LIFT research paper

Study on the Impact of SLLC on Tenure Security, Investment, and Incomes

LIFT
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Abstract

The benefits of land certification have been found across a number of studies to be directly linked to smallholder farmers' perceptions of increased tenure security. This effect is linked to (and defined by) reductions in disputes including with neighbours, better resolution of disputes, a lower perceived risk of expropriation, as well as the potential of greater confidence in the ability of family members to inherit the land. These psychological effects can increase confidence to make longer-term investments in the land, to rent or sharecrop out the land, or to access credit. Longer term investments and more efficient land use may also make households more resilient in the face of future shocks including those linked to climate change.

Research carried out for the Foreign, Commonwealth, and Development Office's (FCDO) Land Investment for Transformation (LIFT) programme which has supported the roll out of secondary level land certification (SLLC) for 14.5 million land parcels across 175 woredas in Ethiopia for an estimated 5 million households, has followed a panel of households selected from 12 woredas across Amhara, Oromia and SNNP, first interviewed in November 2019 and again in March/April 2021.[1] We found evidence for tenure security effects, with significant reductions in disputes, improvements in perceived tenure security, and around one-fifth of households saying they had made additional investments as a result of SLLC. The most cited specific investments were in planting trees and longer-term crops. This included a mixture of trees for wood and for fruit, and motivated by increasing income as well as reducing erosion.

Households were subject to major shocks in the period studied, both as consequences of the COVID-19 pandemic linked to price rises and an increase in the cost of living. A much stronger impact on households, however, was from adverse weather in the year, with variable rainfall including some heavy precipitation events, as well as very high average temperatures in the crucial growing period. Data show the critical period of November 2020 to January 2021 was 2-3°C above the average for the previous decade. This is in excess of even long-term (2090) projections and is alarming for households showing they are at the front line of climate change. A majority of households saw declines in production as a result, with significant variation between woredas. Households were protected where income sources were diversified, but many households faced a very difficult year and reduced food consumption.

We argue that the tenure security effect is a necessary but secondary driver of productivity and income, with other variables, such as weather, playing a larger direct role in determining agricultural productivity. Direct positive effects of tenure security on investment are mainly observed through increased investment in longer term crops, such as trees, and are linked to avoiding soil erosion, for use in construction, for food, and for additional income. Secure certification is also likely to be an important driver in enabling households to improve resilience at the front line of the climate crisis, tackling soil depletion, while diversifying sources of income and nutrition. Satellite time lapse imagery could verify some evidence of investments cited by households, with individual plots identified and tracked over time. Lastly, a significant effect of SLLC on reducing disputes was found, which linked to greater tenure security and was perceived as very important to households. The SLLC effects appear to be stronger in Oromia and SNNP than in the Amhara region, and the diversity and variation between regions and woredas in Ethiopia is likely to be a fruitful avenue for future research.

1 Due to the ongoing conflict in Tigray beginning of 2021, the research team could not visit the region again.

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The Annex is available separately upon request.

Executive Summary

Land certification in Ethiopia

Secure access to land is fundamental to the livelihoods of rural households. It provides a source of food and income through agricultural production, as well as shelter and protection from vulnerability, hunger, and poverty. Competition for land often inflames tensions between different landholders. This, coupled with unreliable information on a household's land holding, can result in conflict and a lack of incentive to invest in land holdings. Stronger and more secure land tenure can be achieved by clarifying and formalising land rights. Increased security of tenure and the associated feeling of permanence can encourage longer-term investments in land and improve environmental practices consistent with longer-term decision processes.

During the 1990s the Government of Ethiopia (GoE) launched a large-scale land demarcation programme now known as first level land certification (FLLC). Although a success in terms of its scale and reach, FLLC had its deficiencies (Deininger et al, 2008) including the absence of a spatial record of parcel boundaries. Furthermore, with little focus given to establishing a land administration system to record subsequent land transactions, many certificates became out of date after the initiative. This, coupled with the fact that households were unable to prove their boundaries, meant that a high incidence of boundary conflicts and land tenure insecurity still remained.

To increase tenure security and motivate farmers to invest in their land, the Foreign, Commonwealth & Development Office (FCDO), through the Land Investment for Transformation (LIFT) programme (£72.7m), has supported the Government of Ethiopia (GoE) in the provision of Second-level land certificates (SLLC) to rural landholders. SLLC adds an additional spatial component to first level certification. This is in the form of a parcel map, verified by the local community and supplied to the landholder in hard copy and then maintained in a digital cadastre at the district land administration office. Alongside SLLC, LIFT works with the Government to make the rural land administration system more sustainable and introduces complementary market-system innovations in the access to credit, land rental, and agricultural inputs markets through its Economic Empowerment Unit (EEU). LIFT's design is unique, and the complementary interventions set incentives to sustain tenure security over time and increase investment, productivity, and incomes for landholders.

From 2014 to 2021, the LIFT programme has provided 14.3 million SLLCs in 175 woredas (districts) across the Amhara, Oromia, SNNP and Tigray regions, benefitting over 5 million households. This makes LIFT not only the largest land certification development programme in Ethiopia but also world-wide.

Research on the Impact of LIFT and SLLC

While there is substantial academic research on the impacts of certification, in Ethiopia this mostly focussed on FLLC and evidence on the impact of the more recent SLLC is sparse. With LIFT being the largest programme to provide SLLC alongside the Government, it was a priority to provide robust evidence on the impact on rural farmers. Several household surveys were carried-out to investigate how LIFT improved tenure security, and how this leads to increased investment, productivity, and incomes.

To strengthen previous quantitative findings on how tenure security translates into increased investments, productivity, and incomes, LIFT conducted a mixed methods study with a strong qualitative component in March 2021. As part of LIFT's income study (2021), 669 households were interviewed across 12 Woredas in Amhara, Oromia, and SNNPR.[2] Findings add to existing quantitative research by bringing in deeper qualitative beneficiary testimonies, applying an innovative methodology guided by the Qualitative Impact Assessment Protocol (QuIP).[3] The methodology aims to bring-out the voices of farmers through an open-ended and free-flowing conversation with an emphasis to avoid leading questions. As a result, farmers were not prompted to link statements to SLLC or LIFT (through "blindfolding"), which increases the credibility of causal statements made. Both positive, negative, and unexpected testimonies paint a detailed picture of rural lives and show where SLLC and its impacts fit in. In other words, a strong and unbiased story around attribution evolves and the most important aspects of SLLC that matter for farmers' lives.

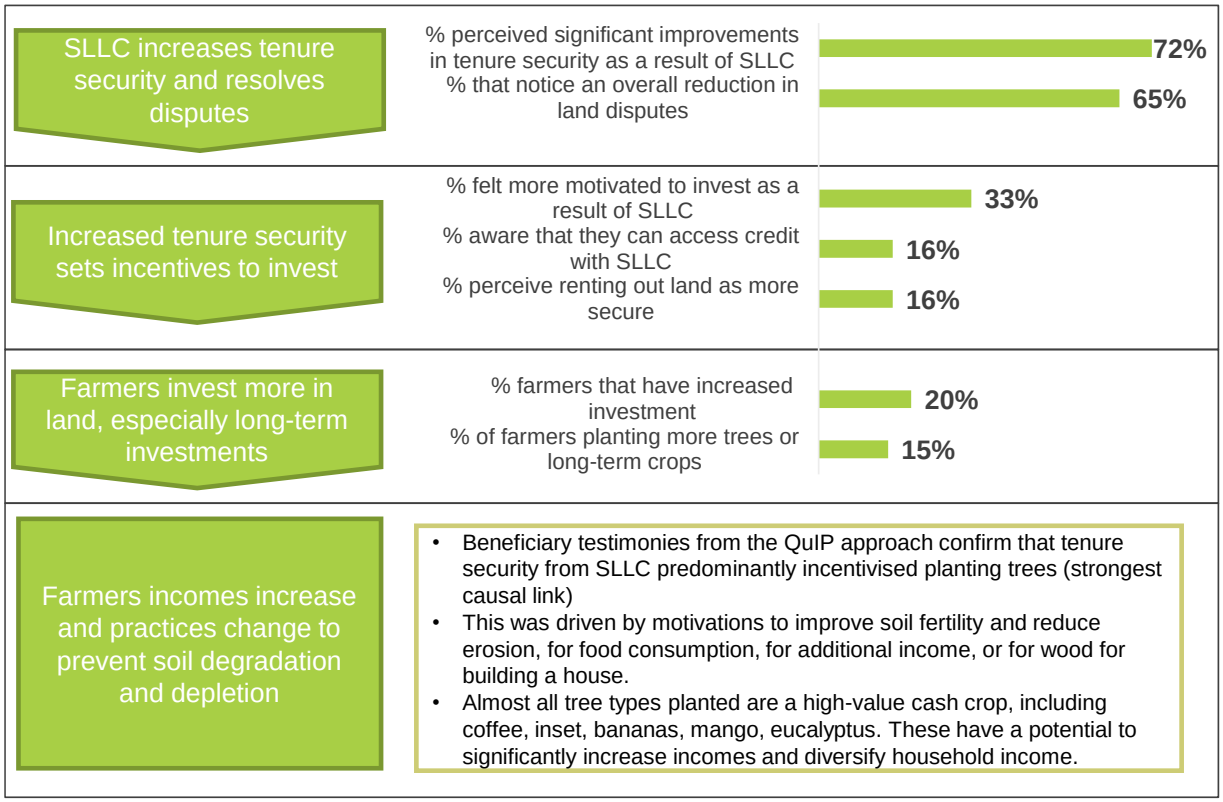
2 Due to the ongoing conflict in Tigray beginning of 2021, the research team could not visit the region.
3 See: https://www.betterevaluation.org/en/plan/approach/QUIP

Summary of Key Findings

We found strong evidence for tenure security effects resulting from SLLC, with significant reductions in disputes, improvements in perceived tenure security, and around one-fifth of households saying they had made additional investments because of SLLC. In line with existing academic literature, the most cited specific investments were in planting trees and longer-term crops.[4] This included a mixture of trees for wood and for fruit and was motivated by increasing income as well as reducing erosion.

A major unexpected but concerning finding was the severe and adverse impact of climate change on productivity and incomes. While our research was not intended to investigate climate change effects, statements linking low productivity to unexpected weather events came out strongly in the qualitative part of the survey. The diagram below maps key findings onto LIFT's Theory of Change. Findings are elaborated on in more detail below.

Summary of findings of LIFT's income study (2021)



SLLC leads to increased perceptions of tenure security and reduces disputes, as evidenced through a significant amount of strong qualitative beneficiary testimonies

Evidence from our qualitative open-ended discussions show that the vast number of landholders perceived positive benefits of SLLC on tenure security. Tenure security was reported via three main types of response. The benefit of clearer demarcation of the land was cited by 24% of the total sample, the sense of security, ownership, and confidence was cited by over half of households (57%), and the legality of the land or its recognition by the authorities was cited by 21% of respondents. With some statements overlapping, 72% of the overall sample reported at least one of the three types of effect (23% cited at least two out of the three and 2% cited all three).

Over half of households (65%) also cited a benefit of a reduction of disputes. Responses varied from those that made a general statement that SLLC certification "avoids disputes" to those that were explicit that disputes had reduced since certification. In total, 7% of respondents said they themselves had previously experienced disputes and this had now reduced or been resolved. This finding tallies with the LIFT SLLC Outcome survey (2019), which found that disputes had dropped by more than half from around 9.6% at Baseline, to just 4.1%

4 See Holden et al. (2009), Deininger et al. (2011) and Fenske (2011).

post-SLLC. Therefore, a very similar percentage of 5.5% of farmers stated to have their disputes resolved as a result of SLLC.

SLLC has incentivised investments, with a strongly pronounced effect on long-term investments, such as planting trees and other long-term crops

The survey's methodology allowed a nuanced understanding of different short-term and long-term investments, based on questions asked in the qualitative section of the survey with the 'blindfolding' principle used (i.e. there was no leading discussion regarding tenure security when investment questions were asked). 33% of respondents commented that SLLC either motivates to invest more or mentioned specific investments that were made as a result of SLLC.

By far the biggest specific effect that was directly linked to tenure security were longer-term investments, most notably trees and longer-term crops, with 15% of respondents mentioning these. Many households reported planting trees, driven by motivations to improve soil fertility and reduce erosion, for food consumption, for additional income, or for wood for building a house or for fuel.

The main types of trees and longer-term crops included i) fruit trees such as mango, avocado and banana (around 23%); ii) long-term tree crops such as chat, coffee and enset (around 39%); and iii) 'wood trees' such as eucalyptus, barzaf and wanza (around 38%). The qualitative beneficiary testimonies suggest a strong contribution of SLLC. The following quote is an example of similar quotes counted under the 15% of farmers that attribute planting trees to SLLC. More quotes can be found in the full research paper in Section 6 and in Annex 1 below.

"We become confident about our land. It assured me of no border conflict in the future. It motivated me to think about the future. It gave me a responsibility to protect the land. I now think about my children, who I am sure will use the land in the future, and I'm investing on things that they may use in future like planting an oak tree."

(53-year old married male, Kacha Bira, SNNP)

Relatively little direct references to shorter-term investments in inputs came out of the study. Shorter-term investments were more likely to be motivated by kebele extension officers, development agents, the experience of neighbours, and farmer's knowledge that inputs were required to improve productivity. LIFT's EEU impact study (2020) however found that complementary market innovations, such as the SLLC-linked loan or the standard land rental contract, incentivise an increase in short-term investments, such as fertilisers, seeds, and herbicides/pesticides. This had a significant positive impact on productivity and incomes for farmers already in the first 1-2 years after accessing the innovation.

Climate change and COVID-19 negatively impacted on production an income, leading households to apply different coping mechanism

The farmers we spoke to had a very difficult year in 2020, with both the COVID-19 pandemic and climate change adversely impacting on production levels and incomes. COVID-19 impacted on production and incomes primarily through an increase in input prices and in the cost of living. A much stronger impact on households, however, was from climate change, which respondents raised as their biggest challenge throughout the qualitative discussions, with 62% raising bad weather as a key reason for lower production.

Weather events were extreme, with variable rainfall including some heavy precipitation events, as well as very high average temperatures in the crucial growing period. Data from the US National Oceanic and Atmospheric Administration (NOAA) show the critical period of November 2020 to January 2021 was 2-3°C above the average for the previous decade in our study area, and significant deviations from rainfall averages (see Section 4 for more detail). Others experienced low rainfall and drought, heavy hail, unseasonal frost in some areas, and interlinked pests and crop diseases. A number of respondents noted the presence of both too much rain and too little rain, i.e. excessive variability and issues with the timeliness of rainfall compared to the usual agricultural calendar of the country.

Most households saw declines in production as a result (68%). Productivity estimates using data from the quantitative section of the income study on households' three main crops find that they are very low and lower in those woredas with many citations to very bad weather and to crop failure in the qualitative conversations. Qualitative research also found instances of farmers explicitly outlining the scale of the decline, and these

often tallied with national averages[5] in that they had previously been close to national averages but seen reductions in yields in 2020. Tables with production estimates of household's three main crops and income estimates in USD disaggregated by woreda and region are discussed on more detail in Sections 8 and 9.

While income change is strongly correlated with production change, households were more protected where income sources were diversified. Still many households faced a very difficult year and reduced food consumption. Extreme coping mechanisms were mentioned, including using savings, and selling assets and livestock. Migration was the most extreme response that some households faced. Around 1.3% of the original target sample had migrated and could not be found (and this may be an underestimate) and 22% of households noted that at least one member had moved, with "seeking work" being the most common reason.

SLLC increases access to credit and expands the land rental market

SLLC can be used as a form of guarantee to access credit and therefore allows farmers to unlock "dead capital" to increase their productivity.[6] Around one-sixth of respondents (16%) noted that certification allows a household to take credit and 3.1% of the sample reported they themselves had taken out credit using SLLC as a guarantee. It can be noted that the woredas with EEU credit interventions taking place were more likely to have farmers that were aware that SLLC can be used to access credit (21% in EEU intervention woredas compared to 10% in non-intervention woredas), as well as rates of gaining credit via SLLC (4% in EEU intervention woredas, 2% in non-EEU intervention woredas). More findings on how SLLC increases access to credit can be found in LIFT's EEU impact panel survey (2020), which found that LIFT's SLLC-linked loan allows farmers to invest in more productive agriculture.

The findings on credit mirrored the picture with rental, with households noting that certification gave more confidence or less fear in renting out land (16%), and a smaller proportion noting they themselves had rented in or out more land as a result of SLLC process (2.5%). Analysis of the cohort responses from the LIFT 2019 outcomes survey mirror these findings and found that similarly 5% indicated they had rented out more land, with 2.5% of households attributing this at least in part to SLLC.

Conclusions and recommendations

Findings are in line with academic literature

Findings from LIFT's income panel study (2021) are in line with the academic literature and in particular draw parallels in finding a very pronounced effect of SLLC on incentivising longer term investments and more specifically, investments in trees. Strong results on this link were found by Holden et al. (2009), Deininger et al. (2011) and Fenske (2011). In the most recent quantitative analysis of SLLC roll-out, Ghebru and Girmachew (2020) find that investment as defined by 'Soil and water conservation investment/maintenance' to be 12.8 percentage points higher for those who received SLLCs compared to those without SLLC. The same study found an impact on the propensity to rent land ('to become a landlord'), at 5.3 percentage points.

LIFT's findings therefore build on previous findings in the literature and add more recent evidence and nuance on the impacts of SLLC, using the largest certification programme delivering SLLC in Ethiopia as a basis.

Tenure security is a necessary but secondary driver of productivity and income, with other factors such as weather playing a more direct role. SLLC can however play an important role in diversifying and protecting income through incentivising planting of trees and longer-term cash crops.

The 2021 income survey has indicated that the tenure security effect from roll-out of SLLC is a necessary but insufficient driver of productivity improvements for smallholder farmers. That is, it is a secondary driver of productivity and income, with other variables, such as weather and input-use, playing a larger, primary, or direct role in determining agricultural productivity.

SLLC can however play an important role in diversifying and increasing incomes through investments in planting trees and other long-term crops, with most tree varieties being cash crops. For example, eucalyptus can be a highly profitable crop to grow for rural households in Ethiopia (Holden et al. 2003; Jagger and Pender

5 See data from Ethiopia's Central Statistical Agency (CSA), Agricultural Sample Survey 2020/21 (2013 E.C.) Volume I Report On Area And Production Of Major Crops (Private Peasant Holdings, Meher Season). Statistical Bulletin 590, Central Statistical Agency (CSA), The Federal Democratic Republic Of Ethiopia, April 2021

6 See LIFT's case study on the SLLC-linked loan here.

2000). There is said to be a growing market in terms of wood product utilisation from eucalyptus, with extensive use as poles for power and telecommunication lines, for scaffold and for a range of other uses (Abebe and Tadesse, 2014). In many cases however it may take more time before benefits on incomes will materialise due to the nature of the investment (time for trees to carry grow and/or carry fruits). The likelihood of significant income benefits however is high for these farmers, with a strong causal pathway linking these investments to SLLC.

SLLC investments can play a central role in reducing soil erosion and other climate change effects, thereby reducing drastic coping mechanism such as migration

Important strategies to mitigate the effects of soil degradation and climate change will be required to protect Ethiopian agriculture in future years, and to slow an ever-increasing rate of rural to urban migration. Strategies required will include crop diversification (particularly given that climate change will render traditionally staple crops as unsuitable for certain areas), soil conservation, tree planting, and irrigation. Gezie (2019) has found awareness for these strategies is already present, but households often have more drastic coping strategies, including the need for food aid, selling assets, and in the extreme temporary or permanent migration. The evidence from the 2021 LIFT income survey tallies with this experience: in a very difficult year households have clearly attempted many different coping strategies.

Increased tenure security and improved incentives to invest in longer-term crops and planting trees can play an important role at the front line of the climate crisis. Since farmers are incentivised to make more long-term investments, including trees, this can help to diversify income and can help to prevent soil erosion and the effects of extreme weather events. Future interventions could combine the effects of SLLC with interventions in trees and long-term crops to maximise these benefits. This can in return reduce or replace more drastic coping mechanism and the linkage between SLLC, long-term investments and potential coping mechanisms such as migration should be further explored.

Avenues for Future Research

A list of potential avenues for future research is outlined below and the authors would be happy to elaborate further upon request.

- The incentives set by SLLC to invest in longer-term crops and planting trees can play an important role to help diversify income sources and prevent soil degradation, overall making farmers more resilient to future shocks. Trees as an income stream and ways of preventing soil erosion and depletion should be further looked into and future programming could combine interventions on trees/long-term crops with SLLC.
- The link between climate change, migration, and casual labour (off-farm work) should be further explored and the role that incentives to invest through SLLC could play in this.
- Some of the responses show other complexities with inheritance, including disputes between family members. As a continuation of LIFT's work on dispute resolution - future interventions and research could focus on inheritance; how to improve the process, make it easier and more accessible and increasing awareness of the benefits of the formal process.
- The rich data of the Government's National Rural Land Administration Information System (NRLAIS) could be further leveraged to confirm the exact parcel size of respondents interviewed for LIFT's income study. This would provide reliable information on exact parcel size and thereby enable additional analysis and improved data quality.
- No clear definition of "tenure security" could be found by the authors. An attempt to harmonise definitions and measurements would make a valuable contribution, including an outline of approaches to measure "perceptions" of tenure security.
- The SLLC effects appear to be stronger in Oromia and SNNP than in the Amhara region, and the diversity and variation between regions and woredas in Ethiopia is likely to be a fruitful avenue for future research.

1. Introduction

Secure access to land is fundamental to the livelihoods of rural households. It provides a source of food and income through agricultural production, as well as shelter and protection from vulnerability, hunger and poverty. Competition for land often inflames tensions between different landholders. This, coupled with unreliable information on a household's land holding, can result in conflict and a lack of incentive to invest in land holdings. Stronger and more secure land tenure can be achieved by clarifying and formalising land rights, together with associated processes to more easily demonstrate claims and enforce rights. This can lessen the risk to landholders of facing ongoing disputes over land with neighbours and with family, and reduce risks of being forcibly displaced from land. Long-term security of tenure and the associated feeling of permanence can then have additional benefits, including encouraging longer-term investments in land, and improved environmental practices consistent with longer-term decision processes. It can also increase confidence in undertaking land transactions such as renting out (or renting in) land, and can help to secure greater access to credit if land certificates allow land holdings to be used as collateral (Deininger, 2004).

New technologies in the form of low-cost and rapid approaches to land registration and formalisation have reduced costs of registration and certification from three-digit to one-digit costs (in USD) per farm plot over recent years, and this has made such interventions more feasible in poorer countries such as Ethiopia (Holden and Otsuka, 2014). During the 1990s the government launched a large-scale land demarcation programme now known as first level land certification (FLLC). Although a success in terms of its scale and reach, FLLC certificates only contained information on the parcel size and landholders' details. They did not include specific information on the boundaries of landholders' parcels. Furthermore, as more focus was given to land demarcation instead of establishing a land administration system to record subsequent land transactions, many certificates became out of date after the initiative. This, coupled with the fact that households were unable to prove their boundaries, resulted in a high incidence of boundary conflicts and land tenure insecurity.

The Foreign, Commonwealth & Development Office (FCDO), through the Land Investment for Transformation (LIFT) programme, has supported the Government of Ethiopia's (GoE) efforts to increase rural land tenure security and make it more sustainable. LIFT is a £72.7 million programme, which was implemented in the four highland regions of Ethiopia: Amhara, Oromia, the Southern Nations, Nationalities, and Peoples' Region (SNNP) and Tigray from March 2014 to July 2021. LIFT has been implemented through a novel combination of interventions this includes:

- **Component 1 – SLLC:** LIFT has supported the registration and certification of over 14 million land parcels, recognising the rights of all legal landholders, through its SLLC process. The SLLC methodology used for LIFT built on the land registration methodology developed in Rwanda under the DFID-funded Rwanda Land Tenure Regularisation Support Program (DFID, 2013). Orthophotos are used to produce high resolution maps on which land holders identify their parcel boundaries on-farm, and in the presence of their neighbours and local leaders. The resulting boundaries and occupancy data are computerised locally by LIFT programme technical support teams. After verification, this data is further processed and approved for inclusion on a register of land rights. After approval, hard copy certificates demonstrating parcel boundaries, occupancy and land rights are printed and made available to landholders.
- **Component 2 – Rural Land Administration System (RLAS):** Alongside the SLLC process, LIFT supports the GoE in the implementation of a rural land administration system in LIFT programme woredas aiming to sustain the certification process and ensure farmers' long-term security of land holding. This includes clarifying and reinforcing the procedures for land administration, and training land administration personnel in the effective and transparent deployment of these procedures. The project is supporting the development and roll-out of a new RLAS, which enables land transactions to be digitally recorded, monitored, and reported.
- **Component 3 – Economic Empowerment Unit (EEU):** The EEU component has focused on improving the way that land-related markets operate and ensure that landholders can benefit from being active participants in these markets. These include access to credit, land rental, and agricultural input markets. The credit component includes an innovative new individual loan product that uses the

SLLC as guarantee. Addressing key constraints in the rural land market aims to allow farmers to fully capture the benefits of certification and invest more productively in their land.

By combining these components, LIFT aims to improve the incomes of the rural poor and support inclusive economic growth through land certification, improved land administration systems, and the development of the rural land sector to enhance productivity and investment. Complementary market systems interventions, through LIFT's Economic Empowerment Unit (EEU), are designed to ensure that the benefits of land certification and administration are maximised by introducing innovations to the access to finance, land rental and agricultural inputs markets.

The LIFT programme has provided 14.5 million SLLCs in 175 woredas across the Amhara, Oromia, SNNP and Tigray regions. Around 86% of the population of Ethiopia is estimated to live in these four regions and the population in the specific LIFT intervention woredas is estimated to be between 26 and 30 million people. This represents around one quarter of the total population of the country, which in 2020, was 115 million according to the World Bank. Table 1 shows the numbers of woredas LIFT has operated in, the estimated population and the share of each region's population covered by these targeted woredas.

Table 1: Population covered by LIFT interventions supporting SLLC roll-out

Region	Total population 2020 (est.)	Number of woredas	Woredas covered by LIFT with SLLC roll-out	Population of LIFT woredas (est.)	Share of total population covered by LIFT
Amhara	26,600,000	141	53	9,902,000	37%
Oromia	41,967,000	278	56	8,673,000	21%
Tigray	6,667,000	47	20	3,365,000	50%
SNNP	23,244,000	147	46	8,250,000	35%
Four regions	98,478,000	613	175	30,190,000	31%
Ethiopia total	114,991,000				26%

The LIFT programme has led to close to 14.5 million SLLCs issued, 13 million of which have been collected to date (as of April 2021).[7] As shown in Table 2, the estimated number of rural households owning land in the target areas is just under 5 million[8], and this implies around 2.9 certificates per land-owning rural household, with the highest amount in Tigray at 4.3, and the lowest amount in SNNP at 1.6. The number of certificates does not necessarily denote that land holding sizes are larger.

