



5th Biennial RAMICS International Congress in Japan

September 11th-15th, 2019

Hida-Takayama, Japan

Proof of Impact: Blockchain Community Currencies in Action

Galia Benartzi*, Rebecca Mqamelo**

**Co-founder, Bancor Protocol, Zug, Switzerland, galia@bancor.network*

***Economics Department, Minerva Schools at KGI, San Francisco, USA, rebecca.mqamelo@minerva.kgi.edu*

Abstract

In the last 30 years, over 4,000 complementary currencies have sprung up in 50 countries. Evidence suggests complementary currencies can stabilize markets and increase local production and collaboration – however, most complementary currencies fail to create sustainable monetary alternatives due to low liquidity. A lack of liquidity leads to most complementary currencies stagnating after an initial “budding” phase, partly because participants are unable to use the currency outside the originating community. Bancor proposed Liquid Community Currencies (LCCs) as a means of overcoming this liquidity and adoption barrier and improving the scalability of complementary currencies. LCCs are blockchain-based currencies which are interchangeable according to market-determined rates without relying on exchanges or third parties. This enables communities to create their own currencies, while allowing continuous convertibility between LCCs within regional and global networks. This paper examines Sarafu, a live network of LCCs across 11 communities in Kenya, deployed by Bancor in partnership with Grassroots Economics. The pilot is among the first to use USSD services to allow all people, regardless of Internet access, to participate in a blockchain-based economy. Early data suggests lowering the technical barriers to currency creation and automating liquidity may improve the sustainability of community currency systems worldwide.

Keywords

Community Currencies, Blockchain Community Currencies, Bancor Protocol, Liquid Community Currencies, Sustainable Development Goals

1. Introduction

The United Nations (UN) estimates that the gap in financing to achieve the Sustainable Development Goals (SDGs) is \$2.5 trillion per year in developing countries alone (UNCTAD, 2014). Realizing the SDGs, therefore, depends in part on a reset of the global financial system in the direction of an inclusive, regenerative economy where financial technology is purposefully deployed for sustainable development (Castilla-Rubio et al., 2016).

In the wake of the 2008 global financial crisis, the world is struggling to address growing inequality, the impacts of climate change and rapid deterioration in the natural wealth that sustains communities and ultimately underpins much of the global economy. The challenge to accelerate sustainable socio-economic development in the world's poorest regions has shifted focus from traditional aid and development models to those that address the underlying structure of local economies. Developmental aid is on a steady decline worldwide (OECD, 2019) and countries like Zimbabwe and Venezuela have shown that political instability can wreak havoc on people's livelihoods in just a matter of days. The advent of blockchain technology and proliferation of cryptocurrencies invites us to think about how monetary systems could evolve as a response to these systemic imbalances and recurring shocks.

In December 2018, a number of UN agencies released a joint statement that identified "cash-based assistance as one of the most significant reforms in humanitarian assistance in recent years". Community currencies, which exist alongside and in support of national currencies, have emerged as a promising new wave of development practices because they act as an integrative medium of exchange that promotes the revitalization of local economies and fosters cohesive community engagement (Nishibe, 2012). However, researchers have observed various barriers hindering the sustainability of complementary currency systems. Among these are financing (Schroeder, 2015), trust (Peña de Carillo et al., 2018) and integration across multiple stakeholders (Nishibe, 2012). Yamazaki (2013) found that about 60% of complementary currencies in Japan were terminated or suspended because of circulation failure due to lack of currency acceptance. Analyzing complementary currencies in Poland, Sobiecki (2018) noted that low market liquidity and a lack of market price setting mechanisms constrained the size of community currency systems and deterred newcomers.

This paper focuses on the liquidity barrier and explores a potential solution in the form of Liquid Community Currencies (LCCs). LCCs utilize decentralized technologies and smart contract-enabled blockchains to facilitate the secure issuance, distribution and continuous convertibility of community-generated currencies. The Sarafu Network is the world's first live implementation of LCCs and is deployed in partnership with Grassroots Economics, a non-profit foundation that has operated community currency programs in impoverished areas of Kenya for nearly a decade. Between 2010 and 2018, community currencies deployed by Grassroots Economics were issued as paper vouchers unique to each community. In August 2018, the organization partnered with Bancor to migrate its community currency network from physical vouchers to LCCs on the blockchain. Early findings from the pilot demonstrate how community currencies can thrive when they are issued and connected via public and

decentralized blockchain infrastructure. Notably, evidence from Sarafu suggests that built-in convertibility between community currencies can promote greater usage and collaboration between communities, since users are empowered to exchange the currencies for goods and services also outside of the originating community. This feature may propel communities with complementary yet underutilized resources to develop diverse channels of monetary links that generate productive capacity and meet inter-community needs with lower reliance on third parties and aid.

The migration of Grassroots' pre-existing community currencies to a digital blockchain-based format using the Bancor Protocol for automated liquidity has reduced the cost of deployment and improved circulation, while delivering powerful insights into trade behavior and currency flows within and between local networks. LCCs may offer a solution to the traditional barriers of trust, integration and liquidity that have hindered community currency adoption to date, as well as new financing models by way of community currency reserve deposits, which are in line with trends in direct giving. We hope monetary innovators will benefit from these findings as they seek to leverage blockchain and decentralized technologies to design and implement sustainable and replicable complementary currency models the world over.

2. The Case for Community Currencies

2.1. Rethinking the Origins of Money

The 2008 stock market crash demonstrated that financial markets can exacerbate social disharmony and inequality. The systemic risk shared by banks and governments led to a global financial crisis that plunged individuals at all levels of society, particularly the poor, into severe economic vulnerability. More than anything, the crisis highlighted the moral hazard of overzealous lending and the danger of offsetting risk through complex debt structures. In response, many have begun to question the structure of the global economy and its relationship to the activity of commercial banks. This is because money creation, in practice, does not occur through central banks or as a result of a multitude of deposits from consumers, but rather as a byproduct of the issuance of debt (McLeay et al., 2014). Rather than banks receiving and lending deposits from household savings, bank lending is what creates those deposits in the first place. In other words, money creation is a byproduct of interest-bearing loans; an outcome enabled when banks extend credit to people and corporations. In real terms, "new money" only enters the economy when this credit is used to buy goods and services in the economy. Conversely, when a loan is repaid, a portion of the total money in circulation is destroyed. Thus a loan is recorded on both sides of a bank's balance sheet: money deposited into a client's bank account is recorded as a passive liability, while the promise of this same money being lent and repaid with interest is recorded as an active asset. In a system where these repayments occur instantly, the total amount of money in circulation would remain unchanged. However, repayments are typically delayed by months, years, and even decades. Analyzed at a macro scale, this time lag between the creation and destruction of money means that vast amounts of additional money are available in the broader economy.

When people have more money to spend, they consume more; demand for all goods and services goes up, prices subsequently rise, and the economy generally finds itself in a perpetual state of inflation. For this reason, inflation should not be seen as a general increase in the price of goods and services over time, but should instead be viewed as the continuous decline of the value of a currency when the amount of money in circulation exceeds the value of goods and services in the economy (Greco, 2001). The modern economy relies on inflation for growth. Basic monetary theory posits that without the constant issuance of debt, growth is almost impossible. The subsequent “debt-growth imperative” that informs much of monetary policy today has resulted in a global economic system that encourages high risk and is characterized by inevitable periodic crises. Unfortunately, those at the bottom of the economic pyramid are often the ones who bear the worst of negative consequences of monetary policy. Inflation decreases real incomes, high interest rates discourage taking on debt and initiating small-scale entrepreneurial activity, and governments occupied with managing financial crises must shift their priorities at the expense of development goals and social issues.

