

## Feeder road development: Addressing the inequalities in mobility and accessibility

It is generally expected that road developments will reduce the inequalities associated with spatial isolation. Feeder road infrastructures undoubtedly bring a range of benefits—including non-economic benefits such as access to health care and education—but the benefits might be distinctly distributed among a rural community. This could lead to subtle effects that may worsen rather than reduce social inequities.

### Quantitative findings regarding inequality

Our research in the study sites of Kilde Awlaelo and Raya Azebo finds severe inequalities in income and in wealth:

- Figure 1 shows the income distribution pattern. At 0.5 on the x-axis, we see that 50% of the households earn a yearly income just above 10,000 birr, or 2,032 \$(PPP). More than 90% earn less than 30,000 birr per year, or 6,097 \$(PPP).

Several wealthy families earn around above 80,000 birr per year, or 16,260 \$(PPP). The inequality ratio of the lower limit of the tenth decile to the upper limit of the first decile (P90/P10) is 7.4. The GINI index of inequality in our study sites is worse than the national average (0.45 and 0.33, respectively).

- Wealth inequality is considered by looking at capital income, which includes income from assets such as livestock, land, business, etc. The largest contributor to capital income is land, whether through rents or the selling of agricultural output. Capital income is more unequally distributed than income from waged employment (Table 1). The average yearly income from capital is calculated at 5,353 birr per 'poor' household versus 35,072 per 'rich' household, which is 6.6 times more than for the 'poor'. The average yearly income from wages is 1,606 birr per 'poor' household versus 5,170 per 'rich' household, or 3.2 times more.

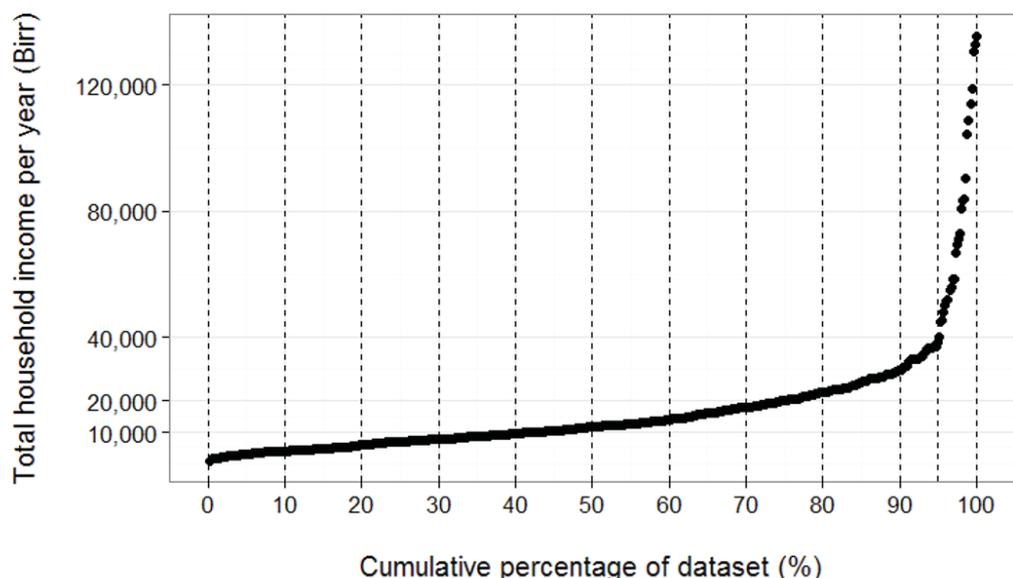
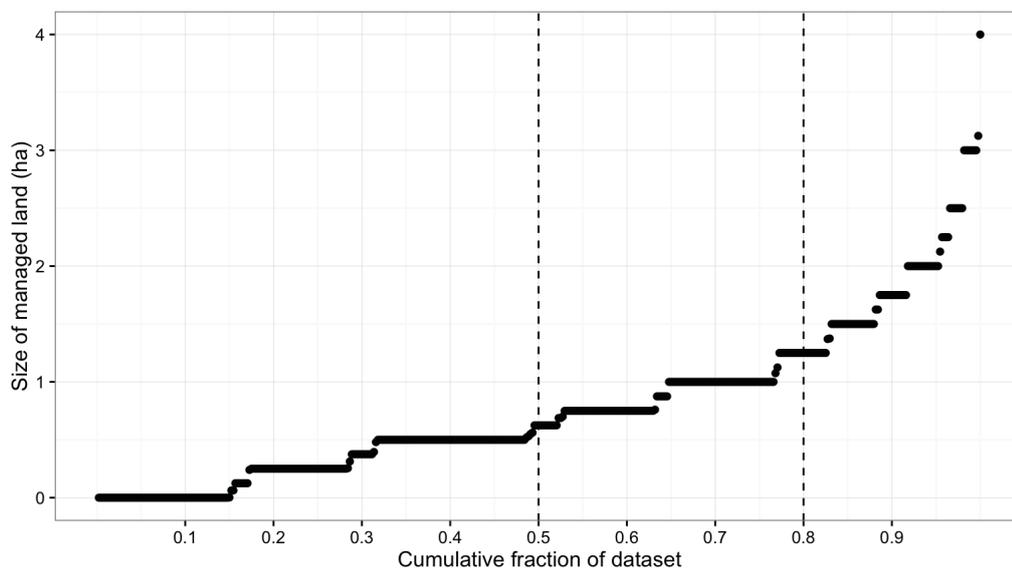