Table 2: Number of households covered by LIFT intervention woredas, and numbers of SLLCs issued

	SLLC woredas covered by LIFT	Population of SLLC woredas (est.)	Land-owning rural households (est.)	SLLC issued	SLLCs per land-owning rural household
Amhara	53	9,902,000	1,886,000	6,596,000	3.5
Oromia	56	8,673,000	1,279,000	3,555,000	2.8
Tigray	20	3,365,000	531,000	2,269,000	4.3
SNNP	46	8,250,000	1,295,000	2,065,000	1.6
Total	175	30,190,000	4,971,000	14,484,000	2.9

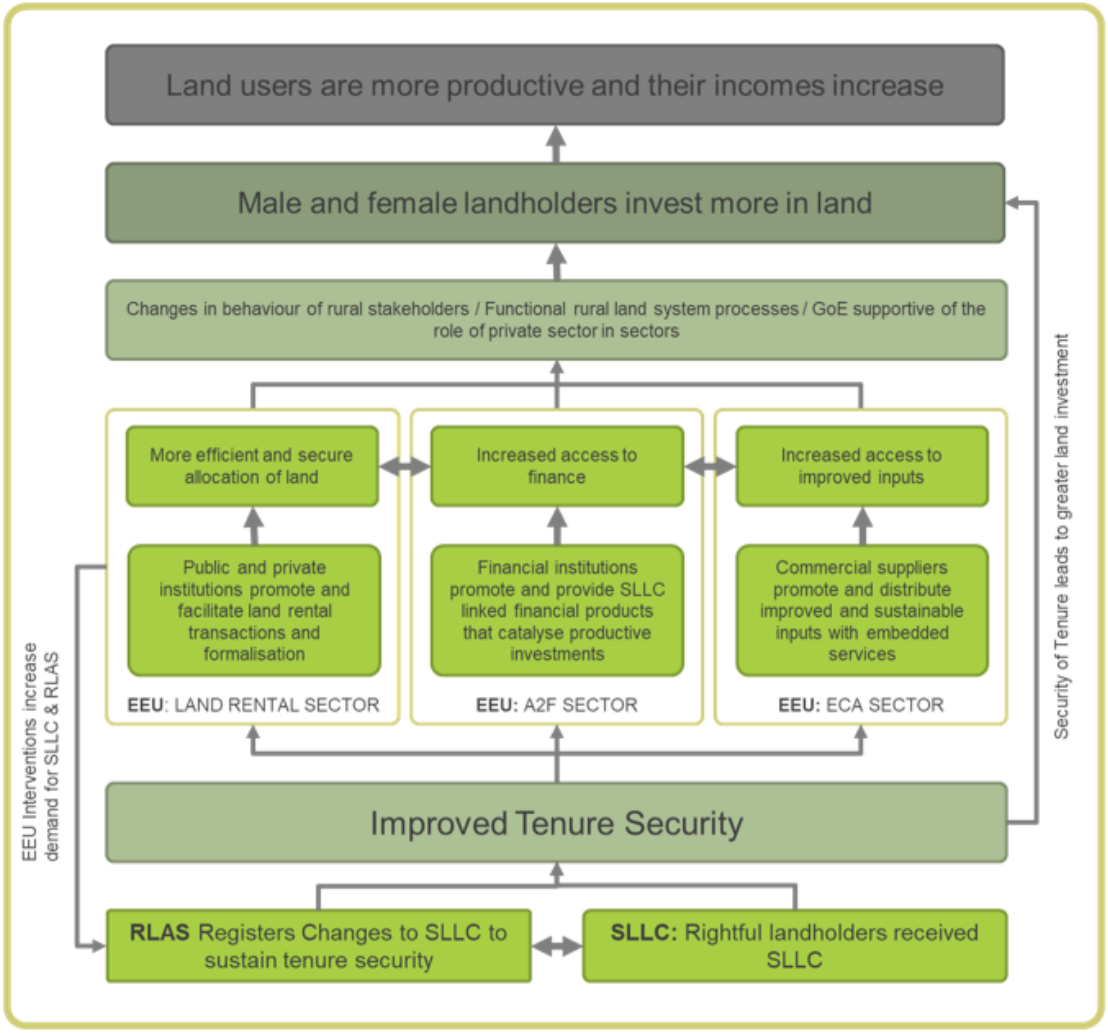
7 A simple calculation of cost per SLLC as implemented by the LIFT programme puts it at around USD 6.50, or on a per household basis around USD 18.80.
8 This is based on average household size from CSA data. The proportion of rural households is used as a national average excluding Addis. The proportion that own land is also from CSA data (CSA, 2017b).

2. LIFT's Theory of change

Improving tenure security for smallholder landholders has a number of theoretical benefits, for example giving greater confidence in making longer-term investments in land, or leaving land fallow. If farmers have more confidence in engaging in rental, there may be more efficient allocation of land in terms of those farmers best able to maximise production. Security of tenure may also improve processes of inheritance and confidence in inheritance for children and grandchildren, and this is one factor in determining patterns of migration of family members over time (Kosec et al., 2017).

Traditionally, women have been disadvantaged in terms of land access. Ensuring they have secure rights to land reduces risks of destitution in case of divorce or death of a spouse linked to expropriation of their asset. Equal ownership of land also may improve women's status and position in household decision-making. Effects of certification on women have been found, with Holden et al. (2009), for example, showing that as a result of a land certification programme, female heads of household in Tigray, Ethiopia, were more likely to rent out land.

Figure 1: LIFT's programme Theory of change including roll-out of SLLC and related interventions



The core logic underpinning LIFT's theory of change (ToC) is therefore that landholders feel more tenure secure as a result of SLLC. This requires clarification of land rights and the ability to make claims and enforce rights, reducing the risk of landholders being displaced from their land. By clarifying boundaries and parcel use rights, SLLC also resolves land-related disputes and reduces the likelihood of these occurring in the future (see Section 5 for further discussion of the definition of tenure security). Greater land tenure security gives

landholders the incentive to make more and better investments in land, driving up product economic returns, and specifically shifting to more long-term investments and more sustainable land management practices that prevent land degradation and improve environmental outcomes. Investments and greater rental activity, in turn, can lead to improved allocative efficiency of land, higher productivity, and increased incomes for rural landholders. As a result of an inclusive and participatory SLLC process, women and vulnerable groups were targeted to equally benefit from increased tenure security and incomes. See also Figure 3 below for LIFT's Theory of Change diagram.

Ethiopian roll-out of secondary level land certification (SLLC)

Rural land registration and certification efforts in Ethiopia date back to 1998. This started in Tigray, followed by Amhara and Oromia in 2002, and the SNNP region in 2004. The federal Rural Land Administration and Land Use Proclamation (2005) allowed the registration of rural land and the provision of land holding certificate to any landholder with details on land size, land use type, level of fertility, and borders of a land parcel. The first phase of rural land certification, also known as FLLC, covered around 9.5 million households in Amhara, Oromia, SNNP and Tigray regions (Ghebru and Girmachew, 2020). SLLC programmes were developed in collaboration with different donors, addressing some of the shortcomings of FLLC (as set out above). The government planned to undertake SLLC over 28.6 million parcels of farmland in 359 woredas, covering 7.2 million households (ibid.). Table 3 shows the various programmes and their respective budgets and targets to support this process. LIFT is by far the largest programme by value and by the number of SLLCs issued, making up close to half of the government target.

Table 3: Summary of SLLC projects from donors in recent years

Program	Donor	Budget	Period	Regions covered	Number of SLLCs issued
Ethiopia Land Tenure Administration Program (ELTAP)	USAID	USD 5.8 million	2005-08	Amhara, Oromia, SNNP and Tigray	395,000
Ethiopia Land Administration Program (ELAP)	USAID	USD 5 million	2008-13	Amhara, Oromia, SNNP and Tigray	192,000
Responsible and Innovative Land Administration (REILA)	Finland	€12.8 million	2011-17	Benishangul-Gumuz and Amhara	153,000
Sustainable Land Management Program II (SLMP II)	World Bank	USD 9.3 million	2014-18	Amhara, Oromia, SNNP, Tigray and Gambella	378,000 and 20,000 communal lands
Land Investment for Transformation programme (LIFT)	UK (FCDO)	£72.7 million	2014-21	Amhara, Oromia, SNNP and Tigray	14,484,000

Source: Ghebru and Girmachew (2020) except for LIFT data

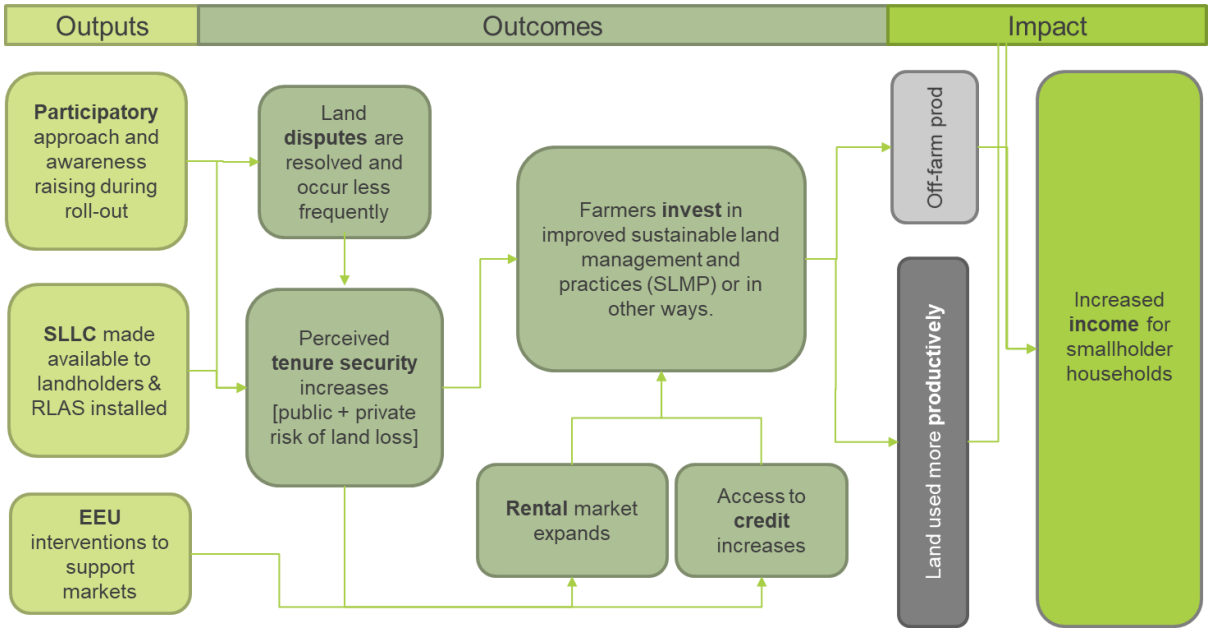
The LIFT programme originally envisaged implementation in 140 purposively selected woredas in Tigray, Amhara, Oromia, and SNNP regions. Selection criteria would be driven by equity between regions; availability of aerial photography; economy and effectiveness in implementation; meeting priorities of the government of Ethiopia; and access to markets. In practice, as set out above, LIFT largely exceeded its targets and reach 175 woredas, while many of the woredas were different to those originally planned. This was driven by practical decision-making and there was never a process of randomisation. This was not feasible given the need to work with government, and therefore does not allow for the original visions of quasi-experimental methodologies (or indeed randomised control trial (RCT)-style methods) of evaluation.

It is important to note that there are differences between the SLLC certificates themselves, by region – notably in Oromia the photos are on the certificate itself, which is not the case in Amhara or SNNP. (In Oromia, 8% of respondents mentioned the photo without prompt as a positive of SLLC certification).

3. Methodology

This survey tests some of the key assumptions of LIFT's ToC, namely the causal link between SLLC and tenure security, the link between tenure security and investment, and how investment links to income and well-being of beneficiary farmers. A theory-based contribution analysis approach[9] was followed, where first a research framework was developed to map and conceptualise the underlying causal pathways, including how SLLC contributes to increased incomes (see Figure 4 below). The research framework then subsequently guided the development of research tools and ensured that evidence on all assumptions would be provided.

Figure 2: Causal pathway framework underlying LIFT's income study (2021)



Evidence from a panel of interviews with beneficiary households is the primary data source for this paper. A first round of data collection was conducted in November 2019 and a sub-set of the same respondents were interviewed again with a modified tool in March 2021. Findings from these household surveys was supplemented with secondary data sources, including international data on weather, available academic literature, and data from the Ethiopian Central Statistics Agency (CSA) on yields.

For the recent data collection in 2021, a mix of qualitative and quantitative methods was applied, which not only allowed the approach to triangulate findings but also offered more nuanced insights into the context and experiences of the beneficiary population. Overall, the combination of a theory-based approach and a mix of methods allowed for a holistic assessment of LIFT's ToC assumptions. This is compared to rigorous evidence generated through LIFT's surveys and rigorous academic literature, to interrogate whether there is a credible case that the causal mechanisms depicted in LIFT's ToC hold.

Survey design was based on three principles – to combine quantitative and qualitative data in an innovative design, to ensure survey length was manageable logistically and for enumerators in the field given the additional challenge of recontacting respondents from the 2019 outcomes survey cohort; and therefore, to ensure the questions asked prioritised information that had not been previously collected and gave the best chance to succinctly understand key characteristics of the sample. Table 4 sets out the modules of the survey that were used. Another key principle in the design process was to try to minimise the risk of leading questions or over-estimating the importance of tenure certification in each individual's livelihood.

9 See Stern et al. (2012)

Table 4: Structure of the survey tools used in 2021

Survey module	Objectives
1. Introduction and identification	Recontact protocols to ensure cohort correctly identified, and replacement individuals selected appropriately if needed. Introduction information for household including ethical protocols related to COVID-19. Location details and taking of a new GPS reading.
2. Household Demographic and Socio-Economic Information	Basic information on respondent (gender, age, education level) and household (number of people by age, individuals that left the household or deceased, and new members of household)
3. Activities on Farm Land	Information on the number and type of parcels, rental activity, type of rental, to or from whom, rental prices. Information collected on three main crops farmed, including the exact crop, the amount of land allocated and production in the previous Meher season 2020-21, the proportion of crop sold, and the total value of crop sales in Birr. Information on additional sources of income and proportion of income from these sources.
4. Qualitative Discussion	30-minute discussion with household to understand their previous years' experience in terms of well-being, income, production, investments (short-term and long-term), and tenure security linked to SLLC.
5. Assets	Basic information on asset household holds (electricity access, roof material, phones, radios, televisions, ploughs, oxen, cattle, chickens etc.)
6. Change and Coronavirus Questions	Questions on trajectory of change (to income, well-being, ability to cover education costs etc.) over past year. Questions relating to degree of impact and concerns relating to the COVID-19 pandemic.
7. Follow-Up Contact and Photo of Certificate	Follow-up permissions and contact details. Each household asked if they would be willing to have a photograph taken of one of their SLLCs, if available.

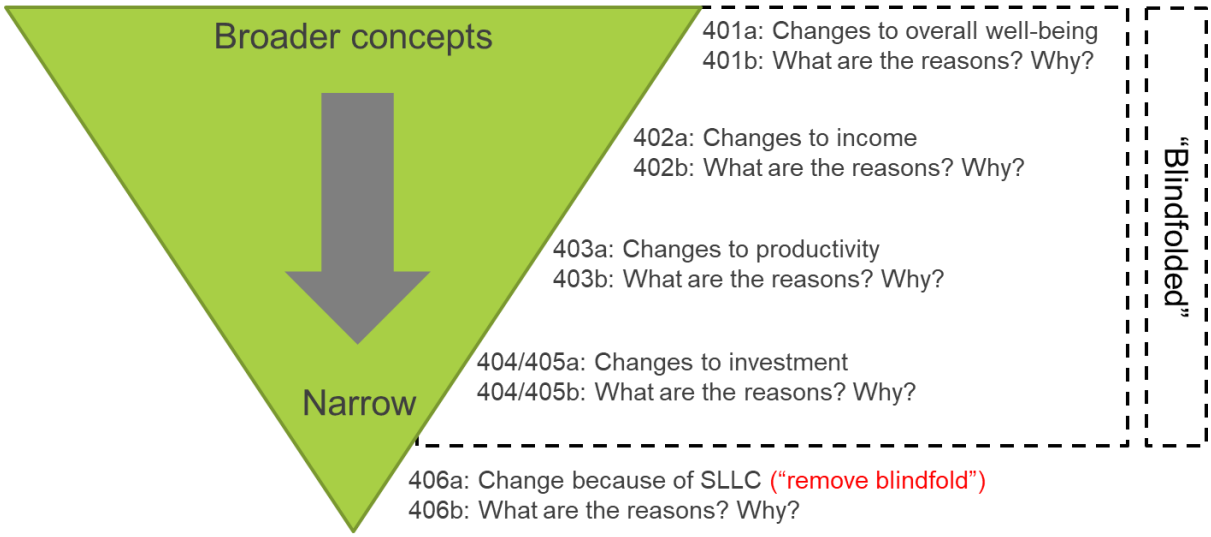
For the qualitative part of the questionnaire, the Qualitative Impact Assessment Protocol (QuIP)[10] was used as a guiding set of principles. QuIP is an impact evaluation approach that serves to provide an independent reality check of a predetermined theory of change. Project beneficiaries' voices are placed at the centre of the evaluation, enabling them to share and feedback their experiences in an open, credible, and respectful way. The QuIP gathers evidence of a project's impact through narrative causal statements collected directly from intended project beneficiaries. Respondents are asked to talk about the main changes in their lives over a pre-defined recall period (three years) and are prompted to share what they perceive to be the main drivers of these changes (the "why"). Crucially, the QuIP methodology includes the important element of blindfolding, which means that the respondent is not informed about the purpose of the research or the project underlying it. The strength of this research methodology lies in the fact that statements relating to the benefits of LIFT will not be prompted or "put in the respondent's mouth".

The qualitative section provides the most novel aspect of the survey design, notably by integrating this into the quantitative approach, it was possible to develop a very rich data-set for the analysis phase. Figure 3 below illustrates the structure of the qualitative section of the questionnaire. Each question begins by stating: "Consider your household's situation over the past year and compare this to the previous three years" – the questions then started with well-being, move on to income status, then production and productivity. This was followed by questions on investment separated by 'longer-term' (such as practices to improve the fertility of the soil, longer-term crop selection such as trees, increased cultivation of unused or underutilised land, irrigation practices, etc) and 'short-term' (to improve your crop production in seeds (variety, type or quantity), or inputs such as fertiliser, pesticide, etc, quantities or quality). Finally, three questions were asked on tenure security and SLLCs – the "main ways" certification affected the household, the "main reasons" SLLC led to any changes, and the impact of any changes on "your agricultural practices". The survey was designed with

10 See: https://www.betterevaluation.org/en/plan/approach/QUIP

the tenure security questions last in part to see how much it was mentioned before the final section without any prompting. Figure 5 below shows the conceptual structure of the qualitative section of the tool and how the blindfolded section zooms in from broader concepts down to concepts that are "closer" to tenure security in the ToC.

Figure 3: Structure of qualitative section for LIFT's income study (2021)



Key qualitative findings are presented in boxes in this report, with quotes to summarise representative and insightful response in the qualitative conversations.11 Quotes are selected based on being representative of positive views, negative views, and unusual experiences that are insightful or provide a unique response. Taken together with the quantitative summaries of qualitative responses, these add detail to understanding the experiences of respondents and their households over the previous year.

Sampling approach

The LIFT outcomes survey 2019 (LIFT 2020b) undertook research with a quantitative questionnaire sampling 2,880 households selected from 112 enumeration areas. These were randomly selected from a single sampling frame across 144 clusters in 77 kebeles in 68 woredas across the four LIFT Programme regional states of Amhara, Oromia, SNNP, and Tigray. The sample selection was based on a statistical approach called Probability Proportionate to Size (PPS), where the sample size and cluster selection is designed to be statistically representative of LIFT's entire beneficiary population across the four regions.

This 2021 follow-up survey undertaken has been a selective follow-up of a sub-set of the 2019 cohort. Operating under a tight budget constraint, COVID-19 restrictions and the conflict in Tigray, 12 woredas were selected with the plan to have 4 woredas for each of the Amhara, Oromia and SNNP regions.12 The plan was to sample all of the respondents surveyed in 2019 for these 12 woredas, in the process creating a panel.

Woredas were selected where 60 or more respondents were sampled in 2019 in order to maximise the potential sample size. Given that Tigray was excluded, there were 17 woredas meeting this criterion. As there were only three woredas in SNNP meeting the criteria, Mirab Badawocho woreda was selected from the outcomes survey sample which had a sample size of 40. Woredas were analysed on key characteristics to select those most similar to the overall sample average – based on rental activity, an asset index, and investment data from the outcomes survey. The approach led to a new target sample of 800, who had all been surveyed in 2019. After some additional changes, the final sample size was 768 households.13 Recontact

11 It should be noted these are based on enumerator transcriptions of interviews which either took place in Amharic or Oromifa, and which enumerators translated into English. The English has been further edited but the sense of every quote should be as close as possible to that original intended.
12 The Tigray region had to be excluded from field work due to the current conflict severely affecting the entire region.
13 A small number of the sample were found to be geographical outliers, which led to the revised sample size of 788 households. In addition a cluster of 20 households in Enenmorna Ener could not be accessed due to missing road infrastructure, the final effective sample size was therefore 768 households. Kalu woreda in Amhara was selected but replaced at a late stage because of security issues on the group, it was replaced with Angolala Tera, also in Amhara. Another woreda, Tole in Oromia, was selected for the pilot.

information included GPS location, names, gender, ages, and household type, were used to trace households. The gender balance of the sample was assessed to be sufficient with 45% female and 55% male respondents.

Sampling frame for 2021 income study

The outcomes survey carried out in 2019 had a total sample size of 2,880 across 68 woredas. Around a quarter of the sample was selected as a cohort for the 2021 Income survey, with the 12 woredas selected. Tigray was excluded from the sample because of the ongoing conflict situation. Table 5 summarises the 12 woredas, an estimate of the population, LIFT data on the number of SLLCs issued, and what this means as an estimate per household, alongside the sample size that had been successfully achieved in the 2019 outcomes survey, and the final achieved sample size for this 2021 income survey.

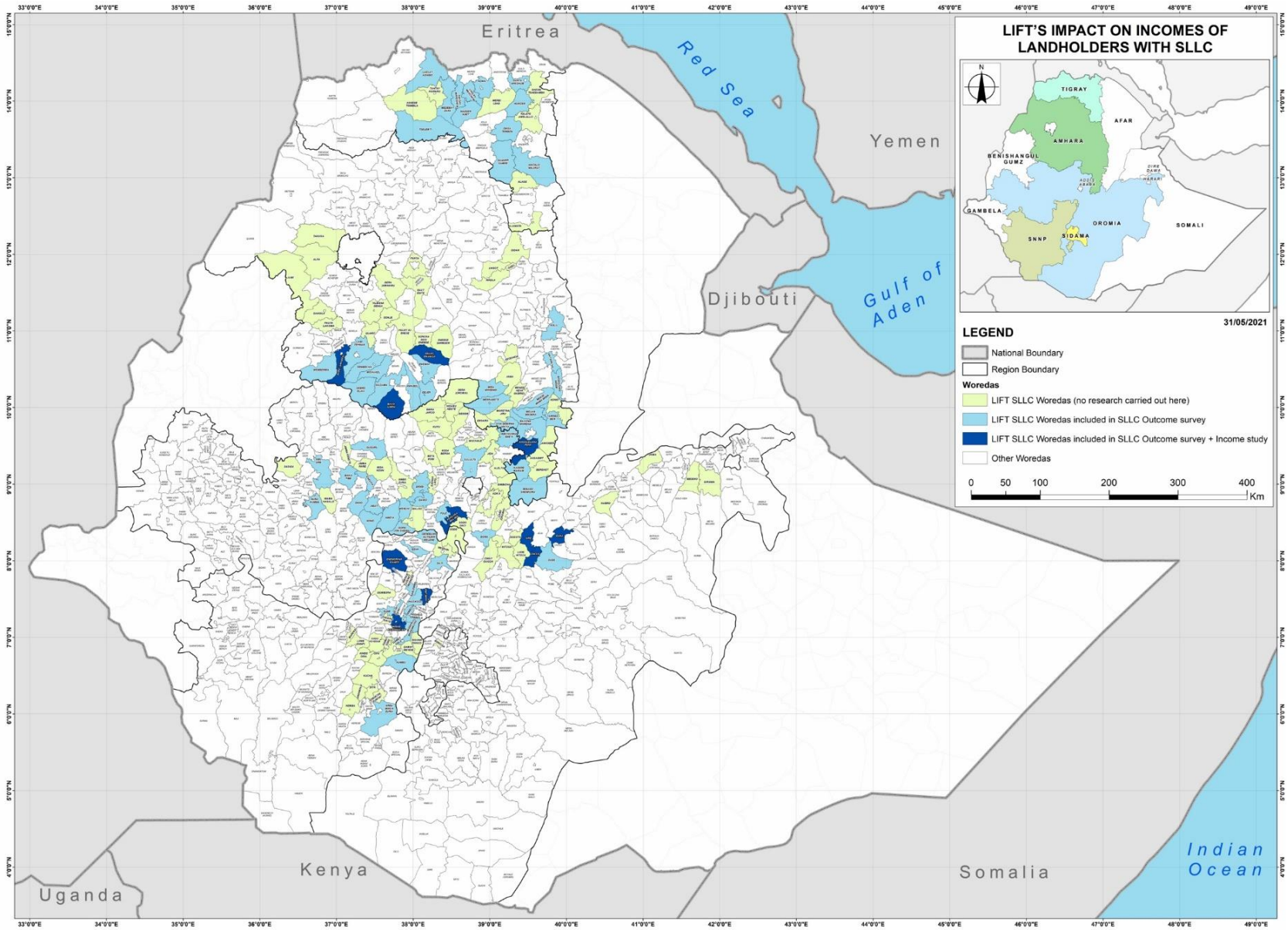
Table 5: Sample woredas for 2021 income survey, populations, SLLCs issued, target and achieved sample size

Region / woreda	Population (est.)	Rural households (est.)	SLLC issued	SLLCs per rural household	Outcomes survey (2019) sample size	Income survey (2021) sample size (achieved)
Amhara	**810,561**	**165,999**	**539,063**	**3.2**	**260**	**212**
Bure	227,360	40,556	98,824	2.4	60	47
Baso Liben	205,894	45,660	131,055	2.9	60	50
Enarj Enawga	253,440	53,234	155,865	2.9	80	74
Angolala Tera	123,866	26,548	153,319	5.8	60	41
Oromia	**468,423**	**79,682**	**217,608**	**2.7**	**300**	**264**
Guna	117,172	20,492	38,242	1.9	80	69
Sire	114,699	18,983	70,152	3.7	60	56
Deksisi	111,994	18,652	58,421	3.1	100	80
Kersana Malima	124,558	21,554	50,793	2.4	60	59
SNNP	**681,002**	**116,978**	**135,006**	**1.2**	**240**	**193**
Mirab Badawocho	122,846	22,574	13,985	0.6	40	32
Sankura	126,426	22,506	34,758	1.5	80	73
Kachabira	182,102	27,158	34,926	1.3	60	55
Enemorna Ener	249,628	44,739	51,337	1.1	60	33
Total	**1,959,985**	**362,658**	**891,677**	**2.5**	**800**	**669**

The final target sample size which the survey teams aimed to contact was 768, with an average sample size of 64 per woreda. The achieved sample was 669, representing a 87% success rate. Additional analysis was undertaken with the data-set ex-post to assess the confidence that the correct household was recontacted. It was found through a combination of concerns around physical distance (as measured by GPS coordinates) and non-matching identification information such as age, household size, number of parcels, or the name of respondents, that there was less confidence for 84 of these households. As a result, the analysis suggests that 585 respondents were successful recontacts from the sampling frame, representing a 76% recontact rate. More detail regarding the recontact process and rates can be found in Annex 8. A discussion of field work processes and COVID-19 guidelines for training and enumeration are shown in Annex 9.

Figure 4 shows a map of the LIFT roll-out woredas, it shows the outcomes survey woredas (in light blue), and then the 12 sample woredas (in dark blue). It can be seen that about half of LIFT's target Woredas were covered through the research, implying a fair degree of representativeness.