The last decade has seen community currencies receive fresh attention for their potential to mitigate the problems associated with high inflation, currency volatility and external risk. With advances in technology opening up access to financial services, now more than ever, governments, commercial and social enterprises, communities, and individuals are seeking viable models that foster socio-economic resilience and can operate independently and in parallel to the existing financial infrastructure and its path to hoped-for reform.



Fig. 1: Community currency vouchers in Lindi, Kenya. Source: Grassroots Economics.

2.2. The History of Community Currencies

A community currency is a complementary medium of exchange to a national currency that draws on the strength of community networks in order to stimulate local economic activity with some social or environmental objective in mind. While community currency models vary, a standard community currency consists of physical vouchers or digital tokens which are issued and honoured by members of a network and can only be spent on goods and services provided by other members in the network (Bendell et al., 2015). Currency circulation thus relies on mutual acceptance and is backed by the resources of the community. Community currencies are of particular interest for the viability of the social economy, whereby social capital forms the basis of economic structures designed to increase the quality of life in a region (Utting, 2013).

Complementary currency systems are by no means a new phenomenon. The most well known early example (which continues today) is Switzerland's WIR (Wirtschaftsring), a system of private mutual credit founded in 1934 as a response to currency shortages and global financial instability during the interwar period. Since the 1980s, thousands of community currencies have sprung up in both developed and developing economies, of which some of the more well known are LETS (Local Exchange Trading System) in Canada and the UK, time banks in Italy and the UK, barter clubs in Argentina, the Ithaca Hour in the US and community banks in Brazil. Some community currencies have seen more success than others, but on the whole many have failed in their aim to provide a sustainable alternative to national currency. Yamazaki (2013) points out that about 60% of community currencies in Japan were terminated or suspended because of circulation failure due to lack of currency acceptance. Even relatively successful cases tend to resemble the process of "budding" – the project grows until it stagnates or bursts and then new projects crop up elsewhere, never developing beyond a certain threshold (Sobiecki, 2018).

2.3. Barriers to Sustainable Community Currency Systems

Trust and satisfaction are the backbone of any community currency system. Community currencies aim to function as a viable alternative to national currencies in order to stabilize markets, increase local production and achieve socio-economic outcomes. The failure of many community currencies can be attributed to lack of market acceptance, however this problem is in itself a result of multiple factors. Peña de Carillo et al. (2018) identify four barriers to the adoption and growth of community currency systems: emotional barriers (community confidence and trust in the network), management barriers (challenges to SMEs and administrative hurdles), technological barriers (infrastructure, connectivity and security of networks) and environmental barriers (resources for finance and training, regulation and integration with national currency networks). Over time, these barriers interact as a reinforcing feedback loop, contributing to the complex nature of addressing failing community currencies.

A local economy may begin with trust in a community currency – fully understanding its nature and the mission behind the initiative and operators. Businesses, schools and other community organizations agree to accept the currency and the local multiplier effect creates a healthy cycle of trade. However, trade being restricted to a

defined network creates a serious problem for the scalability of the community currency system. Businesses that accumulate large amounts of the currency may simply choose to cash out in order to spend their money elsewhere. The Bristol Pound is one such example, where Marshall and O'Neill (2018) found that despite the currency's success in terms of integration and size, it has done little to affect real localisation.

In Israel, the rapid growth and eventual stagnation of AppCoin's digital community currency illustrates how a lack of liquidity can affect the sustainability of community currency programs. In 2013, AppCoin, a startup developing local currency pilots, identified a Facebook group of mothers in Tel Aviv and provided them with their own digital currency called Hearts to use in an online marketplace. The community currency grew rapidly, garnering over 50,000 users and over a million transactions (Reuters, 2014). However, Hearts were not exchangeable for anything outside the online community. This created a fundamental barrier for those holding the currency who were restricted to buying only the goods and services offered in the online community. These problems discouraged adoption over time and usage of the currency subsequently stagnated.

Limiting the utility of a community currency exclusively to goods and services provided in the originating community creates a liquidity risk: people who hold the currency cannot spend it quickly enough and local businesses cannot fully utilize it because it is not transferable for inputs elsewhere. This creates systemic vulnerability in the community currency system as a whole. As a result, the system fails to grow beyond a certain threshold and cannot realize its broader aims of increasing economic capacity and stabilizing markets.

3. Solving the Liquidity Barrier with the Bancor Protocol

According to Lietaer and David (2017), chronically low liquidity is one of the biggest barriers hindering the use of community currencies. Liquidity is the probability that an asset can be converted into an expected amount of value within an expected amount of time (Parsons, 2018). For community currencies this means a) *accessibility* – being able to exchange the currency for goods and services at local or online vendors and b) *exchangeability* – being able to cash in and out of the system by converting one community currency into another or into national currency, and vice versa. The challenge for community currencies is that exchangeability should not occur at the expense of accessibility: no currency should be so difficult to use that people want to convert it to national currency at the earliest opportunity. However, if users have no option of ever converting their community currency into other currencies, this poses an inherent liquidity risk for those who hold the community currency, especially when usability is limited to a specific geographic region or network, as described above.

The consequences of low liquidity are often observed in cryptocurrency markets. Traditional exchanges work by matching buy and sell orders in a bid/ask system using order books or a matching engine to fulfill trades. When there are enough buyers and sellers of a token, this system generally works well; however, it assumes a given level of volume and interest in a token. If a token has low volume at any time, it not only becomes difficult to buy or

sell, but individual transactions can cause unpredictable price swings, reducing a token's usability and adoption. For community currencies, the challenge of finding sufficient buyers and sellers is intensified.

The Bancor Protocol addresses this problem by introducing Liquid Community Currencies or LCCs (blockchain-based tokens integrated with the Bancor Protocol) which allow separate digitized community currencies to be linked to each other vis-à-vis a common reserve, making them continuously convertible one for another. This common reserve creates an automatic exchange ratio between the tokens so that price becomes a function of each token's buy volume relative to its sell volume. Selling Token A for Token B increases the supply and relative price of Token B to Token A due to the adjusted reserve balance of each token. In other words, LCCs set their own price with respect to each other, based on the amount of reserves they hold via a blockchain smart contract at any given time. LCCs do not face liquidity risk because the participation of buyers and sellers becomes optional, rather than required, for the liquidity of the market.

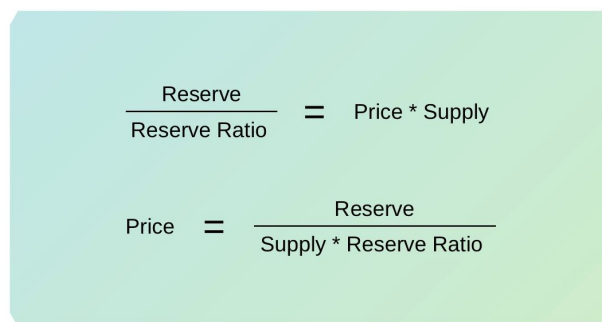

$$\frac{\text{Reserve}}{\text{Reserve Ratio}} = \text{Price} * \text{Supply}$$
$$\text{Price} = \frac{\text{Reserve}}{\text{Supply} * \text{Reserve Ratio}}$$

Fig 2. LCCs continuously recalculate their price by maintaining a fixed ratio between the LCC's total value and the value of its reserve pool. This fixed ratio, known as the "reserve ratio", can be used to maintain the price stability of LCCs. The higher the LCC's reserve ratio, the greater its price stability. Source: Bancor.

