (Adjei, 2007).

Agriculture is the fundamental basis for investment and livelihoods in developing countries in general, and in the study area in particular (Pedro, 2011; Assan & Muhammed, 2018; Ndagijimana, 2021). By investing in the acquisition of new arable land, farmers are more resilient to shocks caused by mining. Some households in the study area have managed to increase their livelihoods by acquiring and exploiting new agricultural lands.

Despite the intrinsic role of agriculture, diversification of income sources is a strategy that further improves livelihoods. Vertical diversification by integrating livestock with agriculture is one of the less risky strategies with multiple benefits. It is the key to farm development in developing countries (Williams et al., 2000; Upton, 2004). Complementarity between crops and livestock increases agricultural productivity and improves the efficiency of production factors (Ramisch, 1999). It enables households to earn money from the sale of agricultural products and animal by-products (meat, milk, skins, manure, etc.), and contributes to agricultural productivity through organic fertilizers - litter and compost - from crops and animals. It ensures a balanced diet. It also fosters savings in kind to cope with any shock (illness in the family, accident, difficult childbirth, etc.) requiring financial resources.

In rural areas, investment in non-agricultural assets is more risky and can worsen household livelihoods. Its success depends on access to a diverse range of economic opportunities, and the judicious choice of these ones (Gafsi et al., 2007). Investing in assets with high working capital for smallholders is largely a wrong choice. In the area studied, the investment of compensation in costly assets (Toyota probox, houses, motorcycles) by some households resulted in non-investment in agriculture. It was not profitable, and instead caused disinvestment in other assets and deterioration in livelihoods. On the other hand, households that have seized the opportunities offered by the zone's socio-economic environment by investing in less expensive assets with low working capital - bicycles, masonry equipment - have accumulated income. This less costly investment enabled these households to invest in agriculture at the same time. As a result, these households improved their livelihoods. Our results corroborate those of other authors. By analyzing the lives of chronically poor households in Bangladesh between 1988 and 2000, Sen (2003) has shown that with age, some households have become less dependent on agricultural labor activities, making use of all the non-agricultural (trade, migration) and agricultural (technological) opportunities available to them. In southern Benin, Floquet and Mongbo (1998) have shown that non-agricultural activities contribute an increasing share of both men's and women's income (Floquet & Mongbo, 1998). The processing of agricultural products, small business, the exploitation of natural resources, etc., are expanding as a result of growing urban demand. In peri-urban areas, those with a certain level of training try new opportunities, such as semi-intensive livestock farming and the production of various agri-food products, while

others are content with lucrative odd jobs such as rickshaw transporters (*Ibid.*). However, the ability of farmers to inform themselves and adapt quickly to these often fluctuating opportunities is crucial (Gafsi et al., 2007). Investing compensation in assets that are not economically but socially profitable (decent housing, family transport, sending children to prestigious schools) can only be envisaged by households with a certain social status - the wealthy.

Assistance or support for compensated households in managing compensation is of the greatest importance. Rural households with a low level of education are the most likely to waste resources by investing in or purchasing goods and materials that do not contribute to improving their livelihoods. In Ghana and Mozambique, for example, support has consisted in helping households to manage compensation by improving production or at least restoring it. Mining activities in these countries have therefore been an opportunity to develop and improve livelihoods for affected households (Koulemou, 2015).

5. Conclusion

According to household preferences, five types of investment characterized the use of offsets in the study communities: agriculture and livestock, alternative activities, agriculture and livestock and alternative activities simultaneously, non-income-generating activities, alternative activities and non-income-generating activities simultaneously. Of these different types of investment, only the first two improved household livelihoods through the inclusion of investment in agriculture. The purchase of new land located far from mining sites enabled households to escape the negative effects of mining activities, and to improve production and livelihoods despite these effects on the rest of their former land close to mining sites. The use of compensation for other types of investment, which did not include agriculture, proved inappropriate for households in the studied communities. These are still professional farmers, and have to reconcile investment in agriculture with other types of investment. Households that opted for these types of investment were also victims of the negative effects of mining activities on the rest of their farms. They have suffered deterioration in agricultural production and livelihoods due to these effects, and to the lack of assistance in their choice of compensatory investments. These households, which have improved their agricultural production and livelihoods, had all benefited from capacity-building projects run by TMB or *DHDI* cooperative. Compensation must be a requirement for households subject to the loss of land and other assets. They need to be assisted in their choice of compensation investment and capacity building to maximize opportunities for livelihood. The mining company and cooperative must also comply with environmental regulations.

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