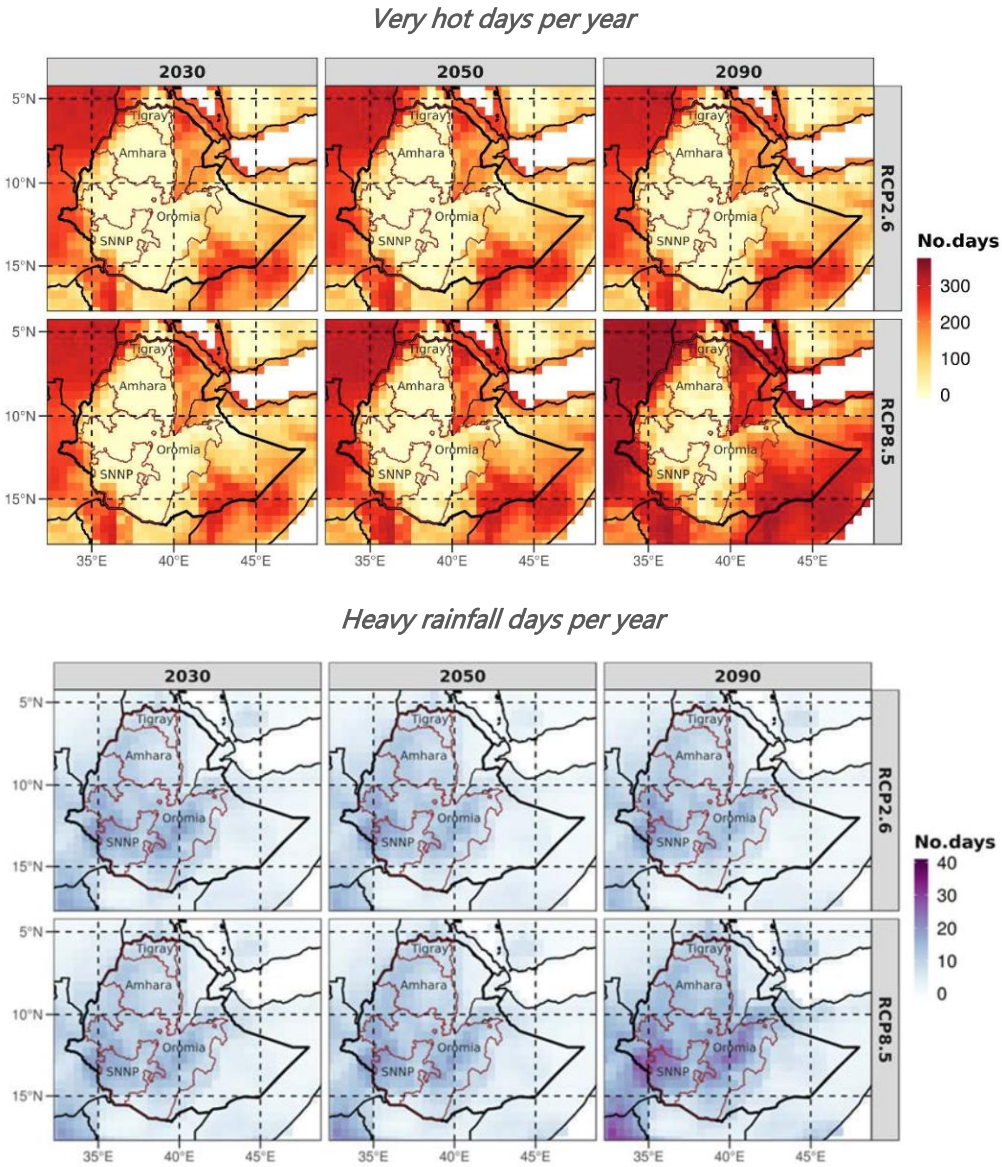
Figure 4: LIFT roll-out and survey sample, geographically across Tigray, Amhara, Oromia and SNNP regions



4. Climate and weather

While it is mid-ranking in cross-country indices of climate change risk,[14] Ethiopia faces major climate challenges. The effects of climate change have been present for many years with 0.37°C per decade warming estimated since 1950 (NMA 2007), and the Belg and Kiremt rainfalls decreasing by 15–20% across parts of the south of Ethiopia from the mid-1970s to late 2000s (Funk et al. 2012). Many areas are more climatically secure however and Ethiopia does not face a *"catastrophic national failure of rainfall, but rather regional hot spots with a tendency towards more frequent droughts"* (Ibid).

Figure 6: Number of very hot days and heavy rainfall days under two major climate models: 2030, 2050, 2090



Source: Murken et al. (2020). Very hot days - temperature above 35°C. Very heavy rainfall days - above 16.6 mm.

Future climate projections include temperature increases as well as variability of rainfall and increased frequency of extreme weather events. Models estimate a 0.6-0.8°C increase by 2030 compared to 2007 levels, and a 0.9-1.6°C increase by 2050, as well as increases in very hot days and tropical nights (Murken et al., 2020). Models estimate an increase in very hot days (temperature above 35°C) of up to 17 days by 2050

14 See for example Eckstein et al. (2021).

compared to 2007 levels, and up to four additional heavy rainfall events (above 16.6mm of rain) per year by 2030 (see Figure).

Models have also estimated the likely effects of climate change on the suitability of different regions of Ethiopia for its most common crops, and a complex picture emerges. While some areas are projected to become less suitable, others become more suitable for different crops, meaning the net effect for the country may be less severe than regional effects. For example, Murken et al. (2020) set out under projected climate change, 15-17% of the area currently suitable for maize in Ethiopia will become marginal (or less suitable), while 10-11% of the area currently marginal for maize will become more suitable by 2050. Therefore, the modelling projects a net loss in maize suitability of 5-7%. For teff, the national net loss of suitable land is projected at 4-7%, and for wheat it is 9-12%, the largest net loss in suitability for the major cereal crops.15 An exception is sorghum, which is better adapted to adverse weather conditions and under projections is set to have a net increase of 2-5% in suitable land.

Ethiopia's major crops are therefore set to see significant changes to suitability, particularly at regional levels. Climate change models find the area suitable for multiple cereal crops will also reduce. In terms of administrative regions, changes in suitability for all four crops will occur mostly in the Amhara region, with decreases of 24-37%; in the SNNP region in comparison, 8-19% of land will become less suitable for all of the four crops (Murken et al., 2020).

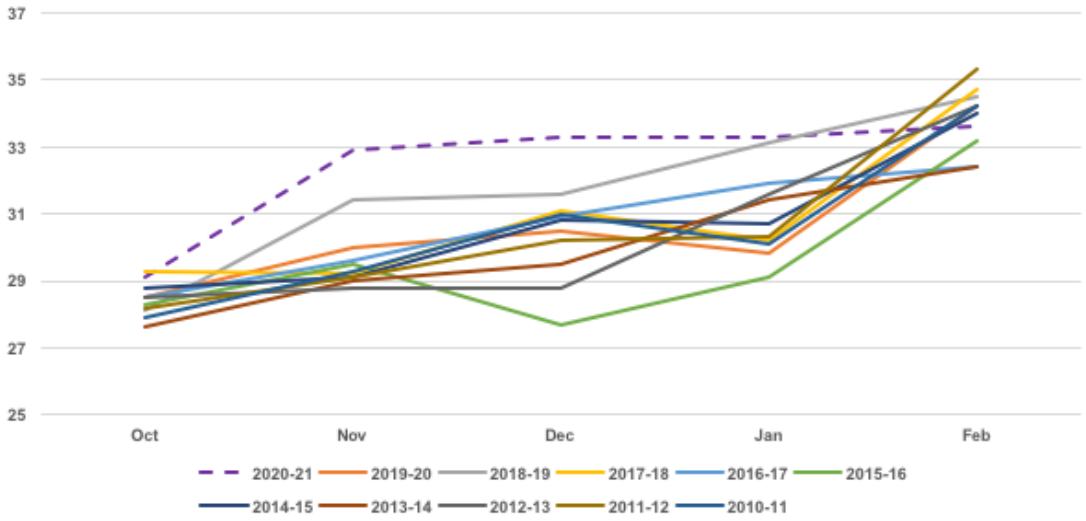
Studies have found suitability for cash crops will also change. In Ethiopia, coffee is optimal in the 1,500-1,900m altitude range, with annual precipitation above 1,400mm and distributed over a seven-month period with an average temperature of 15-26°C, without frost or excessive heat. Coffee is therefore very sensitive to the impacts of climate change, and Moat et al. (2017) have characterised Arabica coffee as having little adaptive capacity. They estimate that 39–59% of the current growing area could experience changes large enough to render them unsuitable for coffee farming, in the absence of significant interventions. Other climate models project 8% national fall in coffee suitability with 14% of land becoming less suitable, against new suitable areas of 6% (Murken et al., 2020).

Weather during 2021 and leading to the Meher season 2020-21

The study period of interest was the Meher season for 2020-21 with interviews conducted in March and April 2021. As such the Kiremt rains of mid-2020 are the crucial ones for the growing period for households sampled, with the growing season going through to the harvest period of January and February 2021. Weather was a major driver of findings (as set out below) and available international data on temperature and rainfall was also assessed to triangulate findings. Data from the US National Oceanic and Atmospheric Administration (NOAA) shows that the 2020-21 Meher had some particular extremes. The most striking extreme was temperature. Temperature was 3.4°C above the previous ten-year average in November 2020, it was 3.1°C above average in December, and 2.5°C above average in January 2021, before reverting to average in February (see Figure). This data comes from the central Ethiopian NOAA GPS co-ordinates data-point (10°N, 37.5°E), and while this is only very close to three of the Amhara region woredas in the survey (see Annex 2), it is likely to be representative of the broader trend the Ethiopian central regions may also have experienced, and which aligns with findings in the qualitative survey responses for this research (see below).

15 Wheat has low tolerance for heat and water stress associated with warmer environments and requires specific conditions for different growth stages.

Figure 7: Ethiopia, mean temperature from October to February, data from past ten years (GPS: 10°N, 37.5°E)



Source: NOAA Climate data repository air degrees Celsius. Data point is GPS co-ordinates 10°N, 37.5°E, see Annex 2 for map and relative positions of the sampled woredas. Altitude at these coordinates is around 1,000m, which is why averages will be higher than Ethiopia's hilly and highland areas.

The higher temperature experienced may explain the experience of drought found by many in the sample. The mid-2020 Kiremt rainfall (June to September) itself was found to be heavier than usual across most coordinates assessed. Other periods had less deviation although with variability and drier periods in the period from October 2020 to February 2021. A summary of 2021-21 rainfall patterns by co-ordinates can be found in Annex 2.

Findings on weather experience from LIFT's survey work

Weather was a major driver of production, income, and well-being for farmers in the survey (see Sections 9, 10, 11). The NOAA data above shows some of the patterns found, although others are likely to be more local than this data can measure, for example NOAA data shows average rainfall over a month rather than individual heavy precipitation events that may cause flooding and severe erosion. Some areas studied may not expect the Belg rainfall, although others - respondents in Mirab Badawocho, Kacha Bira and Sankura in SNNP, and in Angolala Tera in Amhara - noted no or insufficient Belg rainfall, implying they had this in previous years.

Table 6: Responses relating to weather in qualitative component of the LIFT income survey 2021

Woreda	Bad weather / climate change	Too little rain	Too much rain	Too much + too little	Good weather / enough rainfall	Scorch	Hail / snow
Sire	50%	23%	30%	7%	20%	0%	0%
Kersana Malima	22%	5%	20%	2%	29%	0%	0%
Guna	83%	30%	30%	9%	4%	7%	0%
Deksisi	84%	20%	78%	15%	0%	1%	0%
Sankura	75%	25%	27%	8%	1%	0%	64%
Mirab Badawocho	71%	61%	3%	3%	0%	0%	0%
Kacha Bira	78%	71%	4%	0%	2%	0%	2%
Enenmorna Ener	16%	13%	0%	0%	3%	0%	0%

Enarj Enargwa	39%	7%	22%	1%	5%	3%	0%
Bure	30%	0%	21%	0%	13%	0%	0%
Baso Liben	18%	4%	8%	0%	8%	0%	0%
Angolala Tera	73%	12%	39%	7%	0%	5%	0%
Oromia	63%	20%	42%	9%	12%	2%	0%
SNNP	65%	42%	12%	4%	2%	0%	25%
Amhara	39%	6%	22%	2%	7%	2%	0%
Overall Average	**56%**	**22%**	**27%**	**5%**	**7%**	**1%**	**7%**

Table 6 sets out the headline findings from the qualitative section of the survey relating to respondents' direct observations about the weather. It should be noted that weather was not a specific question or prompt in any of the qualitative questions, however it was a very frequent response for most of those sampled. The overall picture was of a very difficult year with respect to weather, with 56% of the overall sample citing bad weather, compared to only 7% citing good weather. The more specific responses were mainly split between those attributing bad weather to too little rain (22%), too much rain (27%), or both (5%), while 7% of the sample cited hail or snow.

Findings appear to be a combination of general patterns, and specific weather events. Kersana Malima in Oromia had the best weather (relative to the sample) according to respondents, with mixed responses in Sire in Oromia and Bure in Amhara. There was hail in Sankura woreda in SNNP which reportedly damaged crops, and similarly heavy rainfall events in Deksisi in Oromia. Heavy rainfall was specifically cited in many woredas with the main exceptions of Enenmorna Ener, Mirab Badawocho and Kacha Bira woredas in Oromia. The latter two woredas were the most likely to cite too little rainfall and referred to drought, and this links to large declines in production and productivity (see Section 9).

The worst hit woredas such as Guna in Oromia had reports of too much and too little rain: *"our crops were destroyed by bad weather condition. Initially, there was no rain, and the sun did not grow the seed we sowed. Finally, the crop failed due to heavy rainfall during harvest time."* (41-year old married female, Guna, Oromia). Some respondents eloquently noted the uncertainty effects of climate change, for example: *"the weather condition of our area has changed recently. If it starts to rain, it will not stop and if it stops raining, it will not rain again."* (32-year old married female, Kersana Malima, Oromia ((504)). In addition, *"the reason for low production was climate change, sometimes high rainfall, another time dryness is affecting our crop. Everything is related to climate for low level production."* (62-year old female widow, Deksisi, Oromia). Others brought up the challenge of hail: *"before this year and this year we have been hit by hail and too much rain, now drought. If there is nothing to sell there is no income."* (37-year old married female, Sankura, SNNP).

The problems created by weather were tied by some to timing of planting, as one respondent noted: *"the reason is that the coffee plant was attacked by a plant disease and extreme cold. The weather condition is generally not good. The rain appears at an unprecedented time so we were forced to skip the right season to plant the seeds. If we don't get the rain we can't plant at the right time."* (55-year old married male, Mirab Badawocho, SNNP). Others noted that it meant facing new problems, for example*: "the problem is that there is a lack of rain, the teff is frozen, in the past this kind of problem was unknown."* (32-year old married male, Mirab Badawocho, SNNP). This was tied with the specific rainfall data set out above (high August rainfall): *"production is zero. It is because of the weather. The weather has changed. There is no rain in April and too much rain in August. This may be the curse of our forefather."* (56-year old married male, Angolala Tera, Amhara).

Box 1 sets out some more qualitative responses with respect to the weather, showing its centrality to both production and yield, and thus to income and livelihoods. At the extreme, there were cases where the weather was motivating the intention to migrate. This is the first of several boxes throughout the report. The boxes seek to set out positive responses that are representative of those respondents broadly expressing a positive view;

and the same for negative responses that are representative. Finally, some "unusual responses" are also included, because they provide an additional insight or an interesting perspective.

Box 1: Qualitative responses relating to the weather and climate

Representative positive responses

"Last year the rain season was good and we got enough rainfall to our grain so the production was increased."

54-year old married male, Kersana Malima, Oromia

"Last year the weather condition was very good. Because of good weather condition we got good crop yield. So this crop yield boosted our household income."

38-year old married male, Sire, Oromia

Representative negative responses

"The wellbeing is decreasing and we didn't make any progress this year. We didn't have enough rain and we didn't produce enough to feed our family. We have used what we have saved in the past. We are desperately waiting for the coming rainy season because we have nothing."

45-year old married male, Kacha Bira, SNNP

"Last year the crop production has been declined. The main reason for the decrement of crop production was heavy rainfall and scorching or high sun light."

61-year old female widow, Guna, Oromia

"Due to heavy rainfall, our fertilisers were swept by flood. The crops and other plants were covered by mud. We almost left with empty handed."

51-year old married male, Deksisi, Oromia

"Red Pepper which looked promising in the early days but it was over-flooded as a result of the unusually heavy rain. Flood has also washed away the fertilisers we added and the yield of Maize was not what we expected. Wheat was also badly hit by 'Mitch' caused by excess water."

53-year old female widow, Bure, Amhara

"Our productivity is declining this year; we used plenty of fertiliser before not now. We have low yield during dry season and the heavy rainfall makes our harvest too small. This is also due to bad weather and dry climate and freeze in the morning and very hot temperature during day time."

48-year old married male, Angolala Tera, Amhara

"Mainly our income is from crops. The family's income has been decreasing. Previously we would never sell our cattle to buy food and seed. But since the last year we have been forced to sell our cattle to buy food. Our income has decreased and this is almost all because of high rainfall that damaged everything. Last year our land has been covered by water and no space remained dry. All our crop has been lost by water."

70-year old married male, Deksisi, Oromia

"We are inseparable from existence and non-existence. The cattle could not stand due to lack of summer rains, because of drought. We used to grow haricot beans in the belg season. The past was better. This year we have sown but are not feeding our family. We could not even find straw for the cattle. The weather condition was completely changed. The haricot beans and maize were damaged."

54-year old married male, Kacha Bira, SNNP

Unusual responses

"The household's situation this year compared with the previous three years has been declining. This is because of climate change, which means before some years the rainfall distribution in the area was bimodal with two growing periods linked to the Kiremt and Belg rains. Thus, a farmer produces twice a year during both Belg and Kiremt season. However, in the current years the rain distribution in the area is changed to intermittent. The Belg rainy season is sometimes missing and even if it rains it is inadequate to cultivate crops. Not only this, but, also the rainfall in the Kiremt season is highly varying. This makes a very challenging situation on when to plant and when to harvest crops."

45-year old married male, Deksisi, Oromia

"There are almost no farming jobs for hire because there is little rain. Farmers only hire others when there is high production."

45-year old female widow, Kacha Bira, SNNP

"We do not know about our future. The drought makes our life bad, and we could not get enough food for us. We are in danger and we are planning to migrate to other places."

35-year old married female, Enarj Enargwa, Amhara

5. Tenure security

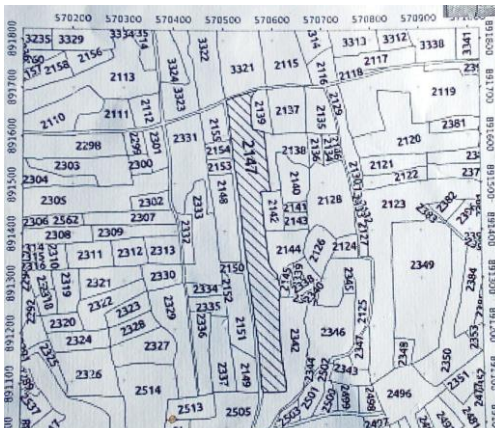
Tenure security is the central intermediate change required for the benefits of land certification to materialise. The concept itself has some complexity. Boudreaux and Sacks (2009) note that *"Land tenure security refers to the right of individuals and groups of people to effective protection by their government against forcible evictions…. the right to remain on one's land and make use of and profit from that land in ways the individual or groups value (so long as they do not harm others)."*

Arnot et al. (2011), however, note that despite the wide array of academic studies related to tenure security, there is a great deal of variation in how security is defined and measured, and this may be responsible for difficulties that empirical studies have had in linking tenure security with economic outcomes. They find many studies provide no direct definition, but simply use the formal rights that are present. Other studies measure as estimated 'probability of eviction' or of losing land rights. As perceived probabilities are difficult to measure, proxies are often used, for example the 'duration of tenure'. But while the exact legal content of security measures (the "rules") are easier to measure by nature than the perceived 'assurance' or psychological measures of security, the use of the rules themselves may be problematic. For example, formal national laws may not be put into practice at a local level where power dynamics and/or customary practices take precedence; in rural settings, land tenure can be very insecure for the poorest, and particularly for women, and widows may face unlawful evictions by family members after the death of a husband or father.

In the studies undertaken by the LIFT programme (for this paper, in LIFT 2020a, LIFT 2020b and others), it has been found that tenure security can be understood in terms of some interlinked and complementary practical aspects. For example, where disputes become less common, where this is clearer and more formal handling of disputes when they do occur, and where there are lower perceived risks of expropriation. The concept of perceived tenure security is likely to be a combination of these factors.

Arnot et al. (2011) seek to formalise a definition as the stream of expected future benefits linked to the resource. This is one way of expressing the subjective confidence in the security of tenure that would drive potential benefits of certification such as greater investment, taking out a loan, renting in or out more land etc. As each of these transactions can be seen as having a cost and expected future benefit. The expected future benefit will decline for longer term investments if the holder feels that the land may be expropriated at any time, while the holder is also unlikely to rent out their land if there is common precedent of the tenant expropriating the land.

Figure 8: Example map on a SLLC certificate



In practice, certification as has been carried out in Ethiopia for the SLLC process, provides additional weight to tenure security through the use of the map itself. SLLCs specify via the map the borders of the parcel, and the maps show this with respect to neighbouring parcels (see Figure 8, indeed many respondents in qualitative discussions referred to the SLLC as "the map"). Parcels can vary enormously in size, and parcels seen for the LIFT Income survey 2021 research could be as small as 0.02 hectares (Ha.) and as large as 4.5 Ha., and many farmers have multiple parcels registered. In one of the three regions studied (the Oromia region) the photos of the land owners are also included on the SLLC, including both husband and wife where required. For the SNNP and Amhara regions, only the names are included alongside the map.

Inheritance is also a key part of security of tenure, and rights of inheritance are also complicated, given the mixture of customary practices and law involved. For example, whether land is split between all children or goes to the eldest child; whether land goes to the wife or to children after the death of a male head of household etc. Fafchamps and Quisumbing (2001) noted more egalitarian inheritance practices in the north than the south of the country, and also that daughters very rarely inherit. An additional aspect related to inheritance under

SLLC is the certificate itself, in terms of whether and how it is replaced with the new owner. This is dealt with via woreda and kebele land administration office, and in theory should be logged on the RLAS system as a transaction (see LIFT transaction survey – LIFT, 2019b).

Findings on perceptions of tenure security

Direct questions were asked about the perceived benefits of land certification for SLLC. Tenure security was reported via three main types of response. Firstly, the benefit of clearer demarcation of the land (24% of the total sample) - a benefit more pronounced in woredas where land was less standard in its size and distribution and therefore more pronounced in Oromia (31%) and Amhara (28%) than in SNNP (10%) (in SNNP woredas land is in highly structured strip farms where natural demarcation may have been clear for many years). Secondly, the sense of security, ownership and confidence, cited by over half of households (57%) and most pronounced in Oromia (80%). The third type of response was around the legality of the land or its recognition with the authorities, cited by 21% of respondents. The results are shown in Table 7, with 72% of the overall sample reporting at least one of the three types of effect (23% cited at least two out of the three and 2% cited all three).

There were not many pronounced differences in these self-reported tenure security measures for other sub-groups, including by age (four categories are included in Table 7), by household type (married male-headed households – MHH; married female-headed households – FHH; and widows), or by two measures of income quintile (see Section 10 for more detail, the first is an overall measure of income including non-crop income; the second is a measure of the value of crops and does not include non-crop income).[16]

Some of the other responses noted from the qualitative discussions regarding SLLCs are shown in Table 12 in Annex 4. The fact the name is on the SLLC is mentioned in total by 7% of respondents; the photo is mentioned in Oromia as a benefit by around 8% of respondents (and not in the other regions as it is not on the SLLCs there). Security of inheritance is mentioned by 6% in total and is more commonly cited in the SNNP woredas (16%). There are two other benefits that were mentioned, one being that SLLC helped to pay the right amount of tax, which again was mainly a response from Oromia (11%), as well as a benefit that the SLLC "on the back" includes information relating to the land and what to grow etc., again only in Oromia (by 2.7% of respondents in Oromia).

Table 7: Direct effects of tenure security, qualitative component of the LIFT income survey 2021

Woreda or sub-group category	SLLC helped us to know boundary / Boundaries are clearly demarcated (1)	SLLC secures ownership / feel sense of ownership (2)	SLLC show land legally belongs to us / ownership approved by authorities, land holding secure (3)	Either (1), (2) or (3)
Oromia	31%	80%	23%	92%
SNNP	10%	48%	13%	62%
Amhara	28%	38%	25%	54%
Overall	**24%**	**57%**	**21%**	**72%**

Findings on disputes

Over half of households (60%) also cited a benefit of reduction of disputes. Responses varied from those that made a general statement that SLLC certification "avoids disputes" to those that were explicit that disputes had reduced since certification, or that cited particular issues they had faced which had now reduced. The results are summarised in Table 8 and show this benefit was again more commonly cited in Oromia (70% compared to 56% and 50% in SNNP and Amhara regions respectively). Table 13b in Annex 4 shows further disaggregation by education, age groups, gender, and income quintiles. No major differences by other types

16 These categories are used throughout the report to present breakdowns of headline results by sub-group.

of sample segmentation were found in terms of disputes, though those in the highest income quintile more likely to say they had disputes in the past and this issue was now improved (13% compared to 4% for the lowest quintile) – possibly by virtue of having more land and more likely to have land further from the household as a result. In total, 7% of respondents said they themselves had previously experienced disputes and this had now reduced or been resolved.

There were also a few references to dispute resolution (2%), with direct links between the dispute resolution system and tenure security, for example: *"If there is a dispute over our lands, we can go to the woreda land administration and solve the problems easily. Because the land information is available in the woreda computer system. When we realised that the land belonged to us, we became interested in planting a variety of permanent and cash crops."* (41-year old married female, Guna, Oromia (291)). Box 2 sets out some more qualitative responses with respect to disputes, reflecting the broadly positive findings, though there are a couple of "unusual responses" with specific disputes including with directly with authorities.

Table 8: Direct effects of tenure security, qualitative component of the LIFT income survey 2021

Woreda or sub-group category	SLLC reduces / avoids boundary conflicts (1)	Now no boundary conflicts (2)	Disputes / conflicts less common (3)	Either (1), (2) or (3)	Before we had problems / disputes with neighbours	There is now formal resolution of disputes
Sire	46%	9%	21%	66%	21%	9%
Kersana Malima	69%	10%	19%	76%	12%	3%
Guna	23%	10%	35%	65%	7%	3%
Deksisi	61%	4%	13%	73%	13%	1%
Sankura	45%	3%	3%	47%	1%	3%
Mirab Badawocho	23%	3%	23%	42%	3%	0%
Kacha Bira	29%	15%	29%	67%	7%	0%
Enenmorna Ener	28%	25%	53%	72%	19%	3%
Enarj Enargwa	32%	5%	9%	38%	0%	1%
Bure	43%	11%	19%	62%	4%	0%
Baso Liben	24%	18%	20%	54%	0%	2%
Angolala Tera	32%	29%	7%	56%	0%	2%
Oromia	**50%**	**8%**	**22%**	**70%**	**13%**	**4%**
SNNP	**34%**	**10%**	**22%**	**56%**	**6%**	**2%**
Amhara	**33%**	**14%**	**14%**	**50%**	**1%**	**1%**
Overall	**40%**	**10%**	**19%**	**60%**	**7%**	**2%**

Box 2: Qualitative responses on questions relating to disputes
Representative positive responses
"The SLLC protects from border conflict. It shields from land grabbers attempting to take the land."
32-year old married female, Kacha Bira, SNNP
"We have problem on land border before SLLC, everyone was wanting to take our land. We could not rent out because of cheating. But now our lands are registered and we have the certificate. So, after SLLC there are no such problems."
27-year old married female, Sire, Oromia
"After the death of my husband I had land dispute with his second wife. After the SLLC certificate, we know our border and we live in peace."
45-year old female widow, Kacha Bira, SNNP
"Before collecting this certificate, we had been in conflict, but now because of this certificate, we know our boundaries, and no more conflict. Our ownership has been confirmed. If husband or wife died, children do not know the boundaries and then end up in conflict. This certificate has removed such confusion."
60-year old married male, Guna, Oromia
"It prevented all the conflict on boundaries that had been our problem. Previously we were in conflict with people and people do not know their boundaries, even there is no witness that exactly know the place. So, people decide as they feel or depending on their closeness to each other. That had been a great problem, but now thanks to this certificate there is no longer any conflict on boundaries. I know my boundaries, and land, and I am farming my land peacefully."
62-year old married male, Deksisi, Oromia
Unusual responses
"There is a change now. We used to fear a lot about the land before. because there are industries close by. Now we are fine for having a map. If somebody wants to take the parcel we are ready to get compensation."
50-year old male widow, Angolala Tera, Amhara
"Because of road construction they took some of my land which they do not compensate. Because I have the certificate I am ready to apply for the authorities. If I did not have the certificate I could not ask any compensation. If I cannot get my land compensation it will be hard for me grow any crops."
59-year old married male, Enenmorna Ener, SNNP
"We are in a court process and we have not done any agricultural activities for three years. The "woreda" and "kebele" decided to divide the land for three parts. I objected not to do this by applying the case on a higher court of the zonal administration body. I cannot raise my eight children with one third of this land so I took the case to the federal court for a final decision and we are all waiting for the decision to be made there."
37-year old married female, Sankura, SNNP
"We can defend ourselves from government expropriation and there will not be any surprise sell offs."
55-year old married male, Mirab Badawocho, SNNP

Overall, the disputes findings as expressed by respondents show how tightly linked the issue is to tenure security itself. The reduction of fear of disputes, and the interlinked reduced potential of losing land, is what leads to greater confidence. Likewise, the demarcation benefit is what allows disputes to be avoided, while the legal status benefit gives greater confidence that disputes will be handled fairly and effectively. As expressed by one respondent this means: *"Even if there is conflict it is possible to show the certificate and prove ownership."* The same respondent then links this to the tenure security benefits and potential to invest more in land: *"There were free lands before SLLC. Now the land in the whole kebele has been assigned to farmers. As a result of that no one in the community expects to be given more land. so, we are tempted to cover the parcels we have with farming developments."* (50-year old married male, Enenmorna Ener, SNNP).