The Bancor Protocol enables community currencies to be connected to each other as well as to national fiat currencies, providing continuous liquidity and automated price discovery for integrated currencies. In essence, what differentiates LCCs from other community currency models is that LCC networks facilitate a truly decentralized and autonomous economic system within communities and between them. Convertibility and price discovery within the network is processed by smart contracts on the blockchain, and thus does not require for-profit matchmakers or a centralized entity to process exchanges or set prices. A network comprised of many LCCs provides the interoperability, liquidity and resilience for greater market acceptance and scalability.

4. Sarafu: Liquid Community Currencies in Action

4.1. Going Digital

The Sarafu Network, operated by Grassroots Economics, is the first community currency program in the world to pilot Liquid Community Currencies. Since 2010, Grassroots Economics has introduced community currencies to over 4,400 businesses and schools in communities across Kenya. Between 2010 and 2018, community currencies were issued as paper vouchers unique to each community. In August 2018, the organization partnered with Bancor to migrate its community currency network from physical vouchers to LCCs on the blockchain. Today, all community currencies on the Sarafu Network are 100% digital and transactions occur through USSD¹ codes sent between members' feature phones and the local telecom network. The program is one of the very few live implementations of blockchain in a low-infrastructure context, where all people, regardless of Internet access or smartphone adoption, can participate in a decentralized economic network on the blockchain.

The concept of mobile payments is not new in these communities. According to the Central Bank of Kenya, mobile money transactions in 2018 were close to 44% of the country's GDP. Services like Safaricom's M-Pesa, a mobile phone-based money transfer, financing and microfinancing platform, have made mobile payments almost ubiquitous throughout the country. A key advantage of LCCs over mobile money counterparts is that transaction fees are much lower than eMoney and fixed versus scaling with the value of a transaction. Most mobile money services in the country extract high fees, especially compared to the value of the goods or services exchanged, sometimes up to 10% of transaction value. LCCs also introduce new money into communities whereas traditional mobile money services rely on the existing money supply, distribution and volatility.

Finally, the migration of pre-existing community currencies to a digital blockchain-based platform provides a unique opportunity to study the effects of community currencies as a means of incubating local economies. Between August 2018 and July 2019, the Sarafu Network grew 340% from 1,000 users in 10 communities to over 4,400 users in 11 communities. Circulating community currencies as tokens on the blockchain as opposed to physical vouchers resulted in historically high volume in Grassroots' programs and exposed an unparalleled level of data analytics, offering powerful insights into trade behaviour, currency flows and the activation of local networks.

4.2. The Sarafu Network: How it Works

Sarafu, meaning *currency* in Kiswahili, is the name of the network token which acts as a reserve currency for the region based on the Bancor Protocol. This gives derived regional tokens their relative value, such as "Bangla-Pesa" in Bangladesh, Mombasa or "Gatina-Pesa" in Kawangware, Nairobi. When a new village-level

¹ **Unstructured Supplementary Service Data (USSD)**, sometimes referred to as "Quick Codes" or "Feature codes", is a Global System for Mobile (GSM) communication technology that is used to send messages between a mobile phone and an application program in the mobile network. USSD can be used for WAP browsing, prepaid callback service, mobile-money services, location-based content services, menu-based information services, and as part of configuring the phone on the network.

currency is launched in the network, a local “hub” is identified as the main point of entry of Sarafu into the community.

A hub is typically a business, school, or community-owned social enterprise that receives support from Grassroots Economics and its donors in return for committing to offer goods and/or services in exchange for community currencies. In the past, support has included installing water tanks at schools, providing refrigerators to key food retailers or donating maize mills to co-operatives. From these hubs, Grassroots seeks to onboard “complementary businesses” – such as a food retailer and local farmers – in order to efficiently integrate the currencies into local supply chains. As markets are intertwined, circulation feeds directly into the livelihood of the larger community via targeted supply-chain linking.

Once a hub joins – or rather, initiates – the network, Sarafu is marketed to members of the community as a complementary medium to pay for food, school fees, church tithes, medical care, and other services. Registration is free and all new members receive a direct donation of Sarafu tokens into a digital wallet. Users transact from this wallet – sending and receiving tokens, checking their balance, and discovering local vendors, all using SMS-based text messages. The donation of 400 Sarafu has an initial purchasing power equivalent to 400 Kenyan shillings (KSh) or 4 US dollars.

The value of each community currency fluctuates based on cross-community trade flows. When a community currency is spent on goods and services outside the community, its price declines in relation to other currencies in the network. As a currency flows into a community, the community receiving inflows will see the value of its currency rise. These flows can be seen as community imports or exports of goods and services. Imports decrease the relative value of a currency and exports increase a currency’s value in the network.

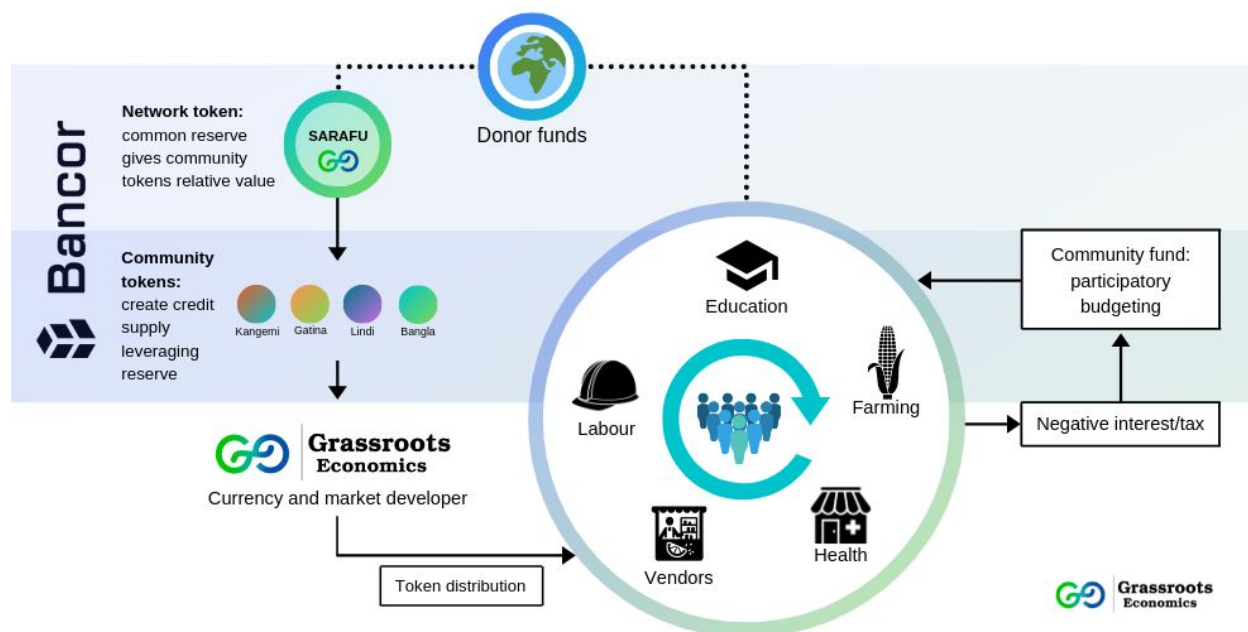


Fig. 3: Sarafu Network community currency model. Sarafu is the network token based on the Bancor Protocol which acts as a common reserve for village-level community tokens. Local trade circulates between individuals, businesses, schools and other organizations as people use their tokens to pay for daily needs. Negative interest may be used to incentivise trade and this “tax” flows into community funds that support sustainable development projects. Donor aid can also support the network by seeding the reserves of LCCs to support SDG-related projects. Source: Grassroots Economics (2019).