Figure 1. Total household income per year (corrected for household size) as a function of the cumulative fraction of the population



- The ratio of capital income to wage income is very similar in all quantiles, except for the richest 5% households (P95-P100 quantile) who earn almost 95% of their income from capital. Income from the land is essential even for those who sharecrop or rent out their land.

- There are serious inequalities in the capacity to manage land (see figure 2). We found that the average size of managed land is 0.278 hectare for poor households and 1.977 hectare for rich households. Most landlords are actually poor in non-land resources (livestock and farming equipment) while tenants are asset-rich landholders.

- Livestock income was considered as income from capital if a household is involved in trading livestock that is reared by others. Income from livestock products was also included under capital income, and higher earnings from that source logically point to

larger stocks of animals. However, it represents a relatively small fraction of potential unaccounted returns from livestock sales. A 2011 survey in Tigray, for example, reported an average income of 560.81 birr per household per year on animal products, versus 1533.10 birr/year earnings on livestock sales.

### Qualitative picture of the possible causal relations

In the context of such inequalities, how will the road affect the different income and wealth groups? Our interviews revealed a wide range of statements about the (in)direct effects of feeder roads on development. Respondents often focused on a specific causality, such as between mobility and employment, accessibility and production, and so on. These causalities would then be complemented or contradicted by other respondents.

Table 1. Distribution of sources of income per wealth category for the total dataset.

Wealth category	N	Average income	Fraction of income from capital	Fraction of income from wages
Poor (D1 - D5)	257	6959	76.9%	23.1%w
Middle (D6 - D8)	154	16516	74.4%	25.6%
Rich (D9 - D10)	103	40243	87.2%	12.8%

Looking beyond individual statements, the interview data as a whole provides a rich picture of economic life and of the function of feeder roads. It also helps to understand the causalities that could increase the gap between, on the one hand, households that are dependent on income from waged employment (labourer households) even if they also earn income from their land and, on the other hand, those households that earn most of their income from capital (producer households). A selection of these causalities are presented in Figure 3, which was developed based on interviews with local communities in our study sites.

Starting with the sequence of causes and effects on the right (LOOP 1), we see that feeder roads are said to improve access to inputs, such as fertiliser, fuel and seeds, which increases food production. The roads also facilitate transportation of food to markets and of consumers from neighbouring areas. This increases trade in food, and therefore income to producers (capital income). According to our respondents: "Formerly, people were mostly consuming what they produced and were not conscious about markets";

"These days, if I have customers in town, I rent a horse cart, I come here and dig out the product and transport it to town. The income itself has increased".

The middle loop (LOOP 2) indicates that increased production increases labour demand and therefore wages to labourers. This loop potentially lowers the income gap between labourer households and producer households. "The road benefits more the poor. If the road and transportation are available, the poor will have a lot of opportunities to engage in different day-labouring and business activities, to move here and there"; "There is more mobility and there are more people engaged in day-labouring". On the other hand, the demand for labour might not increase (and inequality might not be reduced), if food production is capital- rather than labour-intensive. A study in north-western Ethiopia indeed found that sorghum producers that are well connected to extension services and markets adopted more modern inputs, but also employed less labour. This is a concern in our study sites as well: "If there is no effort to expand job opportunities for them [the poor], there will be problems in the future".