The disputes finding also tallies with the LIFT 2019 outcomes survey (LIFT, 2020b), which found that disputes had dropped from around 10% of respondents experiencing them prior to receiving their certificate, to just 4%

post-SLLC.[17] The study also estimated cost savings from a dispute and the de facto reduction that households were likely to have experienced. This found two-thirds of respondents had faced costs dealing with disputes, the majority over 250 Birr or higher, and one in five spending more than 1,000 Birr - driven largely by travel costs to deal with it.

Findings on links to credit market participation

A round one-sixth of respondents (16%) noted that certification allows a household to take credit. As shown in Table 9, there were then 3.1% of the sample that reported they themselves had taken out credit linked to SLLC as collateral, with Kersana Malima woreda disproportionately represented (15%). The perception regarding borrowing being possible was higher for those who had completed primary or had some secondary education (31%), although not higher for this group for taking loans themselves (possibly due to the low sample). It can be noted, though not a statistically significant sample, that the woredas with EEU credit interventions taking place were more likely to see perceptions of being able to borrow (21% in intervention woredas compared to 10% in non-intervention woredas), as well as rates of gaining credit via SLLC (4% in intervention woredas, 2% in non-intervention woredas).

In most cases respondents were not too explicit about how they had used loans, although some were. For example: *"we can now use the certificates as collaterals to get loans from financial institutions. In fact, I already got a loan to buy inputs and made a very good use of it and became more productive."* (60-year old married male, Baso Liben, Amhara). In addition, *"We took a loan from OMO MFI by registering the certificate and we now have a supporting income by selling the wood from our farm directly at the market."* (65-year old married male, Kacha Bira, SNNP). In other cases respondents were more specific, for example one made a direct link between credit and rental with money borrowed to rent more land: *"We used our land certificates as collaterals to get a loan from Amhara Credit and Saving Institution. In addition to our own land we rented in some parcels and ploughed and cultivated more. In so doing, we managed to get bumper harvest and sold our produces and earned enough money, not only to pay back our debt but also got extra cash to expand our farm."* (42-year old married male, Bure, Amhara).

Table 9: Reported effects of SLLCs with regard to access to credit and rental market participation

Woreda	Certification allows people to borrow money / guarantee to take out loan	Gave me access to a loan / we secured credit	LIFT EEU credit intervention woreda
Sire	9%	2%	Yes
Kersana Malima	27%	15%	Yes
Guna	7%	1%	No
Deksisi	8%	1%	No
Sankura	14%	1%	Yes
Mirab Badawocho	26%	3%	No
Kacha Bira	47%	5%	Yes
Enenmorna Ener	19%	0%	No
Enarj Enargwa	18%	1%	No
Bure	15%	0%	Yes
Baso Liben	6%	4%	No
Angolala Tera	12%	2%	No
Oromia	12%	5%	
SNNP	26%	3%	
Amhara	13%	2%	
Overall	**16%**	**3.1%**	

17 The specific finding is that the number of disputes that arose since SLLC is significantly lower than the number of disputes that arose during the two-year period preceding the Baseline survey, with less than half the rate of disputes arising after SLLC, at 4.2% versus 9.6%

Other impacts including on GESI

The linkages between tenure security and investments are discussed more in Section 6 and Section 7 for longer-term and shorter-term investments respectively, while the impact on rental is discussed in Section 8. There were other more complex aspects linked to the SLLC from the qualitative discussions with respondents. Notably, there were a few exceptional stories linked to SLLCs, two cases of formal dispute with the woreda, issues with the names on the certificates, that SLLC meant having to pay more tax than before, the default on a loan meaning land was lost as collateral, or lost land to road construction and fighting for compensation for some time in spite of SLLC. Two households said they had not received the SLLC yet, and one noted that the land size expressed on the SLLC was not in terms farmers understood (i.e. reported in hectares rather than the local unit of land commonly used.)

In terms of gender, there were a number of responses. As shown in **Error! Reference source not found.** above, 3% of respondents noted equal rights for women, with the majority of these responses coming from SNNP (9%). This included one response noting two wives were allowed on the certificate: *"I have two wives and on the certificate both name and photo of three of us are there. So, it is a solution for a conflict that may arise in family as well as with other people."* (65-year old married male, Kersana Malima, Oromia). Other responses included greater security in cases of divorce: *"The SLLC give us guarantee for our holdings from dominant neighbours; and avoids dispute between husband and wife. It will be the real testimony if they are divorced and to settle their holdings."* (48-year old married male, Bure, Amhara). And also in terms of inheritance, *"the land is guaranteed to the family and if one land holder dies then the spouse will remain as the land holder"* (44-year old married male, Sankura, SNNP). More common responses on gender focussed on equality, for example: *"this certificate has both mine and my wife's photo on it. So both of us know our land, females have equal share."* (52-year old married male, Guna, Oromia). Further, *"before SLLC women's rights did not exist. I understand very well that the land belongs to me. I know I have a right to be able to pass to someone else, I can inherit, I can rent out."* (66-year old female widow, Enenmorna Ener, Oromia). Finally, *"the wife controls the land so that the husband does not waste it, and there is no contract for the husband alone without the consent of the wife. This is of great benefit in terms of rights."* (32-year old married male, Mirab Badawocho, SNNP).

There was a more complex picture in terms of inheritance, with some cases of disputes among children, for example: *"previously my children were with me and supporting me which is not a case right now. Since the death of my wife my children shared the land from me. There was big trouble with my children on inheritance, even my children were attempting to kick me off from this compound and then the issue was solved by court."* (55-year old married male, Kersana Malima, Oromia). Box 3 sets out some more qualitative responses with respect to tenure security including some linked to the motivation to invest and direct investments made as a result of SLLC, as discussed further in the next section (Section 6). Some of the responses show other complexities with inheritance, including a dispute between brothers, and a case of a widow losing the land to her husband's children after he died. As discussed above, inheritance is clearly a complex area in which the SLLC has not overcome or overridden traditional or locally specific practices and power dynamics. As discussed in the conclusion Section 12, this is a potential important area for future research.

Box 3: Qualitative responses on questions relating to tenure security
Representative positive responses
"Land ownership certification increased my family security and sustainability. I got a stress-free mind. We started to live stable life. We started to use agricultural inputs without doubt. We started to implement our choices on our farm." 42-year old married male, Deksisi, Oromia
"For our land, there are different boundary features and GPS coordination. So, we don't worry about boundary disputes or the risk that someone could take away this land from our family." 67-year old married male, Kersana Malima, Oromia
"SLLC avoids unnecessary taxation and we only pay the tax according to the size of land and proportional to other land holders. There will not be any arbitrary tax calculation." 43-year old married male, Sankura, SNNP
"Yes, it impacted our activities, since we feel confidence we are using it for any purpose. We are planting trees on our land and sometimes if land failed to give crop we left it fallow, but previously if left fallow someone may plough and take away from you. Then it will be a source of conflict. Generally, it impacted our activities." 40-year old married female, Kersana Malima, Oromia
"Since I have collected the certificate, I have built a house which I would fear before. My confidence and ownership increased compared to before. Previously there was a rumour that your land will be taken if you construct house on it. But that was not true, I do have a certificate." 70-year old married male, *Deksisi, Oromia*
"This certificate has both mine and my wife's photo on it. So, both of as own our land, females have equal share. We knew our boundaries and land size, so there is no conflict as before related to land boundary. We are living in peace with our neighbours. I have developed sense of ownership on my land than before. We are confidently harvesting our products." 52-year old married male, *Guna, Oromia*
"All farmers have SLLC and if someone try to pass our boundary we immediately inform the issue to the woreda land administration office." 39-year old married male, *Sire, Oromia*
Representative negative responses
"I don't know its importance. My husband had stored the SLLCs, but after he died his children took away the certificates." 51-year old widow, Kersana Malima, Oromia
"The map is just to show us the boundary and show us who the land belongs to. I do irrigation on the land closer to the water. in addition to this, I use fertiliser on my land. Does this have any relation with the map?" 40-year old married male, Baso Liben, Amhara
Unusual responses
"it impacted our agricultural activities, even for rented in land we used the certificate as a guarantee, it has been kept in kebele, because the certificate is in kebele we abide to the agreement. So, it is very useful." 27-year old married female, Kersana Malima, Oromia
"If we move, the remaining family members will live a normal life and the land will not be claimed by outsiders." 63-year old male, Sankura, SNNP
"Having SLLC have a lot of importance. My own brother took me to court to take my inheritance, but the name on the certificate was mine and I provided this as my document and the court immediately decided for me. The SLLC certificate saved me and my family. If I had not had the SLLC I would have been kicked out." 35-year old male, Sankura, SNNP
"We took a loan from OMO MFI by registering the certificate and we now have a supporting income by selling the wood from our farm directly at the market." 65-year old married male, Kacha Bira, SNNP
"If my husband wanted to get married to another woman, because I am now getting weaker; then this is my security that I can have my share of the land that would help me raise my children." 30-year old married female, Sankura, SNNP
"It has a problem related with inheritance. When our father dies, his lands should be transferred to his sons and daughters. We are fighting each other since the government land law will not allow all the sons and daughters to get their share. Only those who live with him and who do not have any income from employment have the right to inherit. Others who live in the town and other places could not inherit. This case became the reason for disagreement between brothers and sisters." 60-year old female from cohabiting female-headed household, Angolala Tera, Amhara

6. Investments: longer-term

The link between tenure security and investment is the central claim underpinning the cost-effectiveness of the roll-out of land certification such as carried out via the LIFT programme. Farmers who are more secure that their land will not be subject to disputes and conflict, or to risks of expropriation by stronger neighbours, by government or private sector enterprises, may then be more willing to make longer-term investments. A definition of long-term investments can be taken to be those where the returns accrue beyond the (Belg and Meher) seasons of a single year. It can take, for example, 3-4 years for coffee trees to bear fruit; mango trees take 4 years from nursery saplings to bearing fruit; and eucalyptus trees can take up to 12-years before they are fully grown and reach their full commercial value. It is likely to require confidence that tenure is secure to invest and allocate land to trees or perennial crops. Likewise making other conservation investments that have a long-term pay-off may also require confidence in tenure security (see discussion on the concept in Section 5).

Several studies have found a link between tenure security and investment.[18] Strong results on this link were found by Holden et al. (2009) on FLLC land certification in the Tigray region. They found up to seven years after land certificates were received, that receipt of land certificates resulted in better maintenance of soil conservation structures and more planting of trees on certified land, which included planting of eucalyptus even with restrictions on tree planting on arable land.[19] In total, Holden et al. (2009) found that land productivity had increased 40–45% on certified land. Similarly, Deininger et al. (2011) found that land certification enhanced tenure security and investment in the Amhara region, with an average treatment effect of 30 percentage points on the propensity to invest in soil and water conservation measures, and more than a doubling of the number of hours spent on such activities. This is consistent with findings of a review of the literature on land tenure security and investments by Fenske (2011), with investments in land improvement, and particularly in tree planting. Fenske tested for a relationship between land tenure and agricultural investment in nine data-sets from West Africa, and while there was a significant link found between tenure and investment for fallow land and tree planting, it was less robust for labour use and other inputs, such as manure or chemical fertiliser.

In the most recent and comprehensive quantitative analysis of SLLC roll-out, Ghebru and Girmachew (2020) find that investment as defined by 'Soil and water conservation investment/maintenance' to be 12.8 percentage points higher for those who received SLLCs compared to those without SLLC. The same study found a smaller impact on the propensity to rent land ('to become a landlord'), at 5.3 percentage points.

The LIFT 2019 outcomes survey (LIFT, 2020b) found 30% of households saying SLLC was 'very important' in motivating at least one investment. As set out in Annex 1, for the cohort sampled in both November 2019 and in March/April 2021, the 2019 outcomes survey also found significant effects on investment linked to SLLCs, which included 30% citing they had both invested in trees and linked this at least in part to SLLC certification. Analysis of the data found that a subset, 9% of the sample, had invested in trees "for the first time" and also said SLLC was "very important". There were 29% who had made improvements in their land such as terracing[20] and linked this at least in part to SLLC; for a further sub-group 3% had done so "for the first time" and also said SLLC was "very important" in doing so.

Findings

The challenge is to distinguish between investments farmers made, and the attribution of these investments to certification and tenure security. Our methodology approaches this by first asking what the main

18 As noted in Arnot et al. (2011), it has been suggested in many papers that there may be a reverse causality between tenure security and investment in which investments themselves allow individuals to obtain more secure rights to the land. For example, in Uganda, as evicted tenants must be compensated for lost investments, high-valued investments can reduce the likelihood of eviction, and thus increase security of tenure (Place and Otsuka 2002). This complexity is important but does not negate the assessment of tenure security to investment.

19 Tree planting was predominantly on homestead plots, and the number of trees was significantly lower on distant plots.

20 The full question in the 2019 Outcomes survey was*: "Compared to the period before SLLC, have you engaged in improving the productivity of your land for the first time or increased investment in terracing, clearing stones/stumps/other, planting grass for bunding, installing or repairing a dam, drainage ditch, trench, water harvesting or similar on any of your parcels?"*

investments made in the past three years were,[21] before asking about the effects of tenure security and what changes were made as a result. This allows us to see the difference between households' investment activity, and how and what they ascribe to tenure security and SLLC explicitly. The findings show the two can often be quite different.

The LIFT Income survey 2021 found, as shown in Table 10, that while 83% of the sample cited at least one longer-term investment, 7% explicitly said they had made no such investment in the period. Investments varied significantly by woredas, and by income quintile, with relatively better off households more likely to have made investments (90% for the two highest quintiles compared to 75% for the poorest quintile). The most common investments were terracing (53%), planting trees (48%) and applying ripping (27%). Smaller proportions mentioned others such as fencing land (3%), (basic) irrigation (6%), planting grasses (5%), post-harvest storage infrastructure (2%) or leaving land fallow (1%). Ripping was more commonly cited by the poorest quintile (38%) than the overall average (27%), and also less common in SNNP (7% compared to 34% in Oromia and 36% in Amhara). Terracing was more common in Oromia (81% compared to 35% and 33% in SNNP and Amhara respectively), and also more commonly cited by relatively better-off households (67% among the top quintile, compared to 42% for the bottom two quintiles). Tree planting was most common in SNNP (68%) compared to elsewhere (47% and 31% in Oromia and SNNP respectively), and was also more common among those who had finished primary level education or more (65% planted trees compared to 43% with no education). See also Table 15b in Annex 4 for a disaggregation by age, education, gender, and income quintiles.

The research found land use investments were driven by three main factors, i) woreda and kebele extension officers support or advice; ii) demonstration of neighbouring farms; and iii) the motivation of the household itself. Practices such as ripping and terracing were extensively reported as being motivated to seek to reduce erosion and improve soil fertility. In many cases households reported that these were standard practices for many years, and often (or mostly) carried out in a group. A proportion of households had irrigation or built irrigation, mostly to allow supplementary production of vegetables for additional income; these were also geographically clustered activities with links to kebele extension workers' advice or guidance. As a result, there are cases of investments being made across a range of areas linked to these motivations with tenure security not cited as playing a role, for example: *"We undertook conservation activities and allotted a small parcel to plant trees and introduced small scale irrigation. The advice of woreda and kebele land administration agricultural personnel played the major role, with all such practices meant to improve soil fertility, increase productivity and diversify income sources."* (63-year old married male, Enarj Enargwa, Amhara).

21 Full question in the 2021 Income survey including prompts: "Over the past three years, what would you regard as the most important longer- term changes you've made [*outside of the changes mentioned in 404], such as practices to improve the fertility of the soil, longer-term crop selection such as trees, increased cultivation of unused or underutilised land, irrigation practices (if applicable), assets such as ploughs, or other conservation farming methods such as ripping?"*

Table 10: Long-term investments cited in the qualitative component of the LIFT income survey 2021 summary

Woreda or sub-group category	No improvements / no long-term investment	Apply ripping	Leave land fallow	Planted trees	Planted grasses	Undertook terracing	Irrigation	Fencing	Post-harvest storage	Any investment	Any investment + tenure security measure
Sire	5%	32%	0%	38%	0%	75%	2%	0%	2%	89%	86%
Kersana Malima	0%	32%	14%	78%	0%	93%	12%	2%	14%	97%	93%
Guna	1%	35%	0%	38%	0%	74%	0%	0%	6%	84%	83%
Deksisi	1%	35%	1%	39%	0%	83%	1%	0%	1%	93%	84%
Sankura	3%	8%	0%	77%	11%	52%	7%	4%	0%	89%	62%
Mirab Badawocho	0%	19%	0%	77%	13%	32%	10%	10%	0%	90%	58%
Kacha Bira	15%	2%	0%	65%	24%	27%	0%	16%	0%	75%	58%
Enenmorna Ener	25%	0%	0%	44%	3%	9%	6%	16%	0%	59%	44%
Enarj Enargwa	4%	27%	0%	38%	4%	32%	15%	0%	0%	78%	45%
Bure	11%	36%	0%	28%	2%	45%	2%	0%	0%	81%	62%
Baso Liben	22%	46%	0%	26%	2%	20%	4%	0%	0%	66%	38%
Angolala Tera	10%	41%	0%	29%	2%	39%	12%	0%	0%	83%	49%
Oromia	**2%**	**34%**	**3%**	**47%**	**0%**	**81%**	**3%**	**0%**	**5%**	**91%**	**86%**
SNNP	**9%**	**7%**	**0%**	**68%**	**14%**	**35%**	**5%**	**10%**	**0%**	**80%**	**57%**
Amhara	**11%**	**36%**	**0%**	**31%**	**3%**	**33%**	**9%**	**0%**	**0%**	**77%**	**48%**
Overall	**7%**	**27%**	**1%**	**48%**	**5%**	**53%**	**6%**	**3%**	**2%**	**83%**	**66%**

Investment and attribution to tenure security

To establish attribution between tenure security and investment, the tenure security questions from the qualitative part of the survey were used.[22] As shown in Table 16, there were responses of a general kind where SLLC had an effect "motivating more investment / allows us to invest in any way we want", and then other more specific references to specific investments. An example of a respondent citing a general effect without a specific investment includes a 40-year old married female respondent from Enarj Enargwa in Amhara*: "[SLLC] has an impact on our way of production, since we could exploit our land properly."* An example of a specific investment can be seen from a 30-year old married male respondent from Kersana Malima, Oromia: *"Before the SLLC we had a fear which is government might take away the land from us. But now after the SLLC assured us no one can take away our land. Because of this confident now we are planting whatever we want, including permanent crops and trees."* See also Table 16b in Annex 4 for a disaggregation by age, education, gender, and income quintiles.

Overall, 33% of respondents experienced either a general or specific effect of tenure security on investments (see Table 16). Households either noted greater motivation to invest in their land (14%) or that SLLC gave them more choice in how to invest (6%). There was one-fifth of households that cited at least one additional investment effect (20%), some that they had invested more without citing the specific investment (7%), and then the biggest effect was related to planting more trees or longer term crops as a result of certification (15%). Other minority responses included the ability to leave land fallow, build more fencing, invest more to tackle soil erosion or fertility, or building a house as a result of SLLC. These responses were more common in Oromia and SNNP with around one third of households reporting an effect.

Some households reported explicitly "no effect of certification" (14%), a response more pronounced in Amhara (25% compared to 6% and 15% in Oromia and SNNP respectively) and some other woredas such as Sankura in SNNP (26%). It was also more common among older groups (21% for respondents aged over 66, compared to a 13% average for those under 66), and those that were poorer (23% for the poorest income quintile, compared to 8% for the richest quintile).

There are a number of potential reasons for Amhara having very low responses to the specific investment questions. Some of these relate to the types of investments and communal work that is undertaken, at the behest of the community and authorities and which are unlikely to be affected by tenure security. For example, in Bure, Amhara, a 35-year old married female: *"we are mobilised at Kebele level yearly for Terracing and Ripping works".* And in Baso Liben, Amhara, a 60-year old married male: *"all able farmers in the kebele are mobilised every year for terracing and ripping".* However, in other cases it may have been linked to how the question was asked and interpreted. For example, in Bure, Amhara a 79-year old female in a cohabiting household told us *"we planted 500 eucalyptus trees, guava, papaya, mango, hops, coffee and bushes in our parcels and terracing structure".* This is one of the most extensive sets of investments mentioned by a respondent. The respondent then also said regarding SLLC, *"As a female farmer it provides me security for my holdings. I feel good to have this SLLC. It will help me to get better production."* In this case, without a specific mention of investments made due to the SLLC this was not coded as a causal statement. There may have been a potential issue therefore in how enumerators interpreted the question 406 in the survey. This may be shown in that the same respondent in the Outcomes survey 2019 (LIFT, 2020b) was asked the specific questions regarding investments including trees in which she had invested and had attributed "high importance" to SLLC.[23] The Amhara results therefore should be treated with some caution.

22 406a: What would you regard as the main ways in which holding SLLC certificate/s affected your household, if any? 406b: What are the main reasons holding SLLC certificate/s helped make this change / these changes? 406c: Consider these changes, did they have any impact on your agricultural practices? Please explain if so."

23 The questions from the 2019 Outcomes Survey included*: "Compared to the period before SLLC, have you invested for the first time or increased investment in planting or growing trees including fruit trees for firewood, building, fruit and similar on any of your household's parcels?"* This respondent had answered *"yes – invested for the first time after SLLC"* to this question. The follow-up question was *"How important would you say having second level land certification was to this change? Was it 'very important', 'somewhat important', 'not very important', or 'not at all important'?"* To which this respondent had answered *"very important".*

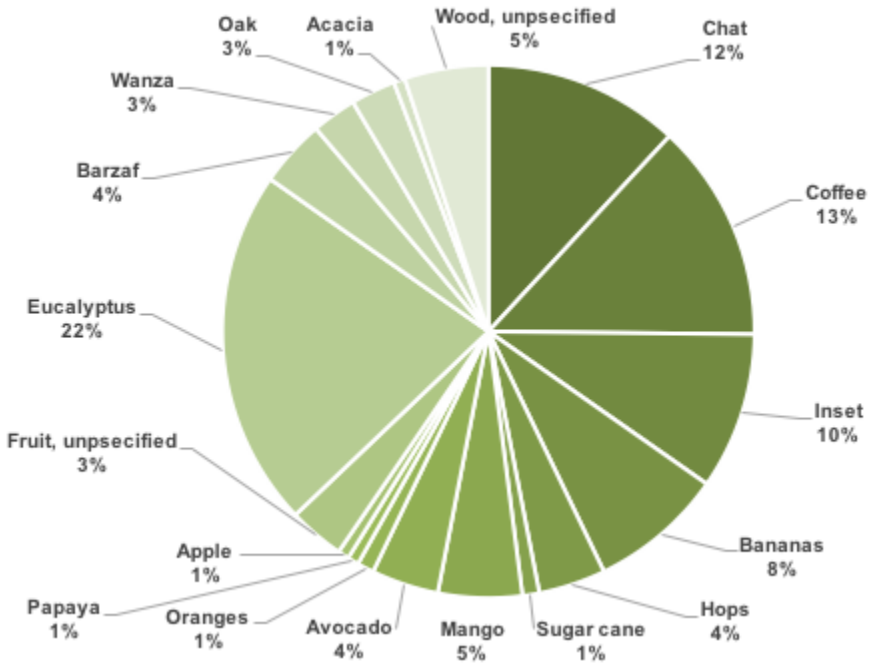
Table 11: Direct effects of tenure security, qualitative component of the LIFT income survey 2021 summary

Woreda or sub-group category	Motivates more work on the land (1)	Allows us to invest in any way we want (2)	Any general effect (either (1) or (2))	Now investing more due to certification (3)	Built house (4)	Fencing land (5)	Planting more trees / long-term cash crops (6)	Investing more to tackle soil erosion (7)	Allowed us to leave land fallow (8)	Any specific effect (3-8)	Either general or specific effect (1-8)	SLLC had no effect / no changes
Sire	27%	7%	34%	7%	0%	0%	29%	2%	0%	32%	57%	5%
Kersana Malima	20%	27%	42%	15%	0%	0%	44%	12%	2%	51%	75%	5%
Guna	32%	1%	33%	17%	0%	0%	12%	1%	0%	23%	48%	7%
Deksisi	15%	6%	19%	13%	0%	0%	10%	0%	0%	21%	30%	6%
Sankura	15%	3%	18%	7%	0%	0%	19%	1%	0%	23%	34%	26%
Mirab Badawocho	10%	6%	16%	6%	3%	0%	32%	0%	0%	35%	39%	19%
Kacha Bira	16%	9%	25%	11%	11%	11%	25%	7%	0%	38%	55%	5%
Enenmorna Ener	22%	22%	38%	6%	6%	3%	9%	0%	0%	16%	47%	0%
Enarj Enargwa	3%	0%	3%	0%	0%	0%	0%	0%	0%	0%	3%	24%
Bure	6%	0%	6%	0%	0%	0%	0%	0%	0%	0%	6%	15%
Baso Liben	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	24%
Angolala Tera	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	37%
Oromia	**23%**	**10%**	**31%**	**13%**	**0%**	**0%**	**22%**	**3%**	**0%**	**31%**	**50%**	**6%**
SNNP	**16%**	**8%**	**23%**	**8%**	**5%**	**4%**	**21%**	**3%**	**0%**	**28%**	**43%**	**15%**
Amhara	**2%**	**0%**	**2%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**2%**	**25%**
Overall	**14%**	**6%**	**20%**	**7%**	**1%**	**1%**	**15%**	**2%**	**0%**	**20%**	**33%**	14%

Specific findings on trees

The longer-term investments that were most directly linked to tenure security were related to trees and longer-term crops. Many households reported planting trees, and as **Error! Reference source not found.** in Annex 4 sets out, the most commonly cited motivations were to improve soil fertility and reduce erosion, for food consumption, or for additional income. Small proportions also cited planting trees for wood, for building a house, or for fuel. The main types of trees and longer-term crops cited included i) fruit trees such as mango, avocado and banana (around 23% of mentions to fruit trees); ii) long-term tree crops such as chat, coffee and enset (around 39% of mentions to longer-term crops); and iii) 'wood trees' such as eucalyptus, barzaf and wanza (around 38% of mentions to wood trees), as shown in Figure .

Figure 9: Tree and long-term crop citations by type



The planting of trees was not without issues, with some problematic references to trees in the qualitative discussions. Notably, *"the land is less fertile because my neighbour has planted trees on our border and that has made the land infertile."* (45-year old married male, Sankura SNNP (791). In addition, *"in our culture we don't plant trees on the border of our neighbour's farm land because it has impact on that person"* (82-year old married male, Kersana Malima, Oromia. Further, *"we have planted banana trees but we didn't plant other wood trees because it destroys the fertility of the land."* 50-year old married male, Mirab Badawocho, SNNP. The final Section 12 on conclusions includes some more discussion on evidence and these potential complications, including as another area for future potential research of significant importance and interest.

Box 4 sets out some more qualitative responses with respect to long-term investments including examples that are linked to greater tenure security and SLLC, and examples where other motivations drove investments.