Naturally, the more hubs, businesses, organizations and individuals who join the network, the more useful it becomes to the people who use it. Liquidity is thus derived from interest-free credit backed by the co-operative assets of the community as well as the common reserve token which facilitates exchange between communities. **Businesses** can expand their activities without taking on the burden of debt because more customers can now pay for goods and services with a community currency that holds its reserve in Sarafu. Mutual credit allows businesses to meet this demand in such a way that leverages underutilized resources in the community, including the labour force, who in turn can purchase more goods and services from local retailers, thus expanding the size and resilience of the market. **Individuals** are able to spend their community currency while reserving their national currency for savings and investments; thus the model promotes financial planning and autonomy. Finally, **co-operative assets** directly benefit from the expansion of community resources and return this value in the form of public services. In this way, the Sarafu Network is a multidimensional tool that builds up capacity between various community stakeholders.

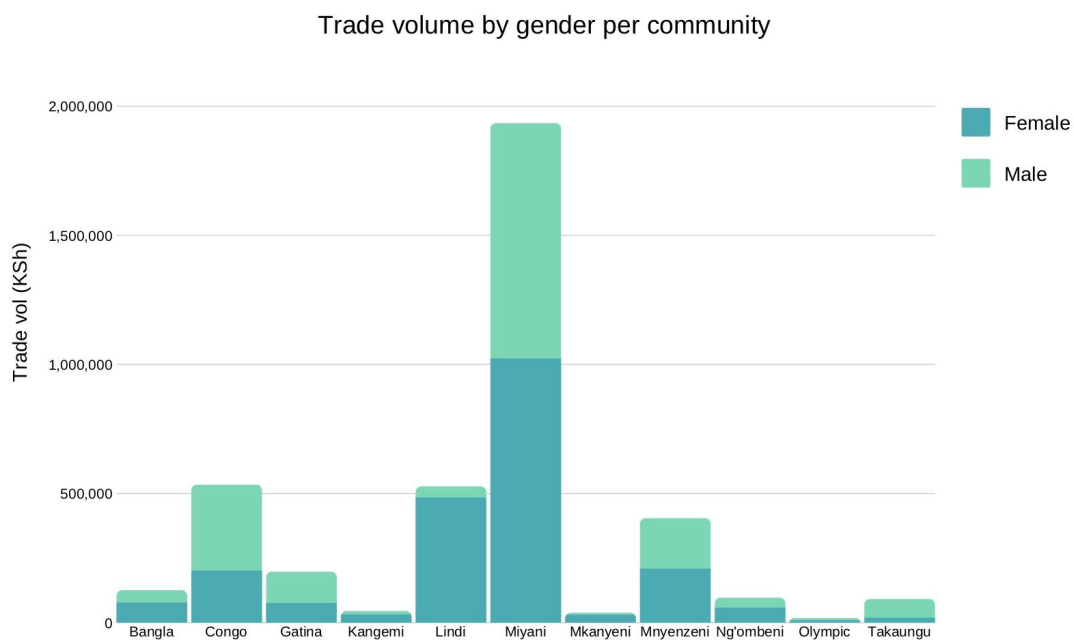


Fig. 4: Trade volume on the Sarafu Network by gender per community. Source: Grassroots Economics (2019).

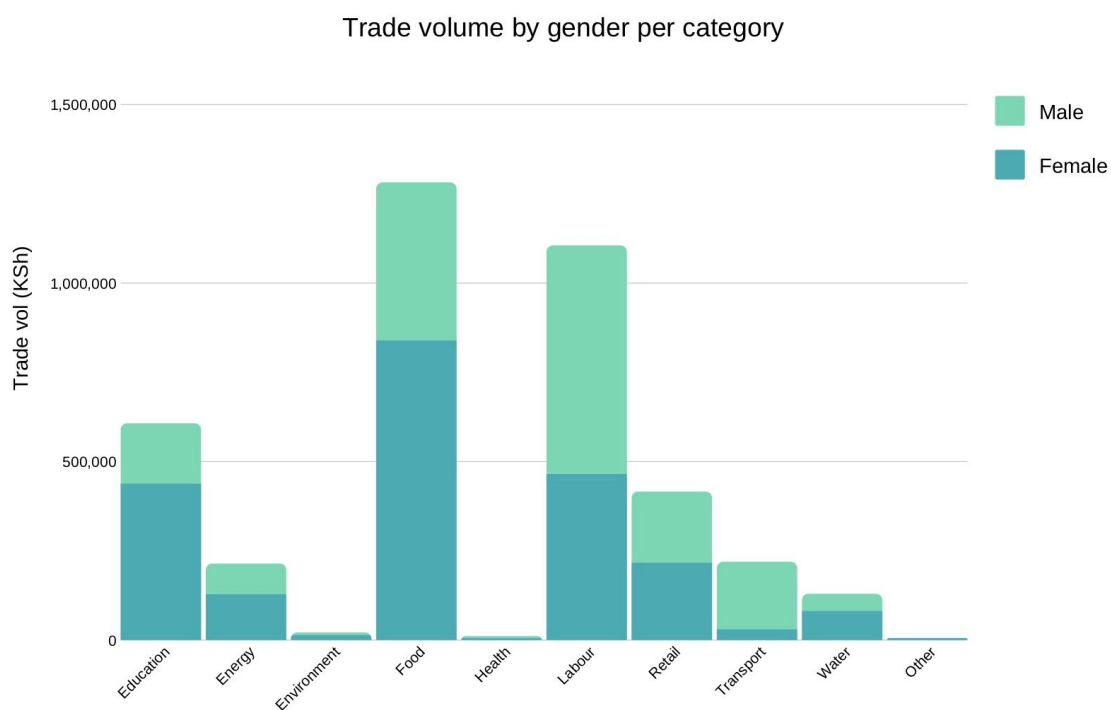


Fig. 5: Trade volume on the Sarafu Network by gender per category. Source: Grassroots Economics (2019).

5. Impacts of Liquid Community Currencies

5.1. Cross-Community Circulation Drives Adoption

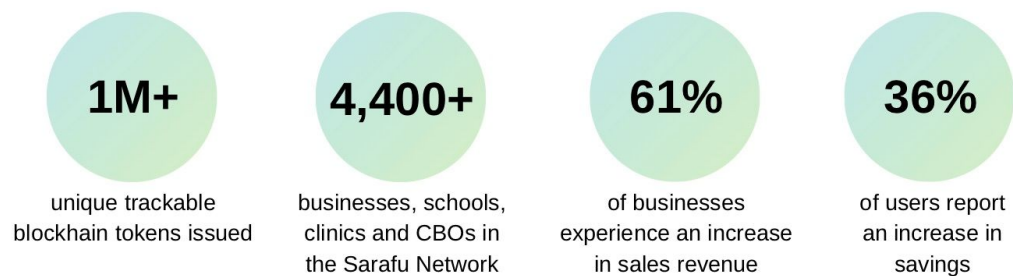


Fig 6. The Sarafu Network at a glance. Source: Grassroots Economics (2019).

Blockchain-based networks offer powerful insights into how users trade between local communities. Since its inception, the Sarafu Network has seen a steady increase of cross-community trade. The number of users in a community currency network is now strongly correlated with foreign trade value, suggesting that populations that are given the option to use their tokens elsewhere may adopt the community currency at higher rates.