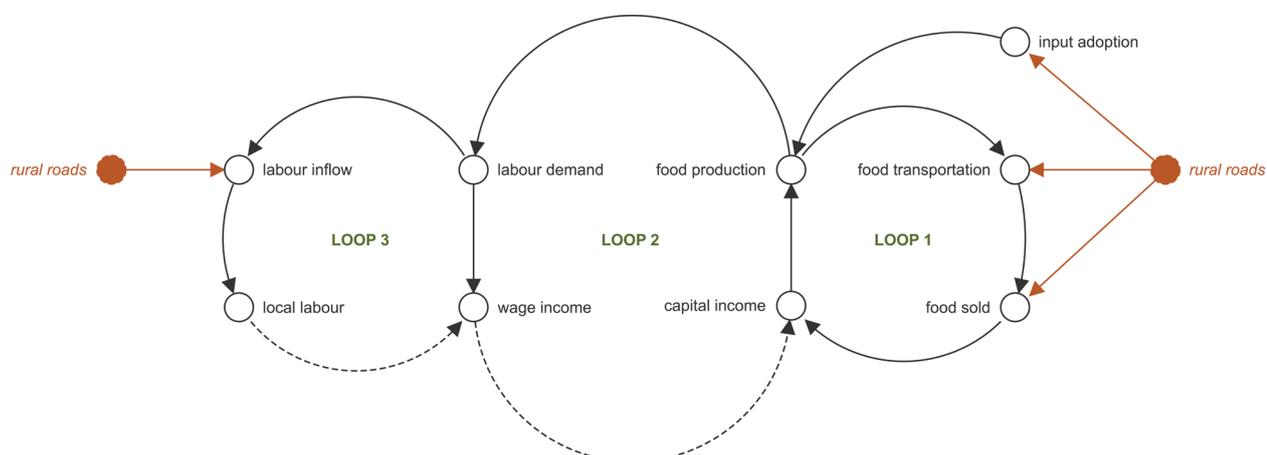


Figure 3. Important causal links and role of rural roads: the diagram consist of nodes and links. In a 'positive' causal link, the influenced node changes in the same direction as the influencing node. For example, if the 'input adoption' node increases, the 'food production' node increases too. A 'negative' causal link (dotted line) means the two nodes change in opposite directions. So if 'local labour' increases, 'wage income' decreases.

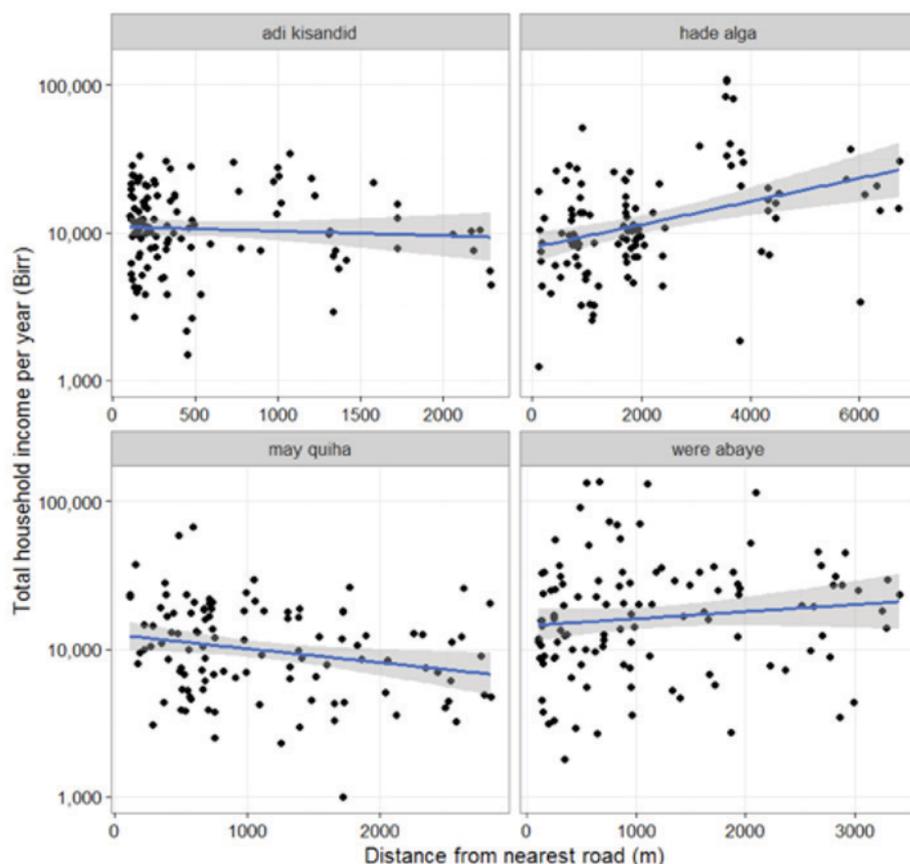
The loop on the left (LOOP 3) might worsen inequality between labourer households and producer households. Increased labour demand can also trigger an inflow from the outside (which is also facilitated by feeder roads). This raises competition among labour and can lower the wage rate. "When there are a lot of labourers, the employers decrease the wage rate. Sometimes it's 100 birr and sometimes it's 80 birr per day. In the worst case it can go down to 30 birr per day". The result is that underpaid and underemployed local labour will seek employment outside the tabia. However, here too there may be inequalities: "Some people can go to Wukro and other areas provided their status is a bit up. Otherwise, for day-labourers there is no migration".