Box 4: Qualitative responses on questions relating to longer-term investments
Representative positive responses
"We have planted wood trees and chat trees. We did ripping works every year in the past three years. We did the ripping works for water flow and we do it every year because the soil fills up the ripped land. We planted the trees because it has long term benefits that last for generations." 45-year old married male, Sankura, SNNP
"We planted some wanza trees, and grass. The grass was to protect erosion and wanza trees nowadays have become important to make furniture. The benefits are so great. I am trying to get better profit." 42-year old married male, Sankura, SNNP
"We identified fertile and infertile land, on infertile one I planted trees. We planted enset, other trees and I applied compost and did terracing to protect soil. I have been trying to do irrigation, since there is rain variation. I have planted long lasting cabbage to be used for more than a year. I have seen the benefit of planting trees, learned that infertile land can be used for them, and saw my neighbour benefiting from such activities. SLLC has increased our confidence over our land, it has direction and coordinates on it, so it has resolved conflict related with boundary. Now I am planting trees on infertile land since the land is mine." 21-year old single adult male, Kersana Malima, Oromia
"Irrigation is a relatively new practice in our area and its increased use, to an extent, is hampered by acute shortage of water. Last time we grew Garlic and harvest was very rewarding. This has proved to be a viable means of diversifying our limited source of income." 62-year old married male, Enarj Enargwa, Amhara
"We are using all techniques which is important to increase crop production. For example, we do ripping, terracing, fallowing and we also use cattle manure to our farm. But this is not new today; we were using long time ago." 47-year old married female, Kersana Malima, Oromia
"We are obliged to continuously practice ripping and terracing as we are told that such practices are necessary to prevent land degradation and prevent soil erosion." 42-year old widowed male, Enarj Enargwa, Amhara
"Ripping is done at a kebele level every year and it is mandatory that all capable farmers participate. Thanks to this, the adverse effects of flood are successfully done with and the soil is better conserved." 72-year old married male, Baso Liben, Amhara
Representative negative responses
"We do ripping in a group. We are planting trees on the land. Even with ripping and planting trees on the land we have, it is still collapsing. We do not know what to do. There is water and erosion, that is why the land collapses." 60-year old female widow, Baso LIben, Amhara
"We do ripping in group with villagers. no other things, I am old." 79-year old married male, Enarj Enargwa, Amhara
"Not much Improvement. We didn't plant trees. A minor terrace work is the only thing we did." 35-year old married male, Kacha Bira, SNNP
Unusual responses
"I did nothing to improve my land fertility or been long time since I stop land conservation. I spend time keeping camels, so I don't have time to take care of my land." 39-year old married male, Sire, Oromia
"I used animal dung and compost to increase soil fertility. Since there is shortage of water during winter season, I prepared a well that serve for my animal, for our drinking and irrigation purpose. I have planted trees to use as wood and to make it a source of income. Land professionals were teaching us to do these activities, from my experience and I have been a role model farmer in this kebele for my extraordinary activities like this. But change of weather conditions affected my farming." 70-year old married male, Deksisi, Oromia
"I have made a fence around my farm land which is very expensive for me. It is because of the wild hogs that are living in the jungle up there which are always spoiling my enset in a way that I cannot recover it again for use. Wild hogs are the number one enset seed damagers around here, and it is why I decided to invest on making the fence." *28-year old married male, Enenmorna Ener, SNNP*
"Since 1987 E.C, [1994] terrains are being built in all kebele territories and at river basins. It was even a kind of forceful action for every farmer to participate on the work, that we would not be supplied with fertilisers or seeds on time if we are not participating on the work. In fact, this helped us save our productive soil not to be washed away by the rain." 48-year old married male, Kacha Bira, SNNP

Satellite imagery as further evidence of investments made

At the end of the 2021 income survey, respondents were asked if the enumerator could take a photo of one of their SLLC certificates where possible, and over 100 photos were taken of the certificates. It was subsequently possible to match these to the individual farmer data-sets, as well as to track a proportion of the land via mapping software (Google Earth) given the GPS coordinates provided via the enumerator's smartphone. Using time-lapse for a number of parcels we are able to track some changes over several years, including roof type and, to some extent, tree coverage in a given area. The exercise also makes it possible to see the very different characteristics of land use across the different regions and woredas of Ethiopia.

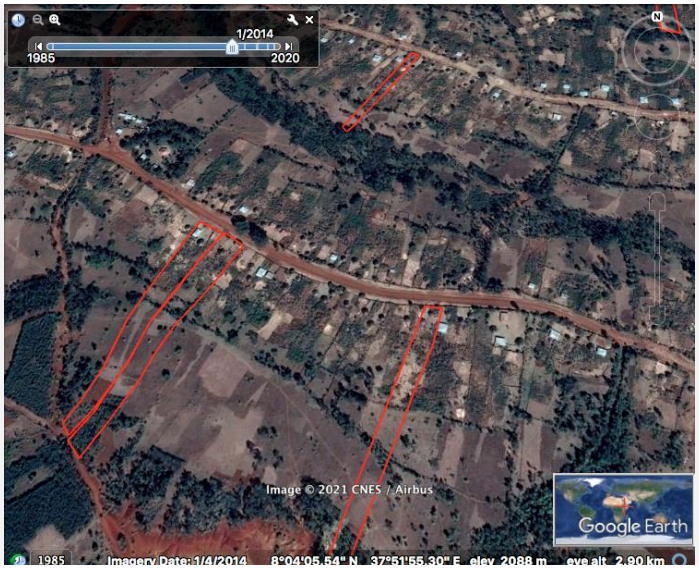
After analysis of all the parcels that could be matched and mapped (78 out of the 100 that were photographed), it was possible to find those that were clustered and then cross-reference the quantitative data on land size reported, as well as the qualitative data on investments made. Figure 5, Figure 6 and Figure 7 show the most interesting visual results that could be found – though given the small sample size and the challenge of attribution the causality of this analysis should be treated with caution. This notes an increase in metal roofs and some additional tree cover.

For Figure 5, one household is visible where the respondent stated: *"I built my home after receiving the certificate"* (66-year old married male, Enenmorna Ener, SNNP). Another visible household stated: *"It is the administrative system that helped us to avoid conflicts. Now I would go and plant trees or other plants on my land freely because of this and the confirmed certificate ownership of my own land. The confidence from land ownership motivates me to work hard and the water well which I was using until the beginning of this year as an irrigation scheme for my farmland."* (47-year old female widow, Enenmorna Ener, SNNP. A neighbouring farmer (also visible in the image) stated: *"The fence that I built around the farmland is to protect from wild hogs, and porcupines that destroy enset plants we are planting. I have also built a terrain at the back of my farmland beside the river to protect my land from being washed away by the water from the river and rain. I have planted trees as well to protect the erosion of the soil from my land along the terrain I built. This neighbourhood on my right is my brother and the farmer who is not my relative on my left. I was in conflict with both my brother and the other farmer neighbour on my left for a very long time; it was after we got the certificate that we all got relieved from those conflicts of ours we were having for very long. It is a very useful document for us in such a way to avoid such conflicts."* (47-year old married male, Enenmorna Ener, SNNP). Tree planting on this land (bottom left of the figure), is visible in the period on these parcels since SLLC roll-out in Enenmorna Ener (in 2018).

For Figure 6, the visible farm (marked by a yellow pin) respondent said: *"We are happy to receive a land ownership map. This is our land, we own it. Because of this we built a new house. We know that we can do whatever we want on our land. We can inherit, give gifts, and rent in. Eucalyptus is planted and we plant enset trees every year. We also planted mangoes and avocado. We built the house, and as a fence we planted bananas."* (39-year old married female, Kacha Bira, SNNP). Metal roofs and tree coverage increases are visible.

Finally, for Figure 7, a respondent whose farm is visible, stated: *"the presence of SLLC certificate in our life is very important because if we hadn't had the certificate any person with authority would have taken it from us. The main reason is the ownership of the certificate which proves the land is the property of my household. Because of this I planted eucalyptus tree, I built a house, and we don't worry about firewood. The advantage of SLLC is a lot."* (45-year old married female, Kacha Bira, SNNP).

Figure 5: Satellite imagery of land parcels within the sample: Enenmorna Ener, SNNP (SLLC roll-out in mid-2018)



January 2014

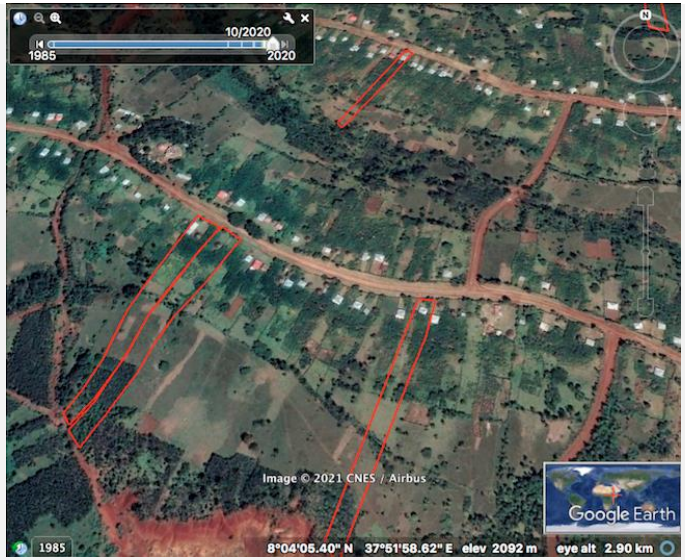
31 metal roof structures visible

March 2016

53 metal roof structures visible

January 2018

59 metal roof structures visible



October 2020

80 metal roof structures visible

Some increase in tree cover (bottom left parcels) visible

Figure 6: Satellite imagery of land parcels within the sample: Kacha Bira, SNNP, site A (SLLC roll-out in mid-2016)

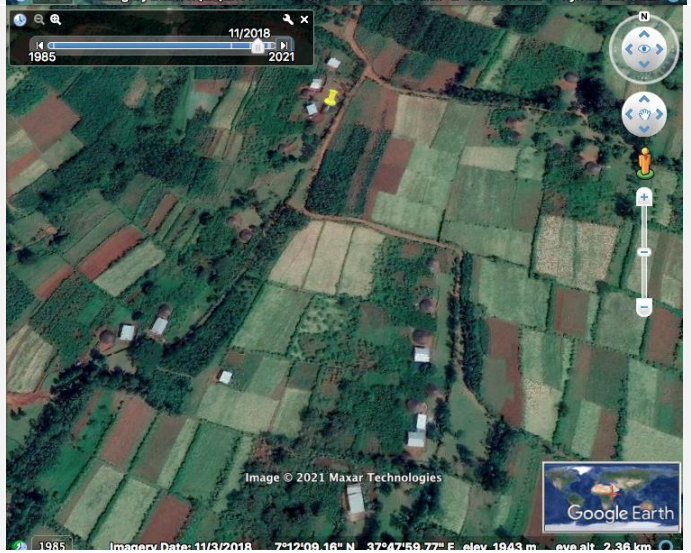
October 2014

1 metal roof structure visible

November 2017

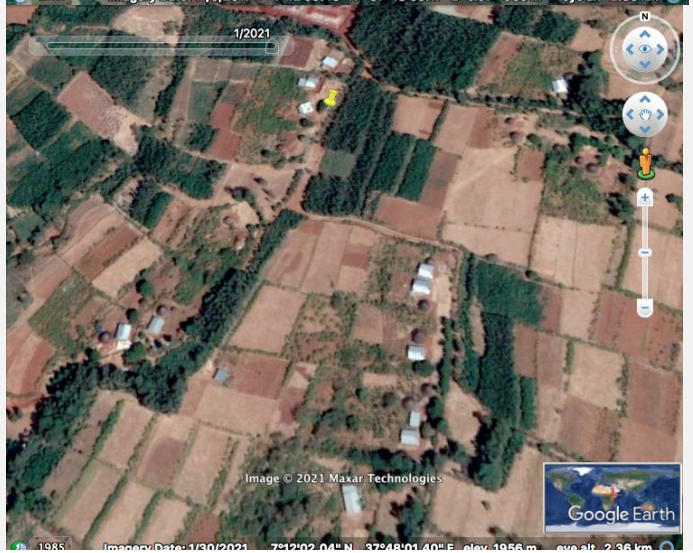
7 metal roof structures visible

Evidence of extra tree cover



November 2018

10 metal roof structures visible



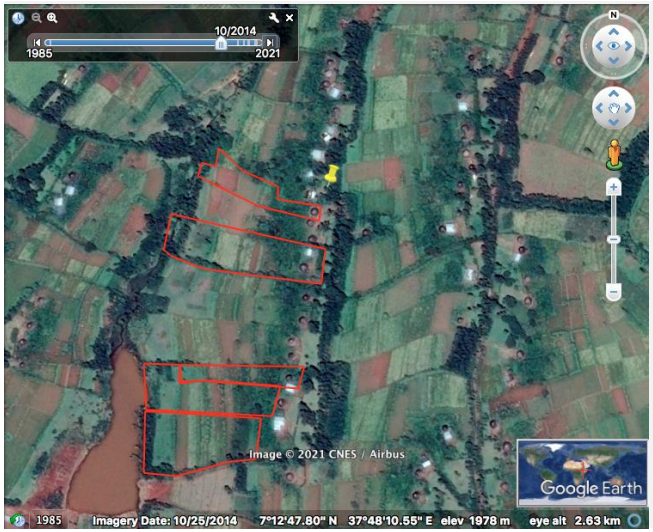
January 2021

13 metal roof structures visible

Further evidence of extra tree cover

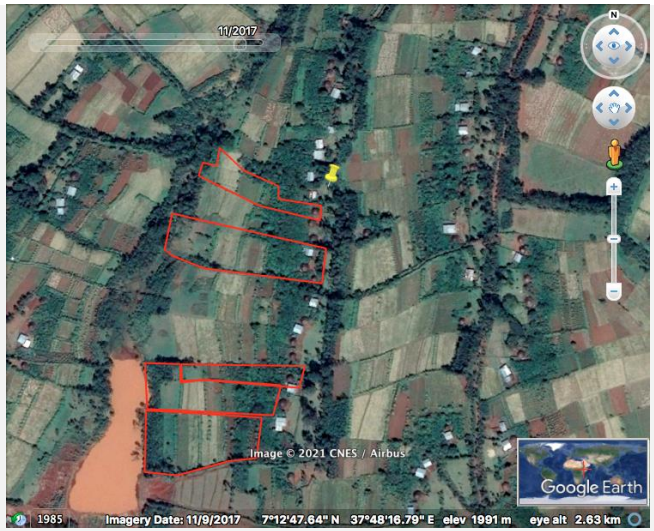
Dry conditions as reported by Kacha Bira respondents for 2020-21 Meher

Figure 7: Satellite imagery of land parcels within the sample: Kacha Bira, SNNP, site B (SLLC roll-out in mid-2016)



October 2014

15 metal roof structures visible

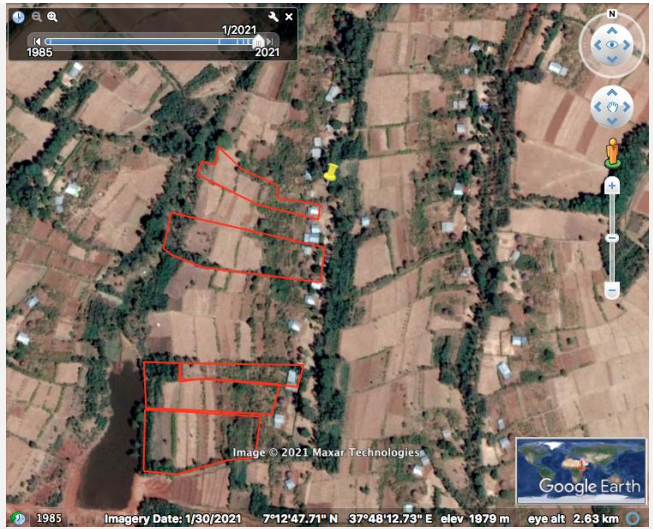


November 2017

31 metal roof structures visible

November 2018

36 metal roof structures visible



January 2021

41 metal roof structures visible

Dry conditions as reported by Kacha Bira respondents for 2020-21 Meher

7. Investments: shorter-term

Studies of land certification and tenure security have been less clear on the impact of shorter-term investments. These can be viewed as annual investment decisions with an impact within the season in question. For example, uses of seeds, fertiliser, pesticide, herbicide, as well as aspects of ploughing and composting systems. Fenske (2011), found investments in land improvement, and particularly in tree planting, but across nine data sets for West Africa, found less robust links from tenure security to labour use and the use of other inputs, such as manure or chemical fertiliser. Holden et al. (2009) in the case of Tigray also only found evidence of a link from certification to longer-term investments with trees and soil conservation structures, but an absence of evidence on manure, fertiliser use or improved seeds.

However, an absence of evidence does not necessarily imply an absence of impact. The LIFT 2019 outcomes survey (LIFT, 2020b) found significant impacts on chemical fertiliser used and self-reported links to tenure security. **Error! Reference source not found.** and **Error! Reference source not found.** in Annex 1 shows some of the outcomes survey results for the cohort of this study, that is, responses from the November 2019 fieldwork. As set out in Annex 1, for the cohort sampled in both November 2019 and in March/April 2021, the 2019 outcomes survey found significant effects on investment in seeds and fertilisers linked to SLLCs, which included 31% citing they had both invested in seeds and linked this at least in part to SLLC certification. A further 44% had invested in chemical fertiliser and linked this at least in part to SLLC certification, and the equivalent figure for organic fertiliser was 7%. Analysis of the data finds that a subset, 9% of the sample, said that had invested in chemical fertiliser "for the first time" and also said SLLC was "very important" in this. The equivalent figures for seeds and organic fertiliser were both 7%.

LIFT's EEU Impact surveys (2020) found that complementary interventions that leverage the SLLC, such as LIFT's SLLC-linked loan or LIFT's interventions to formalise land rental agreements through LRSPs, incentivise investments with positive income effects in the short-term and effects already show after 1-2 years of accessing the intervention. The impact of SLLC on investments and incomes was found to be magnified, leading to even higher investment, with 76.1% of EEU beneficiaries increasing investment, and an average income increase of 25-33% per year (depending on which EEU innovation was accessed). Complementary market interventions can therefore increase the overall economic benefit achieved through land certification, with impacts on investments and incomes in the short-term.

Findings

As set out in Section 9 on production (below), inputs are the most cited reason for those respondents where production is good or improving. Alongside weather they are likely the main drivers for short-term productivity. In the qualitative findings of the study, in terms of input use, most households reported that fertiliser use was standard, improved seeds were often purchased alongside fertiliser from government provision.[24] Farmers also cited pesticide and herbicide use. A number of farmer reported that the high cost of fertiliser and other inputs led to them using less this year with some also linking this to falls in production. Others noted limited availability of inputs or delays. Other practices extensively reported included the use of compost, application of manure or use of 'composting systems'. A minority of farmers reported the use of crop rotation.

As shown in Table 12, 25% of respondents said they had used more fertiliser in the past three years, with higher proportions in Oromia (39% compared to 18% and 15% in SNNP and Amhara respectively). The response was also more frequent among married households than widows (11% for widows compared to 27% of male-headed married households and 36% of female-headed married households), as well as richer households (33% of the highest income quintile, compared to 11% of the poorest income quintile). Conversely a common response was around the use of less fertiliser and other inputs due to high prices this year, and this response was found in 5% of the sample overall, with a particular cluster in Mirab Badawocho woreda in SNNP (23%). An important response found most often in Amhara (23% compared to 0% and 1% in Oromia and SNNP respectively) was that fertilisers were no longer working and in some cases had

24 These were answers to the question in the 2021 Income survey: *"Over the past three years, what would you regard as the most important short term changes you've made to improve your crop production in seeds (variety, type or quantity), or inputs (such as fertiliser, pesticide, etc, quantities or quality) and/or post-harvest processes?"*

contributed to making land infertile (being 'over-fertilised', which was also linked to low production (see Section 9) for many of these households. See also Table 17b in Annex 4 for disaggregation by age, education, gender, and income quintiles.

In the link between certification and short term investments, there were far fewer references in the qualitative discussions than for longer-term investments. There were some exceptions to this, most notably with 12 respondents saying they could access more inputs following their access to a loan. For example, *"we can now use the certificates as collaterals to get loans from financial institutions. In fact I already got a loan to buy inputs and made a very good use of it and became more productive."* (60-year old married male, Baso Liben). Another stated*: "we are using different kinds of agricultural practices like improved seed, fertiliser on our field. Everybody around us are taking loan from the bank and they are changing themselves thanks to SLLC certificate"* (35-year old married female, Kacha Bira, SNNP).

There were only a few other mentions of inputs with respect to certification or tenure security. There were a couple of mentions of the specific land size being useful for planning on the parcel, i.e. benefits of the map itself. For example, *"previously land left as fallow land, but now we planted permanent crops and roots. We can plan better than before, for the amount of fertilisers and seeds, because we know exactly the size of each plot."* (32-year old married male, Mirab Badawocho, SNNP). In addition, there were a handful of mentions about the SLLCs themselves, all in Oromia (2.7% of the Oromia sample) citing the information on the certificate, "at the back". For example, the SLLC *"has clear rules and regulation on how to use the land, what to produce and how to produce, the amount of fertiliser to use per land size, on what soil what to produce. Because of this certificate we are able to manage our land."* (48-year old married female, Deksisi, Oromia)

Box 5 sets out some more qualitative responses with respect to shorter-term investments, including some of the main findings, the systems of input provision linked to kebele authorities, the links between input use and productivity, challenges with prices and supply of inputs such as seeds, and land infertility in spite of increased input use.

Table 12: Experience relating to inputs and short-term investments, qualitative component of the LIFT income survey 2021 summary

Woreda or sub-group category	Use more fertiliser	Use improved seeds / seed varieties	Use more pesticide	Inputs used as usual	Use less inputs as prices high	Shortage of supply of inputs	Fertilisers not working-soil degradation	Applying crop rotation	Using more animal manure	Use compost	No changes	Awareness from kebele extension workers
Sire	46%	34%	27%	32%	9%	14%	0%	25%	9%	41%	2%	64%
Kersana Malima	69%	46%	36%	17%	3%	7%	0%	24%	12%	58%	0%	80%
Guna	29%	16%	19%	45%	7%	10%	1%	6%	1%	32%	1%	81%
Deksisi	19%	18%	13%	76%	6%	18%	0%	21%	4%	30%	0%	79%
Sankura	21%	26%	10%	45%	7%	1%	0%	1%	4%	1%	0%	36%
Mirab Badawocho	19%	16%	16%	19%	23%	13%	0%	0%	10%	19%	0%	23%
Kacha Bira	15%	9%	0%	42%	7%	4%	4%	0%	5%	13%	0%	29%
Enenmorna Ener	16%	22%	0%	6%	6%	3%	0%	0%	9%	22%	3%	19%
Enarj Enargwa	14%	3%	8%	57%	0%	0%	11%	0%	0%	12%	0%	8%
Bure	19%	13%	11%	55%	2%	19%	30%	0%	0%	15%	2%	6%
Baso Liben	20%	24%	22%	60%	0%	2%	26%	2%	0%	28%	0%	14%
Angolala Tera	7%	7%	2%	80%	0%	0%	32%	0%	0%	15%	0%	2%
Oromia	**39%**	**27%**	**22%**	**45%**	**6%**	**13%**	**0%**	**19%**	**6%**	**39%**	**1%**	**77%**
SNNP	**18%**	**19%**	**6%**	**34%**	**9%**	**4%**	**1%**	**1%**	**6%**	**11%**	**1%**	**29%**
Amhara	**15%**	**11%**	**11%**	**62%**	**0%**	**5%**	**23%**	**0%**	**0%**	**17%**	**0%**	**8%**
Overall	**25%**	**19%**	**14%**	**47%**	**5%**	**8%**	**8%**	**8%**	**4%**	**24%**	**1%**	**41%**

Box 5: Qualitative responses on questions relating to shorter-term investments
Representative positive responses
"The most important is changes I have made to improve crop production include diversifying the varieties of crops like pea, potato, barley; using modern agricultural inputs like more fertiliser, composts and pesticides; improving post-harvest processes like keeping it from cattle, storing it in proper places. The motivating factor to make these changes was the advice and support from development agent (DA). Moreover, farming is my duty through which i can support my family and cover family expenses. When I can change production I can improve the situation of the family." 45-year old married male, Kersana Malima, Oromia *"In May and June every year the agriculture office provide us with the fertiliser and we use it properly to improve our production. We also use compost and insecticide."* 79-year old cohabiting female, Bure, Amhara *"We produce and apply compost just because the family have done this for a long time. We don't use fertilisers because the land is very small and investing in fertilisers will not be profitable."* 42-year old married male, Enenmorna Ener, SNNP *"We began to buy and apply more fertilisers. We have improved our farming techniques and began using the pesticide chemicals properly. We tried new special seeds of maize called 'the Shone and Lemu seed'. I was motivated to improve the life situation of my family. The government land office gave us extensive advice on how to advance our farming techniques."* 43-year old married male, Sankura, SNNP *"We use more fertilisers every year and pesticides and chemicals to kill weeds. Fertilisers and compost are used to improve fertility of the soil and maximise yield. Compost in addition will help to minimise the increasing cost of fertilisers.* 38-year old married male, Baso Liben, Amhara
Representative negative responses
"The quantity of fertilisers we use is increasing every year. The fertilisers these days are not as effective as they used to be in boosting production. Perhaps the soil is losing its fertility and we thought using more fertilisers would somehow help." 50-year old married male, Enarj Enargwa, Amhara *"I have applied fertiliser, pesticide, used crop rotation, to overcome soil infertility. I am producing cabbage and I have applied 75 kg fertiliser per kerte. I have applied 100 kg special seed per kerte. But the land is unable to produce."* 35-year old married male, Kersana Malima, Oromia *"Even if it was not adequate, I have applied fertiliser and pesticide, since the price of fertiliser was high, I couldn't buy more than 50kg for all my lands. But if I were to apply more fertiliser and pesticide, I would harvest more."* 85-year old married male, Deksisi, Oromia *"Supplies of inputs are unpredictable and never reach on time. As a result, we could not use them properly and fully benefit. I could not get Maize seeds on time and because of the delay I failed to get as much as I thought I would."* 62-year old married male, Bure, Amhara *"We were ploughing, we have applied fertiliser, and pesticide accordingly, but we did not harvest crop because of high rainfall or dryness. Sometimes we apply 50kg but we harvested nothing due to weather change."* 52-year old married female, Deksisi, Oromia *"Because I am too poor, I did not use fertiliser and pesticide."* 55-year old female widow, Guna, Oromia *"Seed is our headache. We cannot find a new seed from the Government, so we use the seed we have at home. it is not productive."* 68-year old female widow, Bure, Amhara
Unusual responses
"We didn't get the best special seed because of the corrupt working practices of the kebele agriculture officers. We are paying in advance to get the seeds we want but the seed is not delivered and the money is refunded at the final hour. This is not too bad for wheat because the seed was also available on the market but maize seeds are inaccessible in other places." 30-year old married male, Sankura, SNNP *"We use advanced farming techniques and we use tractors to farm the land. And we use combinors and other machines. So we are applying more fertiliser, we have reached 11 quintals of fertilisers"* 51-year old married male, Sankura, SNNP *"We have applied fertiliser, compost, applied pesticide, crop rotation to increase the yield, if for one season barley harvested for next we would produce pea on same land to keep the soil fertile. We have used a machine to harvest our teff."* 27-year old married female, Kersana Malima, Oromia

8. Rental

The link between tenure security and rental market participation is a frequently cited benefit of certification in the literature, and in the LIFT theory of change (see Section 3). Important findings in the past have include for example Deininger et al. (2011) who found "certification increased the propensity to rent out by 13 percentage points and the amount of land rented out by about 9 points". The theoretical mechanisms for greater rental activity include by allowing landlords to negotiate longer-term contracts or select more productive tenants who are not a family of friend or part of their immediate network. In turn greater rental activity, can be seen as promoting 'allocative efficiency', i.e. ensuring land is in the hands of those best able to maximise output (Deininger, 2004). Other papers such as Gebregziabher and Holden (2011) found renting out land may be a means of responding to shocks such as erratic and unpredictable rainfall events and associated food shortages and "an indication that the choice of a fixed-rent contract as a coping response to shocks comes as a last resort after all other means of coping are exhausted."