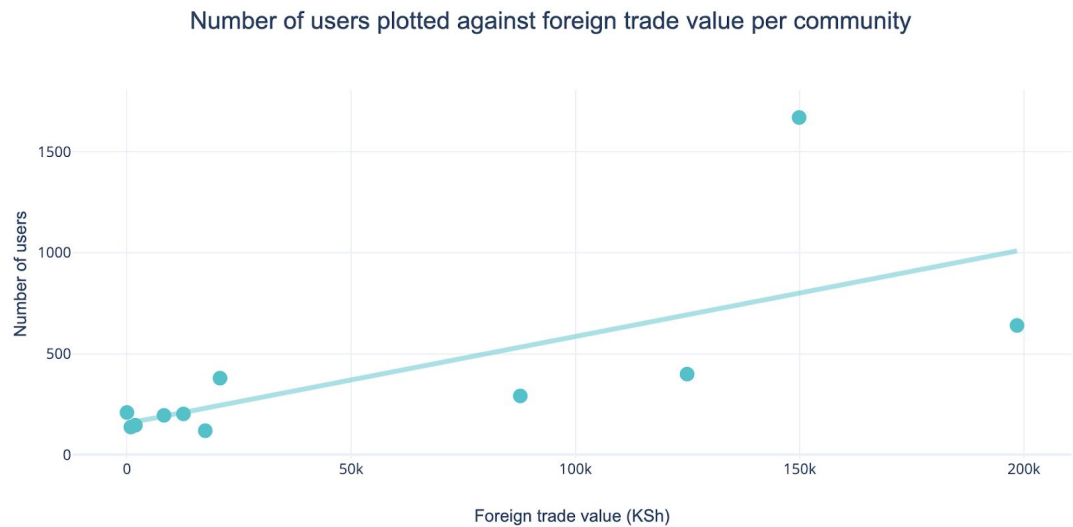


Fig. 7: Number of users plotted against foreign trade value per community. Source: Grassroots Economics (2019).

5.2. Fighting Food Insecurity with Liquid Community Currencies

Miyani is a rural community near the coast of Kenya, roughly a half hour drive from the major port city Mombasa. For the last ten years, Miyani has been categorized as food insecure, despite being the recipient of numerous intervention programs run by a plethora of NGOs, including the United Nations' World Food Program and the Red Cross. For four years, 200 local farmers were involved in an agroforestry cash-for-work program run by the Red Cross, where they received an income in exchange for communal farming, such as digging zai (water conservation) pits and planting trees. Together they formed the Miyani Food Distribution Point (FDP) as a village hub for food aid. While this program supported farmers with an income, it did not solve the fundamental problems plaguing the economic structure of the community. For example, cash injections into the area quickly funnelled out again, due to the lack of key services and resources locally available. Most farmers still had to commute up to four hours in order to grind their maize at the nearest maize mill. Water had to be purchased from neighbouring villages. Any money that circulated in the community quickly exited to be spent elsewhere. When the cash-for-work program ceased, communal labour came to a halt as farmers once again found themselves without a steady income. The food security status of Miyani remained largely unchanged. This highlights a fundamental problem with the way most aid is administered in marginalized communities. Traditional aid, whether in the form of products or cash, rarely increases the economic capacity of communities. In fact, these methods often lead to unsustainable food systems and exacerbate existing market dynamics without addressing underlying structural problems.

In 2017, Grassroots Economics and Bancor identified Miyani as its first pilot project outside of urban slums. Donors sponsored a maize mill to the Miyani FDP and the farmers who had formed part of the cash-for-work program were now in charge of operating the service and using the profits to sponsor labour which had previously been funded by NGOs. The Miyani FDP eventually functioned as a hub on the Sarafu Network and began accepting Sarafu as well as paying for labour with the community currency.



Fig. 8: A maize mill in the village of Miyani accepts Sarafu. Source: Grassroots Economics.

In August 2018, Grassroots Economics and Bancor migrated Miyani from a paper voucher system to its Liquid Community Currency network along with the surrounding villages of Mkanyeni and Mnyenzi. When users trade digital tokens on their feature phones, they are asked to submit each transaction under a choice of categories such as education, food or labour. This provides more granular data on how people are using each community currency to meet their needs. Pulling from the blockchain data on the Sarafu Network, in these three villages, food accounts for the lion's share of all trade volume, representing 40% of trade. Women, who make up roughly two thirds of network participants in the area, contribute 64% of this food trade. Most women reported using Sarafu to pay for food expenses such as tomatoes, sugar, cooking oil and maize from the mill.

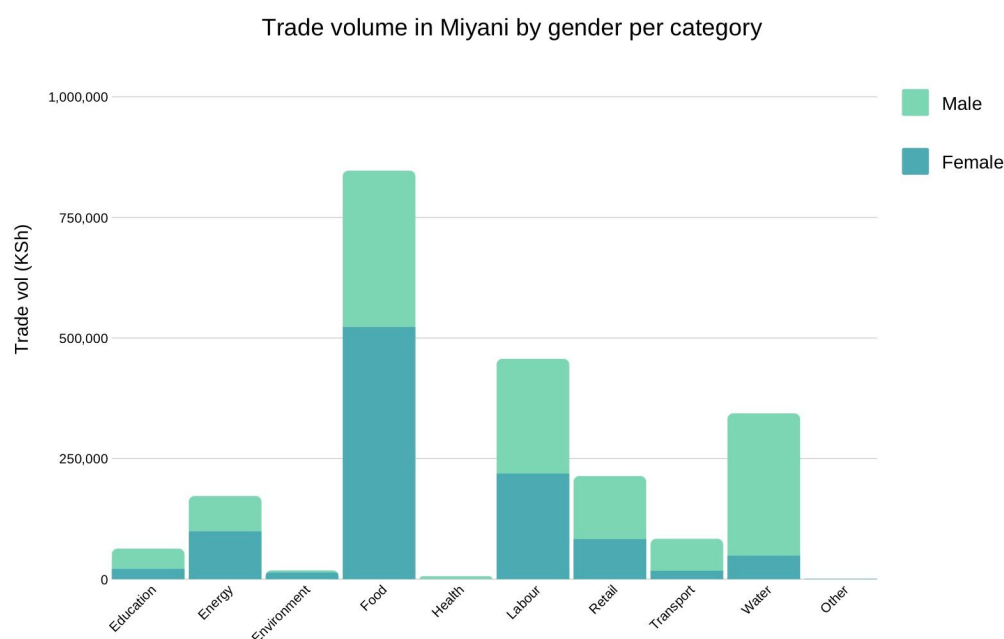


Fig 9: Trade volume in Miyani by gender per category. Source: Grassroots Economics (2019).

To date, the 200 farmers who run the Miyani FDP are the only group out of more than 4,000 participants in the cash-for-work program who have remained in operation. The maize mill has saved time and money for farmers who now no longer need to commute hours to grind their maize. Furthermore, the profits from the co-operative are injected back into the community by paying for services such as communal labour. This has encouraged more schools and businesses to join the network. Sarafu users in surrounding villages like Mkanyeni and Mnyenzi can seamlessly exchange their community tokens for goods and services in Miyani. This is because token conversion on the network is an entirely digital, back-end process. In this way, LCCs have kickstarted a cycle of virtuous trade that remains within and between these marginalized communities.

A series of informal interviews with community members also offered substantial feedback that LCCs have been a powerful tool for fighting food insecurity in the area.



“Sarafu has changed my life. My family used to eat Ugali every day from January to December. Now I can afford to buy beans and rice and even make chapatis. Before, we sometimes had to go without a meal. Now we are eating three times per day.”