### Spatial distribution of inequality

The impacts of feeder roads on production, consumption and employment are distinctly distributed among the local population. This leads to the following questions for policy: what are the potential and observed economic

impacts from rural road infrastructure on different social groups (i.e. households predominantly dependent on wage income versus those that generate more capital income)? What does that distribution of impacts mean for development in the long-term? Will it alleviate or aggravate existing inequities? As illustrated in Figure 3, several competing loops might be operating simultaneously, those loops that dominate will determine the outcome.

We found that the outcome on inequality could go either way. In Figure 4, we see no significant correlations between total household income and distance from the homestead to the nearest road in the cases of Were Abaye and Adi Kisandid. Coincidentally, they are also respectively the most and the least unequal of the four tabias. Looking at the correlations for May Quiha and Hade Alga, the difference is unexpected and interesting. There are significant negative and positive correlations ( $p < 0.05$ ).



In May Quiha, higher income households live relatively closer to the road ( $R^2 = 0.06$ ); in Hade Alga, they live further away ( $R^2 = 0.12$ ). This is particularly puzzling, considering they are also the two oldest feeder roads (10-15 years old).

We conducted interviews in each tabia to probe the causes for this spatial difference. The responses were unequivocal; in both cases the causes are related to the natural endowment of the landscape. While productivity and income benefits are often quickly attributed to better access to economic resources and a lowering of transaction costs, it seems that the geographical pattern of income distribution is more strongly affected by pre-existing environmental conditions, i.e., by the benefits derived from the landscape. In our cases, these were free water (available close to the road in May Quiha) and grazing space (available far from the road in Hade Alga), but there could be others such as soil fertility, forests or biodiversity.

From these cases, we can generalise that the disparities sometimes take on a statistically significant spatial dimension, sometimes they do not, but this must always be considered when seeking explanations for inequality.

### Initial policy messages

The feeder roads themselves do not create inequalities, but they play a role in other economic processes that might increase inequality. Household differences have a strong influence on the intensity and frequency of use of roads. For example, the severe inequality in capacity to manage one's land is important for understanding the distribution of benefits from rural road developments. Those who rely on the road most for selling surplus agricultural production also seem least dependent on it for buying food and other goods.

Labour, on the other hand, can benefit from seeking employment elsewhere, but can lose from the competition resulting from the inflow of labourers from other areas. Improved mobility and access can generate productive employment. While feeder roads are not an essential factor in long-term labour migration, they do affect seasonal and short-term labour mobility, which is much more substantial and frequent. This, in turn, affects wages and productivity, and increased competition among a more mobile labour force can lead to severe drops in wages.

The main message is to recognise that—although feeder roads are crucial to development, as they bring with them better access to health, education and services—they also bring different economic benefits to different categories of households. By narrowly focusing on how roads might help increase overall productivity in a region, we risk overlooking the unequal distribution of this productivity. It is important for policy-makers to determine whether or not the poor can compensate for any negative effects and what interventions may be required to ensure inclusiveness.

Next to feeder road investment, additional interventions could be considered in order to tackle different forms of inequality, such as:

1. Reducing the spending gap: Rural people are still 'living in a walking world'; transportation is either unavailable, or transport costs are too high for low income households. The regulation of transportation costs could keep these low. Alternatively, transport needs could be reduced by establishing local markets at tabia level. This will reduce the need to travel far for consumption needs, especially for those households whose own production is below subsistence levels.

2. Reducing the income gap (see our other policy briefs): Policies and interventions should prioritise low income groups in all sorts of new (road-related) employment opportunities, such as in road construction and maintenance (e.g. sand mining through youth employment schemes); in roadside tree-planting; and in new road-related businesses (e.g. road-side kiosks and transportation services).

3. Reducing the asset gap: Policies and interventions should assist asset-poor households to increase their productive capacity and self-sufficiency. For asset building, a common financial support programmes are credit schemes (e.g. dedebit), which means that the poor—if they are able to get access in the first place—will start with a debt.

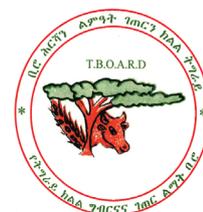
Other microfinance institutions (e.g. RUSACO) offer blended forms which start with savings (e.g. 20%) matched by a loan (e.g. 80%). A large group of poor households will only be able to participate if initial saving contributions and interest rates are lowered. Finally, in relation to the other policy briefs, strategies should be devised to prioritise the poor in the ownership of the road-side trees and water harvesting structures. Of course, the other strategies (reduce spending, increase income) could, if substantial, increase savings and eventually lead to (re)building assets.



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