Findings

The sample for the LIFT income survey 2021 was found to have quite high rental market participation for at least part of households' land. **Error! Reference source not found.** in Annex 4 provides summaries of renting-out experience across the survey, with 5% of the sample renting out some of their land, 14% sharecropping out, with 18% doing either. Proportions were higher in Amhara (27% renting out or sharecropping out land). The proportion of land rented out (as measured by numbers of fields) was found to be 43% for those doing so. In terms of sub-groups, widows were more likely to be renting or sharecropping out their land (30% compared to 12% for those married), and older respondents (30% for those aged over 66, compared to just 8% for those aged 18 to 35). Those with more education were also less likely to be renting out or sharecropping out their land (5% compared to 23% with no education).

Error! Reference source not found. in Annex 4 provides summaries of renting-in experience across the survey. This found 8% were renting in some land via cash rental, 15% were sharecropping in some land, and 20% were doing either. The proportions renting in or sharecropping in were significantly lower in SNNP (9% compared to 25% in the two other regions). For those renting, 35% of their fields were so designated. In terms of sub-group, older people were far less likely to be renting in (5%), and likewise for widows (5%). Those with more education were more likely to be renting in (32% compared to 16% for those with no education). If renting, younger groups were more likely to be renting in via cash rental than older groups (11% renting in compared to 15% sharecropping in for those aged 18-35; compared to 5% renting in via cash rental to 17% via sharecropping for those aged 56-65).

The average rental value per year across the sample for those renting out was USD 111, although it was not possible to interrogate this further in terms of the rental price per hectare. The vast majority of those sharecropping did so on a 50-50 basis, and the average amount of crop 'paid' to those sharecropping out was 48% of the crop. Average renting in prices were USD 136 per year, and sharecropping was again predominantly 50-50 with the average value 51% sharecropping-in share of the crop to be paid. In general, the wealthiest households by income quintile were more likely to be renting in more land (32% of the richest quintile by crop value were renting in or sharecropping in compared to 12% for the poorest quintile), and more likely to be using cash rental (14% of the richest income quintile renting in via cash compared to 5% for the poorest three quintiles).

Error! Reference source not found. in Annex 4 provides a summary of who households rent in and out to. For sharecropping in, 61% did so from family, compared to 86% for those sharecropping out land. This contrasted with just 48% for those renting out via cash rental doing so to family. The most common other category was friends or neighbours (33% for sharecropping in, 20% for sharecropping out, 45% for renting out by cash). The final category was non-family or those not known well, for whom 6% of those sharecropping in rented their land, and the same for those renting out (compared to 2% for those sharecropping out). Widows were found to be much more likely to sharecrop out to family than others (96% compared to 70% of married).

In line with previous findings (for example in Deininger et al. (2009)), the overall rental market picture is one in which poorer households were more likely to be renting or sharecropping out their land, while richer households

were more likely to be renting in. As shown in Table 18 those renting-out (N=118), have different characteristics to those renting-in (N=128), or those not renting at all (N=419). On all indicators of wealth and income, the picture of the two groups is clear and the overall picture is very strongly evidenced.

Table 13: Characteristics of those renting-in, renting-out and not renting at all, quantitative questions from the LIFT income survey 2021 summary

	Renting-in	Renting-out	Not renting
Age of respondent	46	55	50
Household size (people within the household)	6.0	4.6	5.8
Land size (Ha.)	1.5	1.1	1.1
Receiving remittance income (%)	38%	18%	33%
Income from livestock sales (%)	38%	18%	33%
Income from animal products (milk, eggs etc.) (%)	31%	10%	24%
Income estimate (USD) per household	530	229	308
Crop value estimate (USD) per household	861	472	533
Iron roof ownership (%)	82%	70%	72%
Mobile phone ownership (%)	79%	48%	67%
Oxen ownership (%)	89%	34%	68%

This is also supported by the survey's qualitative discussions. For those renting in, there was more evidence that it was a sign of doing well, and earning additional income. Distress sales of oxen were often linked to subsequently renting out land, while the purchase of an oxen could see land taken back and farmed by the household. For example, *"my husband is a teacher. He has no oxen. so were sharecropping out our lands."* (29-year old married female, Sire, Oromia). Further, *"my husband was forced to sharecrop out his parcel because we did not have oxen and used to get half. Now that we bought two oxen we have begun to enjoy fruits of our hard work fully. We have built a new house and begun living better."* (55-year old married male, Baso Liben, Amhara). Finally. *"I used to live in trouble before, but now I am fine. I did not have oxen before and used to share the production with another person. Now i am working with my oxen and getting good production"* (48-year old married male, Baso LIben, Amhara).

Attribution of rental market participation to tenure security and SLLC

In the qualitative findings for tenure security, the findings relating to rental were highly variable, with a clear and often noted effect appearing to be present in Oromia, less so in SNNP, and very little apparent effect cited in Amhara. Two main effects were found, one that respondents noted that SLLC meant they could rent in or out land with less fear (of losing land), and the second that they themselves had rented out more land. In total, 16% of households noted that certification gave more confidence or less fear in renting out land (16%), and a smaller proportion noted they themselves had rented in or out more land as a result of SLLC process (2.5%). Table 14 summarises the results, with perceptions regarding the reduced risk of rental much higher in Oromia (29%) than in SNNP (12%) or Amhara (3%). In addition, all citations of more land being rented due to SLLC were in Oromia (6% of respondents in Oromia).

Table 14: Rental effects of SLLCs, qualitative component of the LIFT income survey 2021 summary

Woreda	Can rent in or out and use lands without fear with SLLC	Now I sharecropped out more linked to having SLLC	Now I rented out more linked to having SLLC	Now I rented in more linked to having SLLC	Any household-specific rental effect	Land rental EEU LIFT intervention woreda
Sire	30%	0%	2%	0%	2%	Yes
Kersana Malima	34%	0%	0%	3%	3%	Yes
Guna	19%	6%	3%	0%	9%	No
Deksisi	34%	4%	5%	1%	10%	No
Sankura	12%	0%	0%	0%	0%	Yes
Mirab Badawocho	3%	0%	0%	0%	0%	No
Kacha Bira	16%	0%	0%	0%	0%	Yes
Enenmorna Ener	9%	0%	0%	0%	0%	No
Enarj Enargwa	5%	0%	0%	0%	0%	No
Bure	6%	0%	0%	0%	0%	Yes
Baso Liben	0%	0%	0%	0%	0%	No
Angolala Tera	0%	0%	0%	0%	0%	No
Oromia	**29%**	**3%**	**3%**	**1%**	**6%**	
SNNP	**12%**	**0%**	**0%**	**0%**	**0%**	
Amhara	**3%**	**0%**	**0%**	**0%**	**0%**	
Overall	**16%**	**1%**	**1%**	**0%**	**2.5%**	

While noting that sample sizes and the approach are not statistically significant given clustering effects, it can be seen that woredas with EEU rental activities had a greater perception of reduced risk of rental linked to SLLC – 20% for intervention woredas, compared to 10% for non-intervention woredas. However, in terms of those attributing additional rent to SLLC, the numbers were 1% for intervention woredas, and 3% for non-intervention woredas, suggesting an unclear pattern with respect to the interventions.

Analysis of the cohort responses from the LIFT 2019 outcomes survey found 5% indicated they had rented out more land, with 2.5% of households attributing this at least in part to SLLC. It is remarkable that this is exactly the same proportion who attributed SLLC via the very different methodology of an open qualitative discussion for the LIFT 2021 income survey. Both sets of data also found a lower proportion in SNNP, although the 2019 outcomes survey found a higher proportion of attribution of more rent to SLLC in Amhara (at 3%).

Some of the qualitative responses were very clear of the certification link to rental, for example: *"[SLLC] has affected our land use, it developed our sense of ownership, before two years we have rent out our land using this certificate, if we could not have this certificate, someone would taken our land"* (56-year old female widow, Deksisi, Oromia). In addition, there were households that attributed renting-in more land, one noting: *"we don't fear to rented in a land from other people. without this certificate there could be disagreement."* (48-year old married male, Deksisi, Oromia). Another noted: *"yes, it has impacted my agricultural activities as I have rented in extra land based on the certificate. Previously you didn't know the amount your land or land you rented in exactly but now you know it. You can harvest with confidence and you do not fear anyone can take away your land."* (31-year old married male, Kersana Malima, Oromia).

Box 6 sets out some more qualitative responses with respect to rental which show some of the main representative and insightful responses from the survey.

Box 6: Qualitative responses on questions relating to rental
Representative positive responses
"I have rented in and shared crop in to get more land that make my income to goes up. We are harvesting different types crop which we can sell and get money, I am fattening animals, on market day I am selling different things and we are getting income from them."
31-year old married male, Kersana Malima, Oromia
"After we collected the SLLC we are renting out our land without any problem. Before the SLLC people were fear of rent-in lands from unknown person."
29-year old married female, Sire, Oromia
"Over the past year, I worked hard not only on my land but also share cropped another parcel from someone in the family. As a result, production level was up by some margin."
38-year old married male, Baso Liben, Amhara
"Our household living condition has improved. Our household lands were rented out. We had no land no land for crop farming. But now since last year our land has returned back to us and we are farming on our lands."
62-year old female, separated, Guna, Oromia
"Though our harvest was not good, our life and income is improving. We used agricultural inputs and we are renting more land in by cash. We will the rented land for green peppers for which the market is good for farmers."
40-year old married male, Bure, Amhara
Representative negative responses
"I am getting old and I am not as strong as I used to be. My wife's health deteriorated over the years and she is no more able to support me in the field. I had no choice but to share crop out my holdings and now earn half of the produce."
72-year old married male, Baso Liben, Amhara
"The land is sharecropped out because of the shortage of oxen. We are a poor family."
60-year old separate/divorced female, Enarj Enargwa, Amhara
"My husband died last year, we don't have someone to support us. Previously we had sharecropped in land, but now since we don't have work force, we have returned that. This has also affected our crop production."
37-year old female widow, Guna, Oromia
"Before the previous year, I had another parcel rent in and sharecrop in. At this time, the land rent cost is high, combined with this the agricultural inputs cost is very high. I cannot afford them, which with income decreasing."
38-year old married male, Enarj Enargwa, Amhara
Unusual responses
"Life is improving, now I could build tin roofed home. I am a padre, and I have salary from a church. With the money i got from church, I rent in additional land. The production is more now"
40-year old married male, Angolala Tera, Amhara
"I returned back the land that I used to sharecrop-in and as a result the household income decreased about 75%. The sharecrop arrangement was cancelled because the land holder wanted to use the land for himself."
45-year old married male, Sankura, SNNP
"The production was good before my wife died. We used to produce well, but after she died I gave most or almost all the land to my children. I divided the land to my six children as sharecrop but they gave me nothing."
75-year old male widow, Baso Liben, Amhara
"Our land is small in size; we have no oxen. Because of this, we gave our land to sharecrop out. Last year the crop failed to produce crop, and even if the crop was little we shared it."
32-year old married female, Kersana Malima, Oromia
"My living condition become worse. My health condition is deteriorated and I don't even have a loaf of bread in my house. My husband and my four children died. No one is helping me and I am starving to death. I gave my land sharecrop out, but they did not give me even a quintal of grain. Crop production was almost nothing. I don't know what happed. They said the weather condition was not good."
83-year old female widow, Guna, Oromia

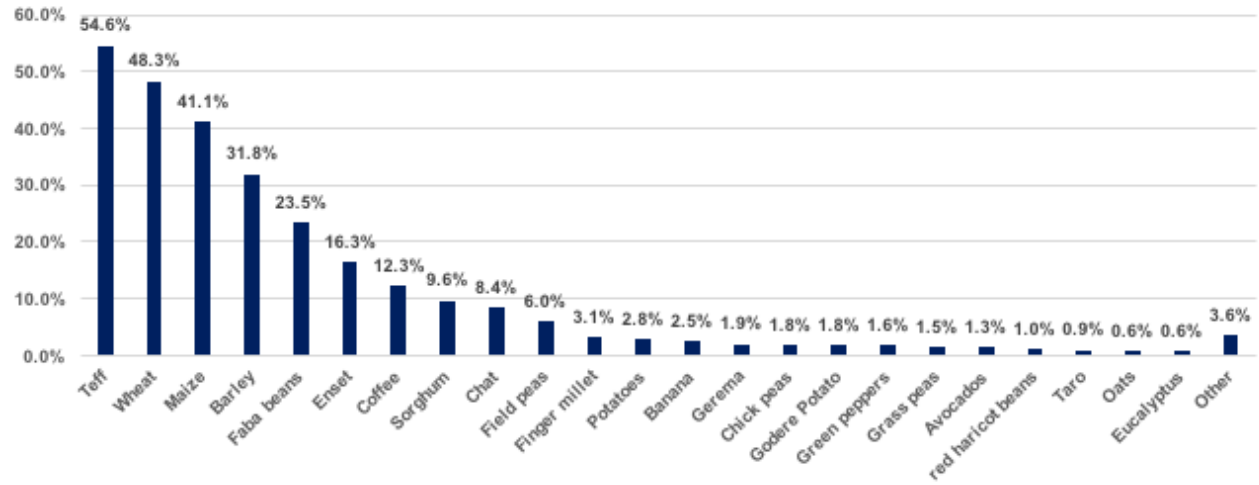
9. Production

Of the production quantified for this study (over 750 metric tonnes), around 40% was sold or exchanged, with 60% consumed by the respondent's household.[25] Subsistence production is therefore predominant for respondents, a good or a bad year can then determine how much food a household has to eat, and conversely how much it must draw down on savings, and/or in the extreme, face food insecurity. This section sets out the experience of the 2020-21 Meher season for households sampled, their main production activities, and the principal causal factors they set out in qualitative interviews for the reasons for their recent experience.

Findings

Extensive quantitative and qualitative questions were asked about production, focussing on the Meher season 2020-21. As shown in Figure 8 the main crops grown by households are the main staple crops of Ethiopia – teff, wheat, maize, barley, beans and enset – together accounting for four-fifths of crops named by households. This was followed by the cash crops coffee and chat, the less common cereals of sorghum and millet, and other types of peas and chick peas as well as potato and banana. Fruits were grown but less likely to be named as one of the three main crops of households, and some tree crops for wood were also mentioned, particularly eucalyptus (as set out above in Section 6, although trees were often not mentioned in the top three crops).

Figure 8: Proportion of households naming crops in their top three main crops in LIFT income survey 2021



Crop choice is highly variable by region and by woreda. In Amhara woredas, teff (70% of households), wheat (61%), maize (47%) and barley (31%) were predominant, as well as gerema. In Oromia woredas, barley was more prevalent than elsewhere (55% of households), alongside teff and wheat. In SNNP, enset was the most common crop (54%) which was rarely present in other regions, again this was joined by teff, maize and wheat as common crops. Table 15 sets out a summary of production by woreda including the main crop proportions, and the number of crops respondents said their household was growing. This shows that farmers in SNNP on average were growing more crops, while in many woredas patterns of production of those sampled were extremely similar, for example in Enenmorna Ener in SNNP nearly all farmers cited enset, coffee and chat as their three main crops. Other woredas had more variable production, but patterns of similarity were, overall, very clear in most woredas.

25 The quantitative approach was to ask about up to three major crops for each household.

Table 15: Summary of crop production by woreda, including number and type of main three crops farmed

Woreda	Cereal crops, pulses, oilseeds, vegetables and root crops	Spices, permanent cash crops and fruits, and trees	Total number of crops	Most common crops cited (three main crops maximum given per respondent)
Sire	3.21	0.11	3.32	Teff (89%) / Wheat (75%) / Maize (77%) / sorghum (22%) / barley (16%)
Kersana Malima	3.24	1.24	4.48	Barley (98%), beans (92%), peas (63%)
Guna	3.28	0.94	4.22	Teff (78%) / sorghum (55%) / Wheat (59%) / Maize (41%) / barley (20%)
Deksisi	3.39	0.38	3.76	Barley (80%) / teff (63%) / wheat (58%) / faba beans (59%)
Sankura	3.48	2.07	5.55	Maize (92%), wheat (88%), teff (27%), sorghum (16%), chat (30%)
Mirab Badawocho	3.50	3.84	7.34	Maize (44%) / teff (59%) / coffee (47%) or enset (66%) / coffee (47%) / banana (22%)
Kacha Bira	3.00	3.36	6.36	Enset (93%) / coffee (64%) / teff (38%) or maize (29%)
Enenmorna Ener	2.48	3.39	5.88	Enset (97%) / coffee (88%) / chat (79%)
Enarj Enargwa	3.33	0.45	3.78	Teff (95%), wheat (87%), barley (44%) / beans (15%)
Bure	3.86	0.87	4.73	Maize (98%) / wheat (43%) / millet (34%) / teff (68%) / chick peas (19%) / peppers (23%)
Baso Liben	2.84	0.76	3.60	Maize (98%) / wheat (70%) / teff (94%)
Angolala Tera	3.26	0.29	3.55	Barley (83%) / gerema (50%) / wheat (23%) / faba beans (78%)
Oromia	**3.29**	**0.66**	**3.95**	
SNNP	**3.18**	**2.96**	**6.13**	
Amhara	**3.31**	**0.58**	**3.90**	
Overall average	**3.26**	**1.30**	**4.56**	

Crop productivity

As households within woredas were very similar in terms of crop selection, this also meant that crop failures could be highly correlated, for example the wheat crop failing for many farmers due to weather conditions and interlinked pests and disease. It also makes it more complicated to compare productivity and income across woredas.[26] Table 16 provides estimates of productivity which come out of the crop analysis. This is based on the quantitative questions in the 2021 LIFT income survey on the top three crops that each respondent named. Questions were asked on the land allocation as well as the crop production for the Meher 2020-21 season, and this allows comparison of yields across woredas.

Estimates are provided for the four main cereal crops and show variation across woredas. Productivity rates calculated are significantly lower than national average productivity estimates (based on CSA 2021 data). It is possible this is due to measurement error, but it is also possible the numbers are close to being accurate and reflect what a difficult year the farmers in sampled areas have had. Yields were higher in Amhara, with the exception of wheat where they were higher in SNNP, led by productivity in Sankura woreda.

26 An additional complexity was that different areas tended to use different measures for land size (gemed/kerte/timad). Conversions had to be used as a result, but may lead to some measurement error.

Table 16: Quantitative estimates of productivity for major grain crops from LIFT income survey 2021 (productivity in kilograms per Hectare – kg / Ha.)

Woreda	Maize			Teff			Wheat			Barley		
	Kg/Ha.	N	Share	Kg/Ha.	N	Share	Kg/Ha.	N	Share	Kg/Ha.	N	Share
Sire	1,346	43	77%	917	46	82%	1,239	42	75%	1,256	9	16%
Kersana Malima		0		841	1	2%	1,121	1	2%	760	54	92%
Guna	1,232	25	36%	613	44	64%	831	36	52%	738	12	17%
Deksisi	1,609	5	6%	621	47	59%	663	37	46%	930	58	73%
Sankura	993	62	85%	514	17	23%	1,413	64	88%	614	2	3%
Mirab Badawocho	808	8	25%	507	16	50%		0			0	
Kacha Bira	1,045	12	22%	476	14	25%		0			0	
Enenmorna Ener	2,802	1	3%	2,242	1	3%		0			0	
Enarj Enargwa	498	3	4%	846	66	89%	957	62	84%	958	31	42%
Bure	3,178	42	89%	800	31	66%	1,543	20	43%		0	
Baso Liben	1,925	49	98%	981	47	94%	1,224	35	70%		0	
Angolala Tera		0			0		859	5	12%	761	25	61%
Oromia	**1,325**	**73**	**28%**	**719**	**138**	**52%**	**928**	**116**	**44%**	**866**	**133**	**50%**
SNNP	**1,004**	**83**	**43%**	**536**	**48**	**25%**	**1,413**	**64**	**33%**	**614**	**2**	**1%**
Amhara	**2,439**	**94**	**44%**	**880**	**144**	**68%**	**1,125**	**122**	**58%**	**870**	**56**	**26%**
Overall	**1,637**	**250**	**37%**	**763**	**330**	**49%**	**1,110**	**302**	**45%**	**864**	**191**	**29%**
National average (CSA, 2021)	**4,179**			**1,882**			**3,046**			**2,526**		

Notes: Transformations of responses were required due to different units used for both land size and quantity of crop productivity. Following previous studies, the estimated conversion rate used for the land size of *Gemed*, *Timad* and *Kerte* was 0.25 Hectares, the unit *Zeng* was also cited and the conversion of 0.04 Hectares per Zeng was used. A small amount of respondents used the measure *Gezem*, for which the conversion 0.14 Hectares was used. For the size of harvest, the vast majority of respondents used Kilograms or quintals, the latter was converted at 93.4kg. Outliers removed from analysis for productivity greater than 6,000 kg/Ha. or lower than 200 kg/Ha. In total, 33 outliers were removed for teff, 20 outliers were removed for wheat, 18 outliers for maize and 22 outliers for barley.

A range of respondents gave qualitative responses putting their own yields in context, which in many ways corroborate the quantitative analysis. For example, a farmer in Bure, Amhara, that received 5 quintal of teff (500 kg) amounting to productivity of 467 kg/Ha. states they received 20 quintal of teff normally in the past, which would then approach the national average (of 1,868 kg/Ha) (60-year old married male). Another farmer in Baso LIben, Amhara who received 18 quintal of maize before had seen this drop to 8 quintal (implying a reduction in productivity of 3,375 kg/Ha. down to 1,500 kg/Ha), again implying he had been close to the national average beforehand. A farmer in Guna, Oromia had got 10 quintals of teff in the past but this was now down to 3 quintals (implying 1,866 kg/Ha. in the past and a reduction to 560 kg/Ha.), again suggesting the farmer had previously been very close to the national average. These results are not comprehensive but add strength to the overall quantitative finding of low production and significant reductions from previous years, and productivity rates significantly below average national benchmarks.

Findings on production changes

Table 17 sets out the high-level production results for the year and show what a difficult year it was. In total, 68% of respondents said that production or productivity was bad or getting worse, and around 9% also cited the more extreme response implying that the crop failed or multiple crops failed. This compared to 27% that saw good, or better yield. The differences are stark between woredas, with a proportion seeing very bad years (particularly Guna and Deksisi in Oromia; Sankura, Mirab Badawocho and Kacha Bira in SNNP; and Angolala Tera in Amhara). It can be seen these are the same woredas with the worst experience in 2020-21 in terms of weather as set out in Table 6 in Section 4. In terms of other sub-groups, older people and widows were more likely to have seen production decline than others.

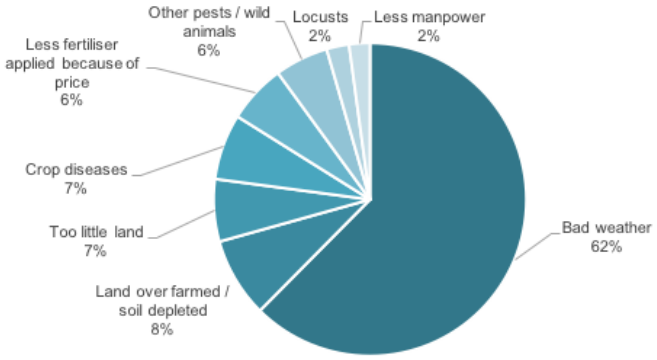
Table 17: Crop production summary for past year, from qualitative responses, LIFT income survey 2021

Woreda or sub-group category	Production or productivity bad / worsening	Crops failed	Better yield / increase in crop production	No change in crop production / yield is similar
Sire	50%	2%	48%	4%
Kersana Malima	32%	7%	63%	3%
Guna	84%	6%	14%	1%
Deksisi	84%	11%	16%	0%
Sankura	86%	15%	11%	1%
Mirab Badawocho	87%	10%	6%	3%
Kacha Bira	89%	9%	9%	0%
Enenmorna Ener	31%	0%	47%	13%
Enarj Enargwa	68%	14%	22%	7%
Bure	43%	4%	49%	6%
Baso Liben	48%	2%	36%	6%
Angolala Tera	90%	20%	7%	5%
Oromia	**65%**	**7%**	**33%**	**2%**
SNNP	**78%**	**10%**	**16%**	**3%**
Amhara	**62%**	**10%**	**28%**	**6%**
Overall Average	**68%**	**9%**	**27%**	**4%**
18-35	60%	7%	34%	7%
36-55	69%	8%	27%	3%
56-65	65%	14%	23%	5%
66-	76%	7%	21%	1%
No education	67%	9%	27%	4%
Some primary	68%	7%	28%	3%

More (finished primary or more)	71%	8%	21%	3%
Married MHH	67%	9%	27%	3%
Married FHH	54%	3%	42%	3%
Widowed	79%	12%	16%	4%

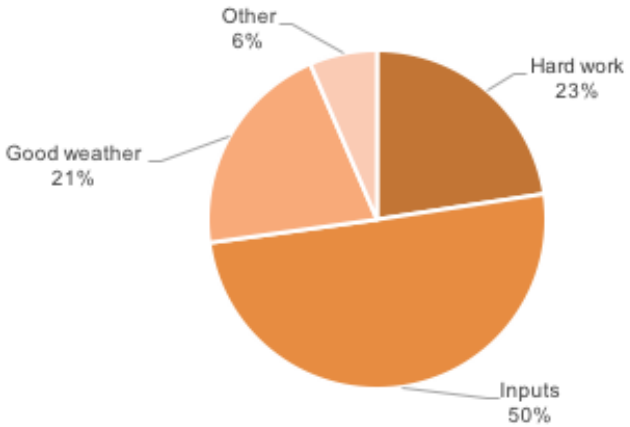
The drivers of bad or falling production were mixed but the most frequent by some margin was bad weather (predominantly too little rain, or too much rain, as set out in Section 4). Some of the other reasons were directly related including certain crop diseases or pests linked to rainfall patterns. The widely reported East African 2020-21 locusts were only mentioned in Sire woreda in Oromia (by 21% of the sample there or just less than half of those that saw production decline). Figure 9 summarises the main drivers for declining production. Limited land size was more cited in Amhara. The land being over-farmed and not fertile, soil depletion or over-fertilised were all also common in Amhara. Whereas soil depletion made up around 8% of reasons for the overall sample, it was mainly from Amhara where it made 23%. SNNP and Oromia were more likely to cite less fertiliser being applied because of price.

Figure 9: Reasons cited for low or declining production in qualitative responses in LIFT income survey 2021



A typical response for poor production was as follows: *"Our farming land is small and the production of yield is very small even the production cost did not cover the land investment like fertilisers and additional inputs cost. The agricultural land has very poor soil, the land is over-farmed and the production is small."* (48-year old married female, Enarj Enargwa, Amhara (126)). As shown however the majority of negative responses, by some distance, related to bad weather. More examples of these responses are included in Section 4 on weather above.

Figure 10: Reasons cited for good or increasing production in qualitative responses in LIFT income survey 2021



The drivers of good or improved production were less diverse, as shown in **Error! Reference source not found.** the most commonly cited reason was the use of more inputs, with around half the amount ascribing it to hard work, or good weather. A number of respondents cited multiple responses. An example response was as follows: *"the weather condition and the rainfall was good. We use improved seeds, fertilisers and pesticides. We worked hard to get better amount and quality crop production."* (33-year old married male, Kersana Malima, Oromia (544)). Box 7 sets out some more qualitative responses with respect to production.