– Kwekwemingo, Mkanyeni resident, feeds a family of 10



Before using Sarafu, Kuzumi Katuma used to save between 1,000 and 2,000 Kenyan shillings per month (10-20 USD), which she would pool together with her husband’s savings in order to pay for their children’s school fees. Since using Sarafu, Kizumi has sometimes been able to bring home more money than her husband and now contributes up to 4,000 Kenyan shillings per month in savings.



Grace Dzidza lives in Miyani and sells paraffin. She says using Sarafu helped her grow her customer base and she can now save about 600 Kenyan shillings more per month than she was able to before. She buys her food from other members in the community using Sarafu and has greatly benefited from the maize mill nearby.

5.3. Liquid Community Currencies as a Savings Tool

Most marginalized communities in Kenya consist of micro-merchants; informal small business owners who conduct most of their activity in relatively low-value transactions. These businesses can range from selling tomatoes from a garden to braiding hair. Micro-merchants are often excluded from using mainstream financial services since fees associated with such services tend to exceed the value of the average transaction. This inhibits access to savings and investment tools as well as financing and customer growth. Consequently, most micro-merchants never expand their business beyond “survival mode”, where day-to-day profits only just meet the cost of basic needs. Any shocks such as illness, crop failure or national currency volatility pose a significant danger to the livelihood of micro-merchants. As a result, they are often forced to turn to micro-lenders who charge high interest rates and offer little tolerance for defaulting on payments. Such is the economic structure of most poor communities. Those who manage to escape extreme poverty do so only by a margin, and those trapped in the poverty cycle have little chance of ever escaping.

Liquid community currencies directly target these reinforcing feedback loops. Informal businesses that form part of the Sarafu Network are more likely to attract local customers because they offer the option to pay for purchases partly in Kenyan shillings and partly in Sarafu. The Sarafu that is accumulated is fed back into the community in the form of personal expenses, buying business stock and supplementing employee salaries. Sarafu has benefited local businesses in the following ways:

- **Increased revenue.** All businesses on the Sarafu network are listed on the USSD feature phone menu which functions as a hub of information for the local marketplace. Individuals looking for a specific product or service can discover a business in their locality that accepts Sarafu. Businesses no longer have to turn away customers who cannot afford to pay for goods and services in full. Where there is a shortage of national currency, customers are encouraged to pay the balance in Sarafu. This stabilizes cash flow and acts as a countercyclical buffer when there is a scarcity of national currency due to high rates of unemployment or immediately after high-expense seasons, such as December.
- **Stable income for employees.** Employees are the first to suffer when an informal business does not meet its monthly targets. In many Kenyan communities, it is not uncommon for teachers to go unpaid for months on end. Supplementing employee salaries with Sarafu is another countercyclical buffer that ensures people are able to meet their monthly needs regardless of economic conditions.
- **Increased savings.** Businesses that accept Sarafu for payments and use it for operating expenses and daily needs are more likely to set aside their national currency for savings. The psychological separation between “spending money” (Sarafu) and “saving money” (national currency) assists individuals in their personal financial planning. The amount that is saved often goes toward a structured savings plan, such as Mpesa’s M-shwari locked savings account or towards a local pooled savings groups called a *chama*.

5.4. Individual Case Studies

Name: Susan Lukobo

Community: Gatina (Kawangare), Nairobi

Role: Principal of Skylife Academy

Member of Sarafu since: 2015

Susan Lukobo is the principal of Skylife Academy in Kawangware, Nairobi. She uses Sarafu to pay for teachers' salaries, classroom repairs and the school's rent. Skylife receives Sarafu from parents who are also part of the network and supplement their children's school fees with the community currency. Before the launch of the Sarafu network, Susan says she often had to send children home due to unpaid fees, which cost 700 Kenyan shillings (7 USD) per month. Since the school receives no government support, teachers often had to go month-to-month without receiving a full salary. Today, the school supplements teacher's salaries in Kenyan shillings with Sarafu, with the ratio of community currency to national currency sometimes as high as 80%. Staff members no longer have to go unpaid or underpaid and can meet their daily expenses by using Sarafu.



Name: Reba

Community: Gatina (Kawangare), Nairobi

Role: Self-employed weaver and bead-worker

Member of Sarafu since: 2016

Reba has been part of the Sarafu network since 2016. She says the biggest advantage of Sarafu is that it enables her to save far more in Kenyan shillings than she was able to before she joined the network. Reba is a self-employed weaver and bead worker so it's important to her that she is able to set aside enough Kenyan shillings to buy the materials she needs to make her scarves, jewellery, bags and wallets. Her primary market is her immediate community and she often accepts payments in Sarafu, which she then uses to buy food or to pay the school fees of the two pupils she sponsors at Skylife Academy.

Reba also believes in the power of collective saving. She belongs to a *chama*, a micro-savings co-operative that is common amongst East African communities. Her *chama*, Joywo – the Joyful Women’s Organization – consists of twenty members who each contribute a portion of their savings to be pooled each month and handed to one member as a loan. Interest is typically charged at 10% and by the end of the year, all the interest collected from loan repayments is shared out according to the portion of savings contributed by each member. A number of the members of Joywo are also part of the Sarafu network. Reba believes that if she can convince the other members to also join Sarafu, they will have more Kenyan shillings to contribute to the monthly pool and thus increase the credit available to all members.

Name: Jackline Kasiva

Community: Gatina (Kwangare), Nairobi

Role: Owner of Jackline’s Hair Salon

Member of Sarafu since: 2018

Jackline’s Hair Salon is the pride and joy of Jackline Kasiva who started this business out of her own savings in early 2018. Jackline used to braid clients’ hair from her home, but over time she was able to set aside enough Kenyan shillings to open her own salon. Initially, she didn’t have clients on a daily basis and would sometimes go up to two days without seeing a single paying customer. She found it difficult to turn away people who couldn’t pay for her services in full, but as a small business owner just starting out, she had to be firm about being remunerated for her services. Jackline says that joining Sarafu not only helped her expand her business to meet the demand of her clients but also drastically improved her ability to save for future investments.

Now, when a customer cannot pay for her services in full, she encourages them to supplement the costs with Sarafu. She sees more clients per day and has also employed a female assistant. Rather than lose out on Kenyan shillings, Jackline says seeing more clients has increased her income and enabled her to better manage her finances. She uses Sarafu for everyday expenses such as buying food for her toddler and husband. Most of her Kenyan shillings go towards her M-Shwari savings account that she holds in her M-Pesa account with Safaricom. In nine months, she saved enough to include hair products in her business stock and now hopes to continue to expand. Jackline says that if she uses Sarafu on a daily basis, she can typically save up to 100 Kenyan shillings per day or 30 US dollars per month.



6. Ongoing Challenges and Future Implications

Ongoing challenges to effectively operating and scaling the Sarafu Network are mainly related to ground-level operations. Although registration on the network is now easier than ever and fee-less transactions can be made by users in a matter of seconds, Grassroots Economics still runs into cultural barriers that skew people's perceptions of a humanitarian, non-profit organization that is giving out "free money". The unfortunate legacy of international donors who started previous impact projects and made large promises only to abandon them has not escaped the minds and hearts of the people who now use Sarafu. The responsibility falls on staff on the ground to ensure that the Sarafu Network and its benefits are communicated to new users, and that training of community leaders and members is comprehensive and self-perpetuating.

The unique makeup of each community shapes the implementation and growth of its currency. Small village communities such as Miyani typically show greater community cohesiveness and it is therefore easier to onboard a large number of people in these contexts using events, meetings and door-to-door awareness. In addition, gaining the support from local elders and chiefs makes rollout and business integration a much easier task as entire communities may join the program at once. In urban communities, such as the slums of Nairobi and Mombasa, trading networks tend to be smaller despite there being larger populations and an older presence of each community currency.

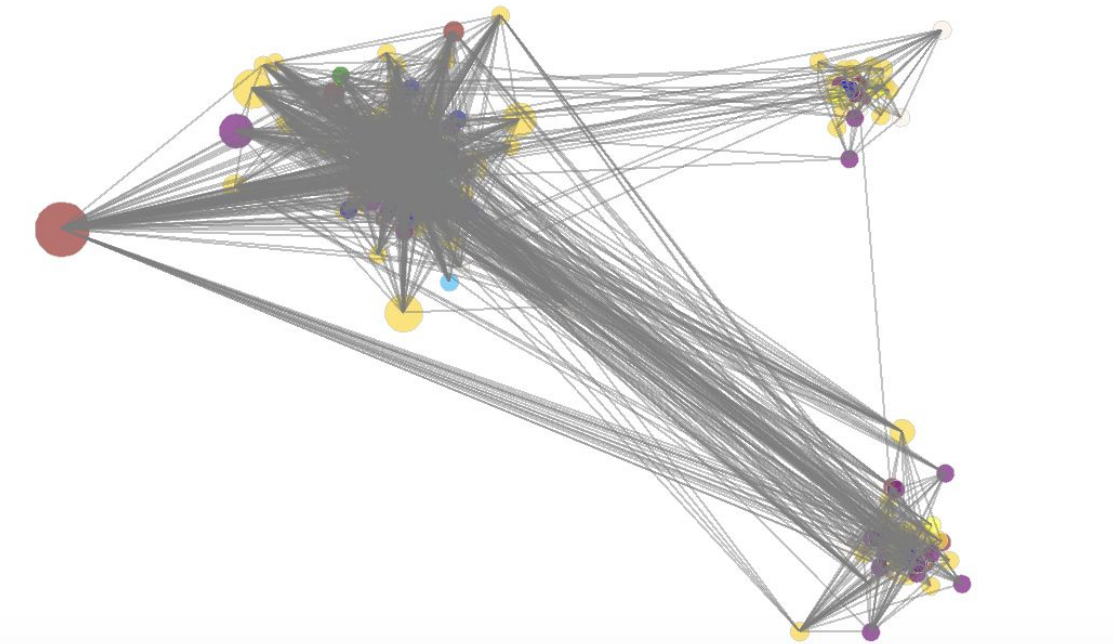


Fig. 10: Network diagram of total user trade in Miyani between August 2018 and May 2019.

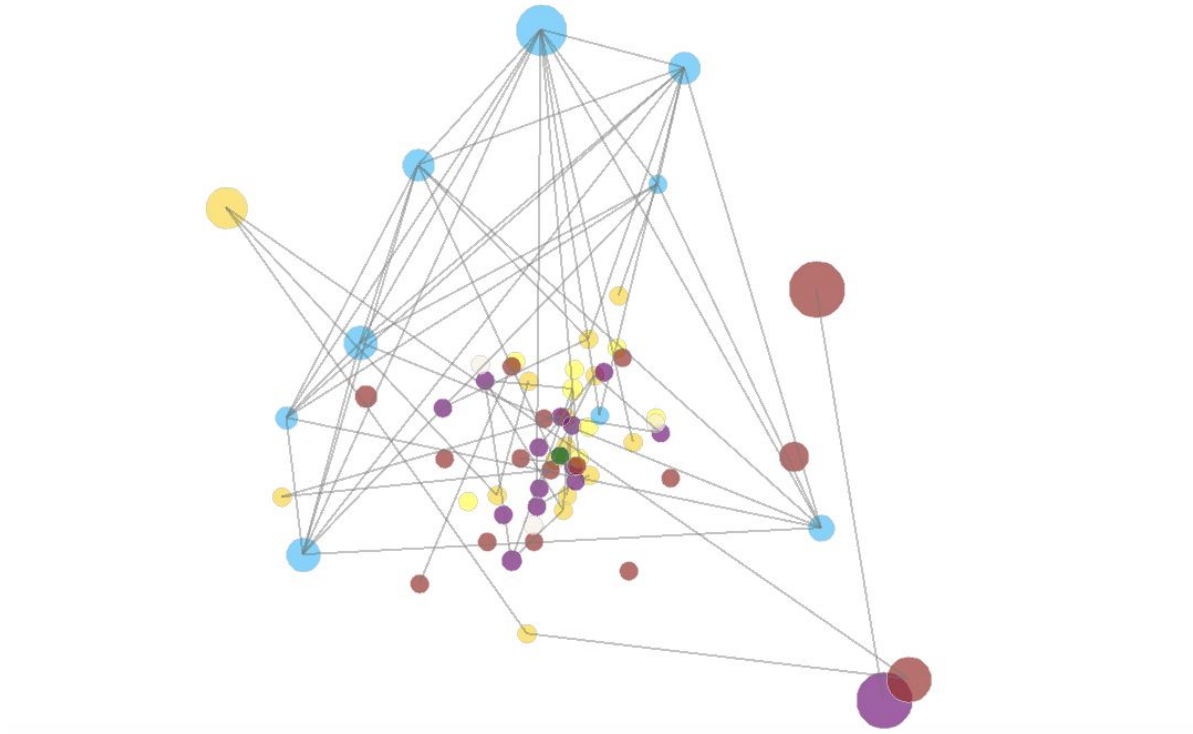


Fig. 11: Network diagram of total user trade in Gatina between August 2018 and May 2019.

Cultural demographics also play a key role in how the community currency is accepted and used. In the predominantly Muslim community of Takaungu, Grassroots Economics has struggled to onboard women as their husbands are often reluctant to allow them to register their names and cell phone numbers with the network's field operators. This highlights that although financial technology can be an incredibly empowering tool for women who are given the autonomy to privately manage their own finances, significant barriers still exist for opening up access to the technology in the first place.

The benefits of a digital network do not come without risks. "Gaming the system" is not uncommon as users try to increase their trade volume in order to earn rewards during promotion periods or from fraudulent onboarding bonuses. In the past, users were rewarded with 100 M-Pesa if they traded 400 Sarafu or more with at least six people in a week. Grassroots Economics subsequently saw a spike in artificial trade, where people would simply send money to each other in order to reach their weekly quota that promised them an M-Pesa reward. This incentive structure was removed in favour of a referral program so that trade could happen more organically. Among

the advantages of a network like Sarafu, in which every movement of funds is publicly recorded on the blockchain, is it offers much more granular data to identify bad actors in the system and learn from experience.

The network must be able to stabilize in the case of one currency's value dropping sharply in relation to another. If a community's productive capacity is very low, people are more likely to spend the community's currency outside the community or to cash out of the system altogether. The dynamics that underlie Bancor's automated pricing mechanism means that if one community currency is oversold, it will lose value in relation to other currencies on the network – thus reflecting the supply and demand of each connected currency. This price volatility can impact the holders of the declining currency and thus discourage usage and adoption, and various manual, automated and periodic balancing solutions are currently being explored.

The full ownership of each community currency should transition to community-elected councils. Community ownership of the currency itself and fluency with the technology, platform and growth, as well as trouble-shooting, are critical for sustainable engagement and capacity-building moving forward. A network based on blockchain smart contracts introduces the possibility for built-in voting systems that are relatively easy to deploy. While this has not been implemented yet, in the future, communities on the Sarafu Network may be able to democratically decide things like which organizations become supported social services or which kinds of programs receive donor funds. In addition, tax from negative interest can be collected into a community fund account where expenditure is decided by community vote of active token holders (Ruddick and Chirenga, 2019).