Box 7: Qualitative responses on questions relating to production
Representative positive responses
"The production has increased. We are able to get more potato harvest. During its season the maize harvest also gave us good yield in addition to the good enset production. This is because we are taking care of the land and spending more time on the farm. We are using fertilisers properly. We are also implementing the advice we get from the land experts."
30-year old married female, Enenmorna Ener, SNNP
"Last year the crop production improved. The weather condition was very good for crop production and we used high amounts of fertiliser, pesticides and improved seed."
63-year old married male, Sire, Oromia
"Crop production is increasing compared to before. Last year we harvested 7 quintals of pea per two kerte. Before that from three kerte we were producing 10quintal. The productivity depends on rainfall, if rainfall is moderate productivity is good, but if rainfall is heavy the productivity will decrease."
27-year old married female, Kersana Malima, SNNP
Representative negative responses
"The production has decreased. The maize production has decreased significantly and we ate all the harvest before it's fully grown. Wheat production have become the lowest ever that is 4 quintals, from the former average of 10 quintals. The main reason for the decrease is the dry weather and the heavy snowed rain that happened in the area. Also, the type of seeds we used is not a good type of seed."
33-year old married female, Sankura, SNNP
"Because of heavy rainfall and too cold our crop failed to produce grain. For example, before 2008 E.C. a half hectare parcel produced 19 quintals of barley, but last season, the same parcel produced just 4 quintals."
40-year old married male, Deksisi, Oromia
"The productivity of the land is decreasing through-out the time. I don' t know what happened to the soil, we used to produce 20 quintals of chick peas from one hectare, but now it is deceased to 6 only. We just allow the oxen to suffer. The land is already burnt by the fertilisers or something else. We do not understand."
60-year old married male, Bure, Amhara
"Our agricultural activity has declined, both in terms of our crop production and our livestock breeding. This is because of too much rain outside the season, shortage of fertiliser, improved seeds and pesticides, as well as lack of manpower, lack of enough lands, and most of the time our biggest issue is environmental change. Variability of rain is a very big problem for our production."
57-year old married male, Deksisi, Oromia
"The plant disease in the area have attacked our crops. and we didn't apply very little fertilisers because it's very expensive. There is also bad weather. but the fruit trees are producing higher because it is not affected by seasonal problems."
40-year old male widow, Mirab Badawocho
Unusual responses
"I have said production has gone down and was very low. Supply of untested wheat seeds, like over the past year, is one of the major causes of failure. We cannot say no to this seed because we are forced to take them in order to get the badly needed fertilisers. The amount of fertilisers we use increases by year and supply is always less than our demand."
38-year old married male, Baso Liben, Amhara
"I did terracing to protect from floods. I have harvested bean, pea and other which sold out one killogram for 36 Birr. The amount was increased than before, for example previously one kerte gave 2 or 3 quintals, but last year we have harvested four/five quintal per hectare."
36-year old married male, Kersana Malima, Oromia

10. Income

For subsistence farmers, there can be very little difference between production and income, however the linkages can be more complex. The majority of farmers sell at least part of their produce in order to provide essential cash for goods and services, as well as to diversify their household's food consumption. The majority of households also have at least some livestock (85% of the sample had some cattle or chickens), and these provide both a food source, a source of income, and an effective source of household saving.

Findings

Overall income reported in the qualitative responses[27] was found to be decreasing for 56% of responses, increasing for 33%, and stayed the same for 9% of respondents (the total is less than 100% as not all respondents reported a clear direction). While income change is strongly correlated with production changes, the income decline was lower than for production (which saw a 68% decline as set out in Section 9), mainly because of strategies to diversify income or cope with the income shock from falling production. Overall findings are shown in Table 18. See also Table 23b in Annex 4 for disaggregation by education, age, and Woreda.

Table 18: Overall income change reported in the past year, qualitative section of LIFT income survey 2021

Woreda or sub-group category	Income has decreased	Income has increased	Income has stayed the same
Oromia	55%	36%	9%
SNNP	65%	25%	5%
Amhara	49%	35%	11%
Overall	**56%**	**33%**	**9%**
Married MHH	55%	34%	8%
Married FHH	46%	42%	14%
Widowed	68%	21%	5%
Quintile - income measure			
Quintile 1	90%	0%	7%
Quintile 2	64%	25%	6%
Quintile 3	49%	34%	13%
Quintile 4	43%	46%	10%
Quintile 5	39%	50%	9%
NA	18%	71%	6%
Quintile - crop value measure			
Quintile 1	74%	17%	5%
Quintile 2	59%	31%	6%
Quintile 3	56%	33%	8%
Quintile 4	43%	38%	13%
Quintile 5	44%	44%	10%

27 The full question was: *"402a. Consider your household's situation over the past year, and compare this to the previous three years. What about changes in the income of your household? This includes income from all sources."* This was followed by *"402b. Considering the comments you've made about your household's income situation and any changes, what would you regard as the main reasons these changes happened. That is, what were the important factors that led to these changes?"*

The experience varied significantly by sub-group. Those that were richer were more likely to see income increase (50% for the top quintile compared to 0% for the bottom quintile). While there is clearly likely to be significant endogeneity here (as quintiles are measured by this year's income), it is also likely to suggest that income protection strategies offset declining crop production, and those with more diversified income are less at risk from production shocks. Widows were more likely to see income decreases than those that were married (68% for widows compared to 52% average for married households). There were also major differences by woreda, which are strongly correlated to the differences mentioned on production (see Section 9) and weather (see Section 4).

Income diversification and protection strategies

There was significant variation between households in alternative income. Respondents were asked if they had any income from a variety of sources. A minority had remittances from children which protected them from the fall in production (16% had any remittances as measured by the quantitative question, and 2% mentioned international remittances in the qualitative section). For example: *"the livelihood for my household changed because of my children one live in USA and the other two live in South Africa we get remittance from our children"* (35-year old married female, Kacha Bira, SNNP).

Others had income from livestock sales (32%), the most common source of non-crop income. Others had a variety of alternative income sources including side businesses (18%), products such as honey, milk or alcohol sales (23%), or the household receiving some form of labour income (25%). Such strategies meant that the proportion of households saying income declined was not as high as that saying production declined.

Labour income was of particular importance to a number of households in qualitative responses, but there was sometimes a reluctance and implication it was a way of dealing with the shocks of low production. For example: *"It is not good as the passed years because we struggle a lot to make sure the we had enough for our children and ourselves. It is getting hard for us even to send the children to school for this same problem we faced nowadays. I am now working in the city on the day time by travelling all the way that you have seen while you came here to get some additional money to support my family by washing clothes of my customers. This is because of the problems that I told you which leaves us with no income."* (40-year old married female, Kacha Bira, SNNP).

Table 19 sets out a summary of income sources based on binary questions of income source, as well as the proportion of income from these sources, and a calculation of income linked to this. In total 32% of income was reported as coming from one of these alternative sources and 65% of households reported having income from at least one of the categories (implying 35% of households only received their income from crops). See also Table 24b in Annex 4 for further disaggregation by education and Woreda.

The table also provides estimates of income, both overall income, and a separate value of crop value. More detail on how these figures were calculated in Annex 7, while the prices used to estimate crop values are provided in Annex 6. The methodology provides an estimate that is relatively robust particularly once outliers are removed. This also provides the foundation for the income quintiles which are used throughout the report. For these figures there are some woredas with significantly higher income, for example Bure (USD 796 average income, and USD1,226 for crop values), this may be linked to measurement error but may also be linked to larger land sizes for the sample there (1.6 Ha. of land reported for the three crops, compared to the average of 1.2 Ha.). The poorest woredas in the year assessed were Kacha Bira and Enenmorna Ener in SNNP with household income estimated at USD 86 and USD 81 respectively. Both areas were among those with difficult production years, while land sizes were also lower at 0.6 Ha. and 0.9 Ha. respectively, the woredas had the lowest estimated market values of crops as well, at USD 207 in Kacha Bira, and USD 226 per household in Enenmorna Ener. Household income was also lower for widows than married households, while those more educated had higher estimated household income than those who had no education.

Table 19: Summary of sources of income, and estimates of income by group, from quantitative responses in LIFT income survey 2021

Woreda or sub-group category	Paid labour	Rental income from land	Rental income from property	Remittances	Sale of livestock	Sale of animal products, (milk, eggs, etc.)	Business operations, unrelated to crop sales	Share of income from other sources	No income source (other than from crops)	Income est. USD	Non-crop sales (USD)	Land size (Ha.)	Crop value est. USD
Oromia	**32%**	**6%**	**13%**	**21%**	**53%**	**41%**	**36%**	**44%**	**16%**	**499**	**306**	**1.4**	**621**
SNNP	**35%**	**6%**	**-**	**25%**	**10%**	**9%**	**10%**	**33%**	**38%**	**287**	**165**	**0.9**	**397**
Amhara	**7%**	**3%**	**1%**	**3%**	**25%**	**14%**	**4%**	**17%**	**58%**	**483**	**533**	**1.2**	**752**
Overall	**25%**	**5%**	**6%**	**16%**	**32%**	**23%**	**18%**	**32%**	**35%**	**320**	**142**	**1.2**	**585**
18-35	36%	6%	7%	15%	31%	30%	17%	34%	32%	325	128	1.1	580
36-55	27%	4%	6%	16%	32%	21%	18%	32%	35%	373	164	1.2	619
56-65	21%	7%	5%	15%	33%	23%	18%	32%	33%	346	152	1.2	604
66-	13%	3%	4%	20%	30%	22%	21%	30%	44%	238	130	1.3	487
Married MHH	27%	5%	6%	16%	32%	24%	19%	33%	34%	378	172	1.2	621
Married FHH	24%	2%	8%	22%	46%	27%	15%	29%	27%	378	150	1.2	666
Widowed	12%	5%	2%	17%	23%	16%	15%	31%	48%	156	65	1.1	422

Findings on asset ownership

The survey asked questions on asset ownership, following on from other LIFT surveys including the outcome survey (LIFT, 2020b) and the original LIFT baseline survey (LIFT, 2015). Asset ownership data is provided in **Error! Reference source not found.** in Annex 4. It can be noted that there were two main areas in which there were significant changes from the overall baseline survey results from 2015. These were the proportion of households with an iron roof, which was at 60% in the 2015 baseline, and up to 74% in the LIFT income survey 2021. In addition, for the baseline survey, 40% had a mobile phone, a figure now up to 66%. However other areas of assets did not vary much between the two surveys, for example 40% had a radio in the baseline, down to 39% for the 2021 survey, 73% had cattle at baseline in 2015, up to 78% in 2021; 2% had a television in the 2015 survey, up to 3% for the 2021 survey. Sample sizes and differences in methodology make these comparisons not statistically significant, however the changes for mobile phones and iron roofs are likely to show a genuine difference (given overall trends of mobile phone ownership in Ethiopia, and for roofing as shown by satellite imagery for iron roofs in Section 6).

Other points to note include those that are most correlated to income, such as mobile phone ownership (61% for bottom two quintiles, 71% for top two quintiles) and oxen ownership (53% for bottom two quintiles, 82% for top two quintiles). Electricity access is more geographical, and only three woredas have households with significant access (Guna in Oromia with 46%; and Mirab Badawocho and Kacha Bira in SNNP with 78% and 62% respectively). Cattle ownership also appears to be geographical - with more by proportion and number in Deksisi woreda in Oromia, and Angolala Tera in Amhara – this is likely to do with the availability and type of land in these woredas.

A complexity across the qualitative research is that sales of livestock and working animals were often driven by distress, thus livestock sales are not always treated as a 'source of income' but rather a case of asset depletion. For example, *"life is becoming worse. We do not own enough fertile land to produce more and cover the ever growing costs of farming and living. We do not earn enough to cover costs of farm inputs, health insurance, tax, etc. Income has decreased. I had to sell my cow and oxen to pay back the inputs I managed to take on credit."* (42-year old married male, Enarj Enargwa, Amhara).

Prices and income

Finally, it should be noted that prices and income were closely inter-related in the survey (more discussion of this in Section 11), and in some cases high prices were either cited as a reason for income being lower (in terms of purchasing power), and for others as a reason for income being higher, or compensated for (due to higher prices for crops sold). As an example, touching on both points: *"the income has increased despite the high cost of living. We are selling our farm produce with good price. Teff used to be sold at 700-800 Birr, but now the price is from 2000-3000 Birr and even more. Even though the production is low coffee is also being sold at double the previous at 150 Birr now."* (55-year old married male, Mirab Badawocho).

Box 8 shows some further qualitative responses relating to income including differences of experience with the diversification of income, prices, and asset ownership and savings depletion.

Box 8: Qualitative responses on questions relating to income
Representative positive responses
"Income has increased. We are producing and selling more maize. Then we exchange the crop and plant Wheat on the same plot. Income is higher because the prices of crops is high and we are getting good income from selling the produce." 53-year old married male, Kacha Bira, SNNP *"Last year chat was my main source of income. I drilled a hole about eight metres deep using a machine. This well was completely filled last winter. Because of this I have a high production of chat. I also built a nice house from eucalyptus tree sales."* 57-year old married male, Sankura, SNNP *"Our income has increased because of crop production and chat selling that contributed for our income to increase. Last year because of high crop production and chat, we have sold at a good price. Since we have bought a cow, we are selling milk which is contributing for income to increase."* 60-year old married male, Guna, Oromia
Representative negative responses
"Our income declined. We have no other source of income than farming." 62-year old married male, Sire, Oromia *"The shortage of rainfall is the reason behind the decreased income for my family. Expenses for healthcare services for the family and pandemic diseases caused declines in the income of the family."* 79-year old married female, Guna, Oromia *"Since our income depends on crop sales and we did not harvest last year, our income has decreased compared to before. Even we are now buying our food by selling our oxen."* 48-year old married female, Guna, Oromia *"We have no income. Even though we have financial problems, our family lives in love. There is no quarrel in our family. The crop we planted is gone; my husband worked daily labour and earned a little money, but now there is no labour work. Our family is alive with the money I made by selling handcrafts."* 32-year old married female, Kersana Malima, Oromia *"Income is going down over the years and has reached rock bottom. In a manner of speaking, one can say we had drought over the past year. The rainy season was then longer and the abundant rain ended up destroying the crops. Hence, our grain harvest was very low and grain, our only source of income, was meagre."* 62-year old married male, Enarj Enargwa, Amhara *"My life depends on my parcel. The amount of teff and wheat they gave me is better for me my income. Now there is a shortage of crop production. We used to produce 5 or 6 quintals of teff and wheat, but now is almost 2 or 3. The weather was not good and the rain was too much. The freeze and pests are the other situation. Even when it was harvested, it was like grass. I am divorced and I have no other source of income."* 47-year old separated female, Enarj Enargwa, Amhara
Unusual responses
"Life is getting harder and harder from time to time. Many of us in the community are afraid that we would not be able to keep on support our family in the future as things are getting worse and worse. I was working in the sugar cane farm for more than two years in the Tigray region to expand our income, and I am now displaced from there because of the current conflict." 47-year old married male, Kacha Bira, SNNP *"Now our income becomes bad. Last year I had a wedding party for my daughter, and we sold trees and other properties to cover the wedding expenses. But now, I have nothing as an income."* 35-year old married female, Enarj Enargwa, Amhara *"We are generating income from different sources, sugar cane selling, and from chat I have been making 40,000 birr per year. Also I have income from other fruits and vegetables, and from animals and animal products. I also have rental income, and in town I have business property which I rented out and. We have sold our crop, animal and sugar cane and this all increased my income."* 52-year old married male, Guna, Oromia *"When I compare last year with previous two or three years my income is increasing. For example, I bought five additional animals, chickens, and in the household I bought materials and clothes. Even if I didn't kept money in a bank, I do have in kind. Previously I bought one of my cow with 12,000 and now it has a calf, so if I want to sell, I can sell for 20,000 or more."* 57-year old married male, Deksisi, Oromia

11. Well-being

The survey period coincided with the COVID-19 pandemic, as well as a particularly difficult year for weather and interlinked declines to production and income as set out in Section 4, Section 9 and Section 10 respectively. This has also then affected the well-being of households. However, there are of course other drivers of well-being, and it is important not to ascribe judgements about well-being to simple linear assumptions (for example that if production is improving, well-being must also be improving). Questions were therefore asked about the overall well-being of the household in order to capture both the wider set of factors influencing the respondent and family's life, and also to link the changes to production and income to this broader category. The questions provide insights into the perspective of respondents on their household's condition, including with respect to health, death, marriage, migration and education and job opportunities for the family including children.[28]

Findings

Income is the most common driver of well-being, and therefore by implication, crop production is the main driver of income for sampled households. In total 79% of households' answers on production, income and well-being were aligned (i.e. improving, worsening, or the same). In total, it was found that 54% said well-being worsened in the year, compared to 37% who said it had improved. This was a slight deviation from the income responses (56% and 33% for worsened and improved respectively). It was found there were 6% of the sample who reported well-being improving despite income getting worse, and 4% who reported well-being getting worse despite income getting better. Around two-thirds of those who reported declining well-being despite increasing income also reported worsening health, which is likely to be the main driver for these households.

Table 20 sets out the overall findings with respect to well-being. Health and age were found to be big drivers of well-being, and often this linked to experiences of production and income. Respondents cited old age as restricting ability to work, and this group were most likely to say well-being was bad or worse (68% of those aged 66 and above saw well-being worsen, compared to 55% of those aged 56-65). Households with a member facing health difficulties also faced major challenges including high medical costs. A proportion of households (6%) lost a member to death and faced grief alongside decreases in the ability to farm. See also Table 25b in Annex 4 for disaggregation by education and crop value quintiles.

Households that saw positive developments in the past year to their well-being were sometimes driven by better or good health, sometimes by marriage or another positive development in their lives. When linked to production improvements, farmers attributed improvements to either good or better weather, the use of more or improved inputs, and a significant proportion to hard work (as set out in Section 9 and 10 above). Income was also highly correlated to well-being when looking at income quintiles – 52% of the highest income quintile said well-being had improved in the previous year, compared to just 11% of the poorest quintile. This suggests that the various means to protect income from the twin shocks of COVID-19 and challenging weather, also enabled households to continue to progress and see their overall situation as improving.

28 The questions asked were: *"401a: Consider your household's situation over the past year, and compare this to the previous three years. Please tell me how the overall well-being of your household is now compared to before, whether the situation has changed, and if so how it has changed."* Followed by *"401b: Considering the comments you've made about your household's situation and any changes, what would you regard as the main reasons these changes happened. That is, what were the important factors that led to these changes?"*

Table 20: Responses relating to overall well-being, from qualitative responses in LIFT income survey 2021

Woreda or sub-group category	Well-being bad / worsening	Well being good / improved	No overall change in well being	Life bad and we intend to migrate	Health good / improved	Health status not good / worsened	Long term illness of spouse	Faced high costs of health care / medication	Can't work / reduced work due to age or health	Sharecropped out / rented out land due to age	Lost spouse to death (in recent period)	Other family member died	Children taking part of land when they marr	Children are supporting me / working the land	Less food to eat / facing food security issue
Oromia	**53%**	**38%**	**8%**	**0%**	**31%**	**13%**	**1%**	**3%**	**13%**	**1%**	**6%**	**2%**	**0%**	**3%**	**20%**
SNNP	**63%**	**34%**	**3%**	**0%**	**4%**	**14%**	**2%**	**4%**	**5%**	**1%**	**3%**	**2%**	**1%**	**3%**	**18%**
Amhara	**47%**	**40%**	**13%**	**1%**	**2%**	**3%**	**2%**	**1%**	**10%**	**5%**	**4%**	**1%**	**4%**	**2%**	**3%**
Overall	**54%**	**37%**	**8%**	**0%**	**14%**	**10%**	**1%**	**2%**	**10%**	**2%**	**5%**	**1%**	**1%**	**3%**	**14%**
18-35	42%	47%	11%	1%	21%	6%	2%	1%	3%	1%	1%	3%	0%	0%	17%
36-55	53%	38%	8%	1%	13%	8%	0%	2%	4%	1%	5%	1%	1%	2%	13%
56-65	55%	34%	10%	0%	16%	13%	2%	3%	11%	2%	2%	1%	2%	4%	14%
66-	68%	28%	4%	0%	8%	17%	3%	4%	33%	7%	9%	1%	3%	7%	16%
Married MHH	53%	38%	8%	0%	15%	9%	2%	1%	8%	1%	1%	1%	2%	3%	14%
Married FHH	47%	39%	14%	2%	15%	3%	0%	5%	3%	3%	8%	2%	0%	2%	15%
Widowed	66%	28%	6%	0%	9%	17%	1%	7%	23%	6%	27%	1%	2%	4%	11%
Quintile - income measure															
1	77%	11%	12%	1%	13%	15%	2%	2%	18%	3%	9%	1%	1%	2%	15%
2	58%	36%	5%	0%	15%	15%	2%	2%	11%	1%	3%	0%	1%	2%	20%
3	54%	41%	6%	0%	20%	9%	1%	4%	9%	4%	6%	2%	2%	3%	15%
4	49%	39%	10%	1%	10%	4%	1%	3%	2%	1%	4%	2%	2%	2%	11%
5	39%	52%	9%	0%	10%	9%	2%	2%	10%	2%	2%	2%	0%	2%	12%
NA	21%	71%	6%	0%	24%	3%	0%	0%	3%	0%	0%	0%	3%	12%	3%

Responses relating to COVID-19

COVID-19 came up in a handful of interviews though is likely to have been behind many findings, notably around prices and inflation. Specific questions were asked directly about COVID-19 in the quantitative sections of the survey. As shown in **Error! Reference source not found.**, responses found that not all households said they were aware of the pandemic. Awareness rates varied by region, with 69% of those in Oromia aware, 75% in Amhara, compared to 97% in SNNP. It is not clear the reasons for these differences (speculation might include different regional policy responses), but they also align to the questions around worry regarding health and worry regarding the threat to household finances. Notably, of those aware of COVID-19, in SNNP, 61% saw it as a substantial threat to household finances, compared to just 11% for Oromia and 36% in Amhara. Despite these findings, in a further question on whether farming activities had been carried out as normal over the past four weeks, households in Oromia were more likely to cite they had not been able to. Households in Deksisi, Guna and Sire woredas cited incidences of being advised to stay at home, transport restrictions, as well as reduced availability of hired labour. See also Table 26c in Annex 4 for a disaggregation by Woreda.

Table 21: Responses relating to questions on COVID-19, from LIFT income survey 2021

Woreda	Aware of COVID-19	Worry about health impact of COVID-19				Threat of COVID-19 to household finances			
		Not at all worried	Not very worried	Somewhat worried	Very worried	Not a threat	A minor threat	A moderate threat	A substantial threat
Oromia	**69%**	2%	12%	28%	57%	35%	14%	40%	11%
SNNP	**97%**	5%	14%	26%	54%	6%	10%	23%	61%
Amhara	**75%**	11%	37%	12%	40%	11%	36%	17%	36%
Overall average	**75%**	**11%**	**37%**	**12%**	**40%**	**11%**	**36%**	**17%**	**36%**

Box 9 sets out some more qualitative responses with respect to the impacts of COVID-19. Many of the economic consequences were brought up by respondents in SNNP. This included the impact of trade closures, the ability of children to work around the country (and send back remittances), as well as the implied impact on commodity prices and the prices of inputs. Other responses relate to the link to prices, and the effects regarding health and education.

Box 9: Qualitative responses on COVID-19
Related to prices
"Our life was faced by many challenges in the last year, one problem is the COVID-19 pandemic. Because of this disease inflation came to be high" 28-year old married female, Deksisi, Oromia
"Since the COVID crisis there is a tremendous increase of price on all commodities and you cannot even buy what you are looking for, though you had the money to buy it. This is making us that a very bad life since then. It is only water that we get from the spring down there which is not we are paying for; all the rest is difficult to get even if you pay for it. We cannot attend the weekly market in our community and we cannot meet whoever we wanted to meet because of the pandemic." 47-year old married male, Enenmorna Ener, SNNP
Related to health and education
"The COVID-epidemic worried our family. Because of the COVID-19 epidemic our children dropped out school. When the outbreak occurred in our country we were terrified that the disease would hit our area." 38-year old married male, Sire, Oromia
"The most important thing is health. Our household health condition was very good and better than before/improved. We didn't go to the places people were gathered because we were afraid of COVID-19. As a result, we have been able to prevent the spread of infectious diseases which could affect our household." 39-year old married male, Deksisi, Oromia
Related to economic consequences

"Traders closed stores and they say there is no movement due to COVID."

47-year old female widow, Kacha Bira, SNNP

"As everyone knows, there is COVID in the city and other places, no one can move freely from place to place. Because of this I cannot increase my income."

47-year old married male, Enenmorna Ener, SNNP

"There is a lack of employment opportunities with fear of the COVID-19 pandemic, that led to ignoring and avoiding other potential work partners along with the other security problems in the country."

42-year old married male, Enenmorna Ener, SNNP

"My children couldn't work in other places because of Coronavirus and the security problems in the country."

45-year old female widow, Kacha Bira, SNNP

"When COVID entered into our country it created big problems. All commodity prices were high. Over the past year everyone cannot shake hands, not kiss, cannot go together in the market place. Because of this, prices are very high. If we go to the cattle market, if you do not have a mask, it is a big problem and no one is interested to talk you. So how can we get money? Previously one of my sources of income was cattle trading. Because of COVID my two children returned home from university, and are simply sitting at home without work; no income, only expenses."

40-year old married female, Kacha Bira, SNNP

Findings relating to prices and the cost of living

Major findings linked to COVID-19 on the implications for prices came up a number of times in the qualitative discussions and are summarised in Table 27 below. Regardless of the link to COVID-19, in total, 40% referenced prices in their qualitative discussions. Around a quarter of these responses mentioned it with respect to a positive in that they could increase the value of the sales of their crops. However, for the other three-quarters prices of purchased goods were mentioned, this included around 8% of the total sample who mentioned that input prices had increased, and around 25% who mentioned the high cost of living and general inflation rates. This response was much more prevalent in SNNP (45%) compared to Oromia (18%) and Amhara (17%). This finding may provide suggestive evidence for why COVID-19 was seen as more of a financial threat in SNNP than the other regions (see above). See also Table 27b in Annex 4 for a disaggregation by Woreda.

Table 22: Responses relating to prices, from LIFT income survey 2021 qualitative questions

Woreda	Inputs price up / high	Fertiliser price up / high	Labour cost up / high	High cost of living / inflation increased / cost basic goods increased	Crop price increased (cash from sales increasing)	Crop price of specific crop decreased	Any prices mention
Oromia	4%	3%	0%	18%	8%	0%	28%
SNNP	4%	8%	1%	45%	15%	0%	53%
Amhara	16%	9%	2%	17%	14%	3%	43%
Overall average	**8%**	**6%**	**1%**	**25%**	**12%**	**1%**	**40%**

Box 10 sets out some more qualitative responses with respect to prices and the cost of living. This shows some of the variety in these responses, covering the three major impacts. Firstly, that the cost of essential items is high meaning the cost of living is high; secondly that the cost of inputs is higher with implications for their use (see Section 7 on shorter-term investments); and thirdly, that sales prices of crops had increased for those selling, and this could have an offsetting impact to declining production or to cushion other shocks to income.

Box 10: Qualitative responses on increasing prices / cost of living
Representative positive responses
"Our income has been increasing and I have been saving from my income. I have applied fertiliser and on my crop which increased our income. The price of cereal crop has been increasing, and sometimes I am doing daily labour activities that also contributed for our income. Labour income has increased and daily can earn 70 birr." 21-year old single male, Kersana Malima, Oromia
"There is a change in the price of products on the market. This makes the change on the income of my household. Though you get good money for the sale of your products, there's a problem of the money buying capacity, which is weakening every time. This is blocking us from getting the change with a bigger margin." 47-year old married male, Enenmorna Ener, SNNP
"Our income has increased. Coffee, maize and teff are being sold. I have also sold a cow, and the women in the family are selling dairy products. We have sold eucalyptus tree wood. The price of crops have risen and we have sold our produce at a good price. We are selling coffee 5 times the price it was two years ago. The same is true for teff." 50-year old married male, Mirab Badawocho, SNNP
Representative negative responses
"Our family's living condition is declining over the past three years. With the ever-changing climate, the cost of living is increasing beyond our incomes. We earn very little money; and when we go shopping we spend a lot of money." 62-year old female widow, Guna, Oromia
"The amount of fertiliser used on our farming was low because of its high price and our inability to buy." 36-year old married male, Sire, Oromia
"The cost of living is becoming high. The poor society can't afford the market price of goods and services. The locusts also reduced our crop yields and this leads to high price of grain cost. Even we couldn't buy 10 kilograms of food grain." 30-year old married female, Sire, Oromia
"Production is decreasing and we cannot produce more than what we can eat. Nowadays only rich people can afford fertiliser." 68-year old female widow, Bure, Amhara
Unusual responses
"We spent a lot of money to buy pesticide, fertiliser and better and new seed, but we cannot get a good result. We used to buy fertiliser relatively with less price than now. But now even I use more fertiliser with more money, the result is almost same or less. We bought fertiliser with credit, and when it is time to pay back, we must sell something with less price to cover the credit with interest." 56-year old married male, Enarj Enargwa, Amhara
"When we compare last year with previous one, our well-being increased. Our health condition is improving and we have separate rooms for animals and humans now which was not before. Last year our crop production was increased and overall our income increased since we are selling our crops at a high price. Previously 100 kilogram was 700 birr but now it is about 2000 birr, so we are expanding agricultural activity to earn more. We have sent our children to school which was not a case before three years since we could not able to cover school related costs." 65-year old married male, Kersana Malima, Oromia

Other aspects of well-being including on migration

Migration was the most extreme response for some households faced with the difficult year of 2020-21. While only three respondents expressed the intention to migrate, the initial survey data on contact rates (see **Error! Reference source not found.**) suggested that ten households had migrated between November 2019 and March/April 2021, representing 1.3% of the original target sample. In addition to this 81 households could not be found (10.5% of the sample) and it is possible some of this was also due to families having moved. In addition to this, questions were asked about whether anyone from the household had moved in the previous two years.[29] In response, 22% of households noted that at least one member had moved, with "seeking work" the most common reason. For this question households from Amhara (16%) and SNNP (20%) were more represented than Oromia (7%). The movement of household members seeking work was also more pronounced in certain woredas. Notably in Sankura in SNNP (30%) and in Angolala Tera in Amhara (24%). In terms of income quintiles, this movement was not significantly different (at 27% for the poorest quintile compared to 23% for the richest quintile).