7. Conclusion

The LCCs on the Sarafu Network offer promising data for how this new model of community currency design can build and scale sustainable complementary currency systems. Early results suggest that introducing interconnectivity between community currencies and national currencies can lead to greater adoption and circulation, increasing the size of a network and creating more robust and resilient local economies. Additional research suggests that LCCs can be a powerful tool for savings for people who do not have access to basic financial services. However, this research would benefit from a deeper long-term analysis of how LCCs act as a counter-cyclical buffer in impoverished communities during economic shocks, and how the increased savings are sustained and deployed over time. Furthermore, advanced features such as voting and community tax are yet to be implemented and would open up novel areas of research around how the design of local economic systems can support social and environmental outcomes.

For decades, community currencies which could otherwise potentially support thriving communities have faced seemingly insurmountable barriers to measurable impact and scalability. LCCs enable a new form of local commerce and finance – powered by a decentralized public infrastructure which requires no fees, no central authority, and can be seamlessly and affordably operated and accessed by any community in the world . As LCC-based pilots evolve and yield insights, advancements in blockchain infrastructure and network design may

offer additional significant advantages in the design and deployment of community-generated currency programs in both emerging and advanced market economies.

Acknowledgements

Our research was greatly aided by the Grassroots Economics Foundation, particularly Caroline Dama and Will Ruddick and his team in Kenya, who provided ongoing support by way of translations, data, research and images during the writing of this paper. Special thanks to Nate Hindman for assistance with editing, and with gratitude for the guidance of the late Professor Bernard Lietaer, formerly President and Chief Monetary Officer of the Bancor Foundation.

References

- Bendell, J. Slater, M. and Ruddick, W. (2015). Reimagining Money to Broaden the Future of Development Finance. United Nations Research Institute for Social Development. Retrieved from [http://www.unrisd.org/80256B3C005BCCF9/%28httpAuxPages%29/99FCA15CAF8E24F4C1257E7E00501101/\\$file/Bendell%20et%20al.pdf](http://www.unrisd.org/80256B3C005BCCF9/%28httpAuxPages%29/99FCA15CAF8E24F4C1257E7E00501101/$file/Bendell%20et%20al.pdf)
- Castilla-Rubio, J., Zadek, S. and Robins, N. (2016). Fintech and Sustainable Development: Assessing the Implications. United Nations Environment Programme (UNEP) Inquiry into the Design of a Sustainable Financial System. Retrieved from http://unepinquiry.org/wp-content/uploads/2016/12/Fintech_and_Sustainable_Development_Assessing_the_Implications_Summary.pdf
- Communications Authority of Kenya (2018). Second Quarter Sector Statistics Report for the Financial Year 2018/2019. Retrieved from <https://ca.go.ke/wp-content/uploads/2019/03/Sector-Statistics-Report-Q2-2018-19.pdf>
- Fidelity International (2019). The financial power of women. Retrieved from <https://www.fidelity.com.au/insights/investment-articles/the-financial-power-of-women/>
- Grassroots Economics (2019). Transaction Datasets. Github repository. Retrieved from <https://github.com/GrassrootsEconomics/TransactionDatasets>

- Greco, T. (2001). Money: Understanding and Creating Alternatives to Legal Tender. Retrieved from https://books.google.com/books?id=SYbBxpqxx8MC&printsec=copyright&source=gbs_pub_info_r#v=onepage&q&f=false
- Hertzog, E., Benartzi, G. and Benartzi, G. (2018). Bancor Protocol. Retrieved from https://storage.googleapis.com/website-bancor/2018/04/01ba8253-bancor_protocol_whitepaper_en.pdf
- Lietaer, B. and David, A. B. (May 11, 2017). Draft: Unconditional Basic Income Smart Tokens. Retrieved from https://2017.iswi.org/wp-content/uploads/sites/17/2017/05/Basic-Income-Smart-Token_BALMay11.pdf
- Marshall, A. and O'Neill D. (2018). The Bristol Pound: A Tool for Localisation? Ecological Economics Volume 146 pp. 273-281. DOI <https://doi.org/10.1016/j.ecolecon.2017.11.002>
- McLeay, M., Radia, A. and Thomas, R. (2014). Money Creation in the Modern Economy. Bank of England Quarterly Bulletin 2014 Q1. Available at SSRN: <https://ssrn.com/abstract=2416234>
- Nishibe, M. (2012). Community Currencies as Integrative Communication Media for Evolutionist Institutional Design. International Journal of Community Currency Research, Vol.16 (D), pp. 36-48.
- Parsons (2018). Forward. In Editor *Liquidity or Leakage: Plumbing Problems with Cryptocurrencies* pp. 2. Retrieved from https://www.longfinance.net/media/documents/Liquidity_Or_Leakage_KQg79GR.pdf
- Peña de Carillo, C. I., de la Rosa i Esteva, J. L., Carillo Peña, P. N. and Pharow, P. (2018). Identification of Barriers and Solutions for Adoption of Social, Complementary and/or Virtual Currencies. International Journal of Community Currency Research 2018 Volume 22 (Summer) 125-140 ISSN 1325-9547. DOI <http://dx.doi.org/10.15133/j.ijccr.2018.020>
- Rabinovitch, A. (February 11, 2014). Israeli startups dream of a bitcoin world. Reuters. Retrieved from <https://www.reuters.com/article/us-bitcoin-israel/israeli-startups-dream-of-a-bitcoin-world-idUSBREA1A0R420140211>
- Randriamaro, Z. (2010). The impact of the global systemic crisis on women in Eastern and Southern Africa: responses and prospects. AWID Women's Rights. Retrieved from https://www.awid.org/sites/default/files/atoms/files/icw_2010_eastsouthernafrica.pdf

- Ruddick, W. and Chirenga, C. (2019). Liquid Community Currencies. Retrieved from https://docs.wixstatic.com/ugd/ce30dd_d5c510a583604ce3991e0e3f45204afc.pdf
- Schroeder, R. (2015). The Financing of Complementary Currencies: Problems and Perspectives. International Journal of Community Currency Research Volume 19 (Section D) pp. 106-113. ISSN 1325-9547. Retrieved from <https://ijccr.files.wordpress.com/2015/02/ijccr-2015-schroeder.pdf>
- Sobiecki, G. (2018). Sustainability of Local Complementary Currencies: Conclusions from an Empirical Study in Poland. International Journal of Community Currency Research 2018 Volume 22 (Summer) 105-124 ISSN 1325-9547. DOI <http://dx.doi.org/10.15133/j.ijccr.2018.019>
- Vanguard Center for Investor Research (2018). How the UK Saves 2018. National Employment Savings Trust. Retrieved from <http://www.nestinsight.org.uk/how-the-uk-saves/>
- United Nations Conference on Trade and Development (UNCTAD) Division on Investment and Enterprise (2014). World Investment Report 2014: Investing in the SDGs: An Action Plan. UNCTAD. Retrieved from https://unctad.org/en/PublicationsLibrary/wir2014_en.pdf
- United Nations (December 5, 2018). Statement from the Principals of OCHA, UNHCR, WFP and UNICEF on Cash Assistance. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/2018-12-05-FINAL%20Statement%20on%20Cash.pdf?source=post_page-----
- Utting, P. (April 29, 2013). Social and Solidarity Economy: A Pathway to Socially Sustainable Development? United Nations Research Institute for Social Development. Retrieved from <http://www.unrisd.org/thinkpiece-utting>