29 *"Has at least one previous member of your household permanently moved out of this household at any point over the past two years?"*

Finally, it should be noted, that in many cases there were overwhelming circumstances driving well-being, which were specific to the household. For example: *"I was treating my sick husband; our lands were rented out to send him medical treatment. After my husband died my stepchildren took away most land. The people who lent me money during my sick husband treatment now they took the remaining lands as a collateral. I have no family who help me."* (51-year old female widow, Kersana Malima, Oromia). A further example can be seen in the following response: *"We go backwards in life that have never been before. I have never purchased food from the market for I was able to supply by myself from my farms. It is because of the bad year we had now, and some personal problems that I faced in the meantime. I have lost 5 oxen and 16 cows this year only because of the disease they were attacked with. I have on top of this spend almost about 100,000 Birr for my daughter who wanted to go abroad this same year which destructed me to the maximum in addition to the other problems that I faced."* (40-year old married male, Sankura, SNNP).

Responses highlight some of the many inter-related factors that were mentioned on the well-being question. The availability of remittances could be a key driver, for example: *"My son who went abroad has sent money. I also occasionally earn money with someone my friends share by selling and buying oxen. My wife also has a donkey and she trades in it. So, last year was better for my family in terms of income."* (42-year old married male, Sankura, SNNP). Other unusual responses included an emphasis on improved public service provision in their area, for example: *"The health extension worker is teaching us on improving sanitation. We have a health insurance card and we can get medical services when we are ill. We also now have good road infrastructure and ambulance service. Robberies have reduced as government sends security officers if someone try to rob or rape. Previously there was no one who could read and write because no one was educated in our family but now schools are opened here near to us. We sent our children to school and now they can read and write letters and other documents to us."* (76-year old married male, Kersana Malima).

Box 11 sets out some more qualitative responses with respect to well-being, including linked to health, education, income, and agricultural production.

Box 11: Qualitative responses on questions relating to well-being
Representative negative responses
"The land is over farmed. My wife is sick. I am busy because I help her, nobody supported me on the farming of my land." 56-year old married male, Enarj Enargwa, Amhara
"The well-being has decreased. We have very limited production. We are not feeding the children nutritious food like vegetables. The children have become unhealthy and physically weak." 50-year old married male, Sankura, SNNP
"The wellbeing has worsened, and I have never seen such problem in my life. I don't have food to eat. Since my husband has died, I was in trouble." 66-year old female widow, Guna, Oromia
"In the last year, our life has declined. Due to age, we cannot work on our farm. Our children are almost finished school. Our health status was not good. We do not have support from our family who are independent." 65-year old married female, Sire, Oromia
Unusual responses
"My well-being and life has not improved. But before it was good. Production is declining and now it is difficult to live. I am working hard as compared to before but this isn't helping. Last year I had a wedding party for my daughter, and I sold trees and could cover the expense, but now I have nothing except crops to eat. The drought is bad, our sowing was lost and we are in danger. We are intending to migrate." 42-year old married female, Enarj Enargwa
"Everything is declining. It is related with the production we get, since our farming become bad from time to time and we could not get money for medical services and we lose one of family member who died because of lack of money." 68-year old female, cohabiting male-headed household, Enarj Enargwa
"Our household's well-being situation over the past year has improved. Our children are able to learn to read and write. My household is in perfect health, and we safe in security. Our household's agricultural situation is improving. But in our kebele there are so many different problems. For example, we have no health centre nearby; we have no pure water; we have no road infrastructure; we have no electricity; and there is no grain mill nearby." 38-year old married male, Sire, Oromia

Conclusions

The 2021 income survey carried out in March and April 2021 has aimed to add insights into the linkages from SLLC certification, tenure security, and the experiences of households in terms of investment, production, income, and well-being in the previous year. The research has been carried out for the UK's LIFT programme which has supported roll out of secondary level land certification (SLLC) for over 14 million land parcels across 175 woredas in four regions of Ethiopia. A panel of households was selected from 12 woredas across Amhara, Oromia and SNNP, first interviewed for LIFT's 2019 Outcomes survey and then again for the new survey in 2021. By using a methodology based on the Qualitative Impact Assessment Protocol (QuIP), combining qualitative conversations with targeted quantitative data, we are able to get a detailed picture of the experience of the 2020-21 year as compared to previous years. This is based on the voices of a sample of 669 respondents from farming households, asking them about the major changes they have experienced and what they attribute as driving these changes.

The year had one very specific circumstance in terms of the COVID-19 pandemic, which likely had a number of impacts in terms of children's education, the cost of living and inflation, crop prices, and availability and supply of inputs, as well as opportunities for a range of income sources, from labour income, to remittances, to the potential sales from side businesses. The other major challenges of 2020-21 for the sampled households related to the weather. The farmers we spoke to are at the front line of climate change, with a combination of unprecedented temperatures, up to 3.4°C above the previous ten-year average in November 2020, and significant deviations from rainfall averages, most notably with heavier than average rainfall in the Kiremt rains particularly in August 2020, which were cited by some respondents as directly leading to crop failures. Others experienced low rainfall and drought, heavy hail, unseasonal frost in some areas, and interlinked pests and crop diseases. One woreda was also affected by locusts. A number of respondents noted the presence of both too much rain and too little rain, i.e. excessive variability and issues with the timeliness of rainfall compared to the usual agricultural calendar of the country.

The experience has been in line with projections set out in climate change models, and for some months in 2020-21 temperature increases were in excess of 30-50 year projections (Murken et al. 2020). Climate change is set to drive shifts in yield patterns for the major crops of Ethiopia and across different regions, making areas marginal or less suitable for staple crops, with teff, maize, wheat and coffee all likely to be affected. The survey year was significantly in line with these projections, with a number of instances of crop failure for wheat (the crop said to be most at risk of becoming more marginal according to models), teff, and coffee (also projected be highly vulnerable to temperature change), among others. Weather is said to explain 55-89% of year-to-year yield variability (Murken et al., 2020), and this aligns with the experience of sampled households, with 68% saying production was bad or declining in the past year and bad weather cited as the most common reason for these declines.

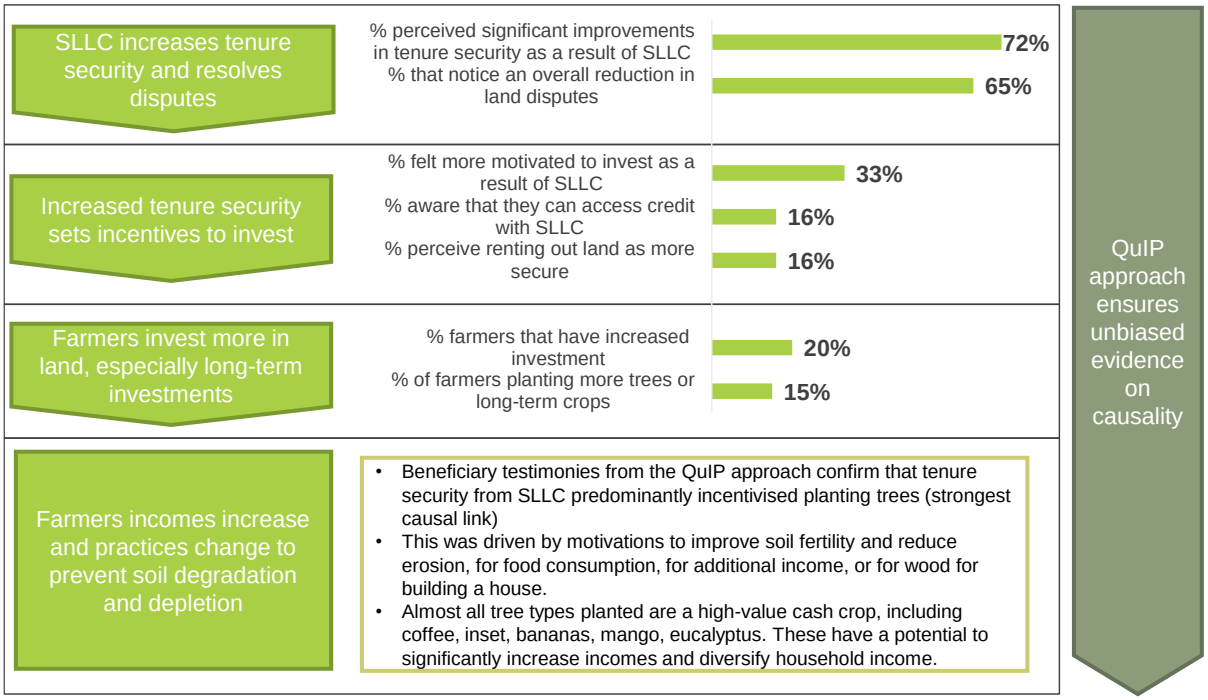
The role of tenure security

The benefits of land certification have been found across a number of studies to be directly linked to smallholder farmers' perceptions of increased tenure security. This effect is linked to (and defined by) reductions in disputes including with neighbours, better resolution of disputes, and a lower perceived risk of expropriation. Tenure security can also then bring greater confidence in the ability of family to inherit the land. The psychological effects of perceived tenure security in turn may give confidence to make longer-term investments in the land, in renting out or sharecropping out the land. Longer-term investments and more efficient land use may also make households more resilient in the face of future shocks including those linked to climate change.

Direct questions were asked about the perceived benefits of land certification, i.e. of SLLC. Tenure security was mainly reported via the benefit of clearer demarcation of the land - a benefit more pronounced in woredas where land was less standard in its size and distribution (for example in SNNP woredas land was in highly structured strip farms where natural demarcation has been very clear for many years, see Annex 5). The other benefits were a sense of security, ownership and confidence, cited by over half of households and most pronounced in Oromia. The third type of response was around the legality of the land or its recognition with the authorities. Some households cited their name on certificate, photo on certificate, a small proportion also highlighted security of tenure for women specifically.

All of the woredas sampled had SLLC roll-out dates between 2015 and 2018, and all households were selected because they had received a SLLC although they did not always have it to hand.[30] Figure 11 provides a summary of the main findings with respect to tenure security and investment for this report. This includes the main findings with respect to tenure security changes, coming from a mixture of the land demarcation, confidence and sense of security of tenure, and the legal status conveyed by certification. These findings are interlinked by the large number of respondents saying disputes had been reduced.

Figure 11: LIFT income survey 2021: Summary of results



Investment

The survey's methodology allowed a nuanced understanding of shorter-term and longer-term investments, based on questions asked in the qualitative section of the survey with the 'blindfolding' principle used (i.e. there was no leading discussion regarding tenure security when investment questions were asked). A majority of households said they used inputs (75%), with a third of households indicating they had used more inputs over the past three years, including fertiliser, pesticide and improved seeds. Input supply and the increasing prices of inputs, likely linked to COVID-19, had created challenges during the year, and for some this meant using less, and lowering production as a result. Longer-term investments were made by 83% of households, with terracing, ripping and tree planting the three most common types.

In terms of the attribution between tenure security and investment, there was relatively little in terms of direct references to shorter-term investments in inputs when asked about the effects of SLLCs – shorter-term investments were more likely to be motivated by kebele extension officers / agents, the experience of neighbours, and farmer knowledge that inputs were required to improve productivity. In addition to this, ripping and terracing were cited by many respondents as longer-term investment activities that had been carried out for many years, often as a group, and sometimes at the behest of kebele authorities. There appeared therefore to be relatively little attribution of SLLC to these activities (there were some exceptions to this, most notably with 12 respondents saying they could access more inputs following their access to a loan). However, there were general responses around motivation to invest in terms of respondents noting greater motivation to invest in their land (14%), or that SLLC gave them more choice in how to invest (6%). The earlier LIFT outcomes survey (LIFT, 2020b) had found attribution of investment in both chemical fertilisers and in conducting improvements to the land including terracing to SLLC, though these effects did not come out clearly as a finding

30 This was a pre-qualifying question for the survey. In spite of this when asked if the enumerator could take a photo of their SLLC, 13 respondents said they had lost their certificate, 2 respondents said they had not received it, a further 23 respondents said the SLLC was with the woreda or kebele land office, and 1 respondent had seen the SLLC burned.

again from the 2021 survey. It is possible that the impact of SLLC on these investments was under-estimated by the qualitative interviews in the 2021 survey.

In the qualitative responses, one-fifth of households cited at least one additional investment effect (20%), some that they had invested more without citing the specific investment (7%), and then the bigger specific effects related to planting more trees or longer term crops as a result of certification (15%). Other minority responses included the ability to leave land fallow, build more fencing, invest more to tackle soil erosion or fertility, or building a house as a result of SLLC. These responses were more common in Oromia and SNNP with around one third of households reporting an effect, but the tenure security effect in Amhara was small.

The longer-term investments that were most directly linked to tenure security were therefore related to trees and longer-term crops. Many households reported planting trees, driven by motivations to improve soil fertility and reduce erosion, for food consumption, for additional income, or for wood for building a house or for fuel. The main types of trees and longer-term crops cited included i) fruit trees such as mango, avocado and banana (around 23% of mentions to fruit trees); ii) long-term tree crops such as chat, coffee and enset (around 39% of mentions to longer-term crops); and iii) 'wood trees' such as eucalyptus, barzaf and wanza (around 38% of mentions to wood trees). Via use of time-lapse imagery of some areas, some tree planting activity was visible over time, and the effects of investing in iron roof houses were also visible, while this method was limited by sample size and some potential bias, it was also indicative of the effects of SLLC on longer-term investments.

The finding on trees and longer-term crops as the principle investment effect attributed to SLLC is in line with previous studies. Fenske (2011), found investments in land improvement, and particularly in tree planting across nine data sets for West Africa. Holden et al. (2009) in the case of Tigray also found evidence of a link from certification to longer-term investments with trees and soil conservation structures. While this earlier Ethiopian research related to FLLC, more recently In the most recent quantitative analysis of SLLC roll-out including a control group, Ghebru and Girmachew (2020) found that investment as defined by 'Soil and water conservation investment/maintenance' to be 12.8 percentage points higher for those who received SLLCs compared to those without SLLC.

Rental and credit

The LIFT programme EEU interventions have aimed to catalyse changes in both rental and credit markets through a market systems approach. There were 16% of respondents that noted that certification allows a household to take credit as a potential effect of SLLC. There was then 3% of the sample that reported they themselves had taken out credit linked to SLLC as collateral.[31] The LIFT 2019 outcome survey (LIFT 2020b) had found over a larger sample of 3.5% gaining credit via SLLC-linked loan. Analysis of the sample cohort from the 2019 data suggests that 1.2% of them had received a SLLC-linked loan, these did not overlap with those saying they had received a loan by 2021, suggesting the larger amount of loans may be possible.[32] The majority of cases reported positive investment impacts of loans, although there were a couple of outliers, one of losing land in the face of loan default, and a couple of using loans for unexpected purposes, including renting more land, and sending an adult child abroad in part to send remittances.

The findings on credit mirrored the picture with rental, with households noting that certification gave more confidence or less fear in renting out land (16%), and a smaller proportion noting they themselves had rented in or out more land as a result of SLLC process (2.5%). Analysis of the cohort responses from the LIFT 2019 outcomes survey found 5% indicated they had rented out more land, with 2.5% of households attributing this at least in part to SLLC. Although the individual respondents did not match, it is still remarkable that this is exactly the same proportion who attributed SLLC via the very different methodology of an open qualitative discussion for the LIFT 2021 income survey. There was significant rental activity found overall in the survey, with 18% of households renting out or sharecopping out at least part of their land, and 20% of households renting in or sharecropping in additional land. It is possible that a greater proportion of this might be attributable to SLLC than the direct attributions, and it is notable that in their control group study, Ghebru and Girmachew (2020) found animpact on the propensity to rent land ('to become a landlord'), at 5.3 percentage points for those with SLLC compared to those without SLLC.

31 Average loan values were not cited in the 2021 income survey. But a previous EEU impact survey report 2020 found an average value of 35,000 Birr (around USD 875) (with average interest rates of 17.6%) (LIFT, 2020a).
32 There were also an additional 7 respondents for the 2021 survey, when asked where their SLLC was (in order to take a photograph of it at the end of the survey), who said it was "at the credit agency", suggesting the number of loans may be higher.

Disaggregation by sub-group

The investment effects, rental and credit effects, found in the 2021 income survey, included variation by group. Income quintiles were used to assess equity of effects, and led to a number of significant findings. Poorer households were less likely to use inputs (63% for poorest quintile compared to 84% for richest quintile), less likely to have invested in more inputs (43% for the top two quintiles compared to 20% for the poorest quintile) and less likely to have undertook a long-term investment (at 91% for the highest income quintiles compared to 75% for the lowest quintile). Richer households were in general more likely to perceive a security of tenure benefit (81% for the richest quintile compared to 68% for the poorest two quintiles), although the results in terms of a direct effect of tenure security on investment were less clear. The exception was for the link from SLLC to planting trees and longer-term crops (with 21% citing this effect of SLLC for the richest two quintiles compared to 8% for the lowest quintile). Widows were also less likely to perceive a security of tenure benefit than married couples (67% compared to 74%), less likely to have invested in more inputs (24% compared to 40%), and less likely to have made a longer-term investment (74% compared to 84%). Widows were also less likely to cite a tenure security effect on investment than married couples (22% compared to 37%).

Analysis of rental experience also shows some significant differences between groups. In line with previous findings (for example in Deininger et al. (2009)), the overall rental market picture is one in which poorer households were more likely to be renting or sharecropping out their land, while richer households were more likely to be renting in. In particular, those renting-out compared to those renting-in (as well as those not involved in rental markets) were likely to be older, invest less in their land, and be poorer on all major available wealth and income indicators from the survey. Qualitative responses detailed above also show that renting out land is more an indicator of distress, for example not having any oxen, oxen dying or having to be sold etc.; while renting-in can be a sign of success, and mentioned by respondents alongside a number of other income-generating activities.

Linkages to production, income and well-being

The survey allowed a good understanding of production, income and well-being, based on questions asked in the qualitative section of the survey with the 'blindfolding' principle used (i.e. there was no leading discussion to the programme intervention until the final qualitative question). This allowed clarity on the causes for production, income and well-being from their own perspective.

Overall, the three were highly correlated with 79% of households' answers on production, income and well-being aligned (i.e. all improving, all worsening, or all the same). Many respondents spoke immediately about production when asked about well-being, and as subsistence farmers who had faced a very difficult year in many instances this is of course to be expected. However, there were other drivers, and households facing old age with restricted work, were most likely to say well-being was bad or worse. Households with a member facing health difficulties also faced major challenges including facing high medical costs. A proportion of households lost a member to death and faced grief alongside loss of ability to farm. Households that saw positive developments in the past year to their well-being outside of those with positive production and income experiences, were sometimes driven by better or good health, sometimes by marriage or another positive development in their lives.

Production experiences were highly linked to the weather experience of the previous years, which for 'good weather' only outweighed 'bad' or 'worsening weather' for one out of the twelve woredas. Woredas were also very distinct in terms of crop selection, with farmers very similar in crop choice within woredas. This also meant that crop failures could be highly correlated, e.g. the wheat crop failing for many farmers due to weather conditions and interlinked pests and disease. The productivity estimates using data from households' three main crops find that they are very low and lower in those woredas with many citations to very bad weather and to crop failure in the qualitative conversations. Qualitative research also found instances of farmers explicitly outlining the scale of the decline, and these often tallied with national averages in that they had previously been close to national averages but seen reductions in yields in regions of up to 75% or more. Respondents predominantly cited bad weather, but also lower input use due to high prices or limited supply, as well as a range of pests and crop diseases which in many cases were likely linked to the bad weather. Farmers, particularly in Amhara, also cited soil depletion or over-fertilising for low yields. For respondents that had a positive experience with production, farmers attributed improvements to either good or better weather, the use of more or improved inputs, and a significant proportion to hard work.

There was significant variation between households in income experiences, and income sources allowed a proportion of households to see income improve despite declining production. A minority had international remittances from children which protected them from the fall in production. Others depleted livestock savings. Some farmers found that higher prices for their sales protected them from lower production. Others had a variety of alternative income sources including side businesses, products such as honey, milk or alcohol sales, or the head of household or spouse making labour income. Such strategies were much more prominent (and by definition) for households in the higher income quintiles, and for the lowest quintile there was in many cases an absence of any income, with many households in a very severe food security situation, including animal's dying from starvation and drought, and in extreme cases family members dying or the household intending to migrate.

The effect of the longer-term investments in trees and long-term crops are likely to generate additional income, in many cases this may take time. As Kassa et al. (2011) note, tree planting was an original driver of promoting tenure security, with tenure insecurity found to be a primary driver discouraging farmers from planting trees. The investments should yield additional income for households, and for example, eucalyptus can be a highly profitable crop to grow for rural households in Ethiopia (Holden et al. 2003; Jagger and Pender 2000). There is said to be a growing market in terms of wood product utilisation from eucalyptus, with extensive used as poles for power and telecommunication lines, for scaffold and for a range of other uses (Abebe and Tadesse, 2014). A number of respondents in the 2021 income survey noted they were planting eucalyptus as a source of income.[33] Despite this, it is important to note some complexities, with eucalyptus sometimes claimed to have adverse impact on crop production and sustainable land use. This is from the assumed aggressive use of resources that precipitate soil fertility depletion and water deficit, or by supressing other vegetation from being allelopathic (Dessie and Erkossa, 2011). [34]

Linking findings to marco trends and migration

World Bank data suggests an estimated half a million people are moving from rural to urban areas every year. Groth et al. (2021) find evidence for their framework in Ethiopia in which there are two major influential factors that affect environment-related migration: (a) the sufficiency of a household's agricultural production and (b) non-farm activities. Environmental changes increase migration, either through high migration needs due to low agricultural production and/or through increased non-farm activities, which increases the necessary financial means to enable migration.[35] Hermans and Garbe (2019) find migration to be one response among others in response to production shocks. Others include livestock sales, wood sales, daily labour. The findings of the 2021 LIFT income survey, in this most difficult year, include that many of these strategies were affected by the COVID-19 crisis coming at the same time as a bad weather environment. For example, daily labour opportunities were not available, while livestock in some cases died due to drought (particularly in Guna and Deksisi in Oromia, and Sankura in SNNP). Migration was the most extreme response for some households faced with the difficult year of 2020-21. While only three respondents expressed the intention to migrate, around 1.3% of the original target sample had migrated and could not be found, and this may be an underestimate. In total, 22% of households noted that at least one member had moved, "seeking work" the most common reason.

In addition, in the Ethiopian highlands, severe topsoil erosion and forest degradation is a major environmental stressor which is amplified by recurring droughts, and migration is also an important household adaptation strategy in this regard (Morrissey 2013, IPCC 2020). While not included in this study due to conflict, the historical experience of Tigray is important in showing the need for terracing work. Frankl et al. (2013) show how collective work since 1991 enabled degraded landscapes to be restored, in Tigray with positive impacts on soil fertility, water availability and crop productivity. In the 2021 LIFT income survey, Amhara respondents were more likely to see land is over-farmed or over-fertilised / with soil depletion. They were also more likely to say there is "less land to live on" or "too little land". Kosec et al. (2018) in Amhara and Oromia also find that

33 Zerga et al. (2021) note that for farmers, eucalypts mean "living bank account" which can be used when one is in need of money for different purposes, such as to pay land or agricultural taxes, yearly celebrations of Meskel and Arafah, and for supporting social institutions. Their study found that some farmers in the study area collected about 80,000 Birr (USD 2,000) over a six-year period by selling eucalypt poles.

34 *"Allelopathy is the release of chemicals from leaves or litter that inhibit the germination or growth of other plant species. Field trials which compared sites in miombo woodland and a Eucalyptus plantation concluded that although significant variation in soil mineral content was observed, with less magnesium and potassium in the eucalypt soils, there was little evidence to indicate that allelopathic effects were significantly inhibiting maize growth. Results evidently vary across a wide spectrum of conditions from humid, fertile sites to dry, infertile ones."* Dessie and Erkossa (2011)

35 The paper notes these are supplemented by migration experiences within the social network, and interlinked attitudes to migration

where soil quality is low (below median), a reduction in land inheritance predicts a significantly greater tendency to migrate to an urban area and be employed in the non-agricultural sector than that seen in areas with higher quality soil.

Important strategies to mitigate the effects of soil degradation and climate change will be required to protect Ethiopian agriculture in future years, and to slow an ever-increasing rate of rural to urban migration. Strategies required will include crop diversification (particularly given that climate change will render traditionally staple crops as unsuitable for certain areas), soil conservation, tree planting, and irrigation. Gezie (2019) has found awareness for these strategies is already present, but households often have more drastic coping strategies, including the need for food aid, selling assets, and in the extreme temporary or permanent migration. The evidence from the 2021 LIFT income survey tallies with this experience, in a very difficult year households have clearly attempted many different coping strategies.

The findings for the 2021 income survey add to previous research in suggesting that the tenure security effect of SLLC certification is likely to be a secondary driver of productivity and income, driven mainly by increased investment in trees linked to seeking to avoid erosion, for use in construction, for food, or for additional income. Secure certification is likely to be an important driver in enabling households to improve resilience at the front line of the climate crisis, tackling soil depletion, while diversifying sources of income and nutrition.

The final word on this is expressed from one of the survey respondents: "*We become confident about our land. It assured me of no border conflict on the future. It motivated me to think about the future. it gave me a responsibility to protect the land. I now think about my children, who I am sure will use the land in the future, and I'm investing on things that they may use on future like planting an oak tree.*" (53-year old married male, Kacha Bira, SNNP)

Avenues for Future Research

A list of potential avenues for future research is outlined below and the authors would be happy to elaborate further upon request.

- The incentives set by SLLC to invest in longer-term crops and planting trees can play an important role to help diversify income sources and prevent soil degradation, overall making farmers more resilient to future shocks. Trees as an income stream and ways of preventing soil erosion and depletion should be further looked into and future programming could combine interventions on trees/long-term crops with SLLC.
- The link between climate change, migration, and casual labour (off-farm work) should be further explored and the role that incentives to invest through SLLC could play in this.
- Some of the responses show other complexities with inheritance, including disputes between family members. As a continuation of LIFT's work on dispute resolution - future interventions and research could focus on inheritance; how to improve the process, make it easier and more accessible and increasing awareness of the benefits of the formal process.
- The rich data of the Government's National Rural Land Administration Information System (NRLAIS) could be further leveraged to confirm the exact parcel size of respondents interviewed for LIFT's income study. This would provide reliable information on exact parcel size and thereby enable additional analysis and improved data quality.
- No clear definition of "tenure security" could be found by the authors. An attempt to harmonise definitions and measurements would make a valuable contribution, including an outline of approaches to measure "perceptions" of tenure security.
- The SLLC effects appear to be stronger in Oromia and SNNP than in the Amhara region, and the diversity and variation between regions and woredas in Ethiopia is likely to be a fruitful avenue for future research.

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