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# **Finding leverage points to improve the agricultural system in semi-rural areas in Sierra Leone**



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# Finding leverage points to improve the agricultural system in semi-rural areas in Sierra Leone

From **Christoph Rosinger**

## ■ Introduction

### Problem definition & background information

Sierra Leone is one of the poorest countries in the world. Because of the weak development of the secondary and tertiary economical sector, approximately 70 percent of the country's population are working in the agricultural sector. The country depends on imports to cover the demand on the staple food, which is rice. Domestic production covers around 70-75 percent, with imports making up the difference. Due to this fact, the price for rice is very vulnerable to world market price fluctuations. The cost of rice in Sierra Leone rose by over 50 percent from January to July 2008. While international prices have slid down, local prices are still high, and the downturn in the global economy is creating new challenges for the most vulnerable (cp. FAO, 2011).

I had the fortune to spend my civil service in Sierra Leone in 2010/2011. During my twelve month stay, I was mainly situated in a semi-rural area on a »competence centre for renewable energy«. This centre was some kind of educational and research centre, where a training for solar engineers was offered. Beside my activity as a teacher, I was enthusiastically working in the agricultural sector of the centre, trying to improve the agricultural production of the 15 hectare site.

Through this work, and through the interaction processes and communication exchange with the local farmers, I got some insight in the problems, which the farmers are facing in this region.

As a consequence of my experience, I want to make an attempt to analyse the problems of the agriculture in this region (you will find a detailed description of the analysed system later on) and find some main leverage points to enhance the situation of the farmers in this particular semi-rural region.

### Problem definition & background information

These four stated objectives should be elaborated within this work:

- What are the main restraints concerning the development of the agriculture in semi-rural areas in Sierra Leone?
- Who are the main actors in the system?
- How are factors and actors interlinked with each other?
- Where/what are the leverage points to improve the situation of smallholders in semi-rural areas?

The first two questions are just dealing with the collection of a data base. The third question will make the attempt to put the first two questions into a systemic framework. The last step, after the interlinkage in the third point, is the detection of possible leverage points.

### Used tools

For the first step, the collection of data concerning the main restraints of the agriculture, I was using the mind-map approach, whereby I used an open-source freeminding software.<sup>1</sup> This tool fits, because of the fact, that a lot of data can be presented in a clear way, perfect for such occasions. I was able to create a mind map covering seven categories with altogether 42 sub parameters, which can be found later on on the next page.

Because of the relatively simplicity, no special tools were used for finding the actors in the system.

For the interlinkage of the restraints and the actors of the system, I used the influence diagram. According to Howard and Matheson (2005), an influence diagram is a way of

1 This software can be found under the following address: <http://freemind.sourceforge.net/wiki/index.php/Download>.

describing the dependencies among aleatory variables and decisions. An influence diagram can be used to visualize the probabilistic dependencies in a decision analysis and to specify the states of information for which independencies can be assumed to exist. An extensive description and interpretation of the influence diagram can be found under point 5.

The last step will be the analysis of the influence diagram and the presentation of the leverage points in detail. At this, Donella Meadows' book »Thinking in Systems« (2008) and especially the chapter about leverage points was used as main literature.

Additionally to my experience, the inland coordinator (Mr. Idriss Kamara) and the overseas coordinator (Mr. Martin Strele, Mr. Simon Vetter) of the project were giving me helpful feedback and support during my creational process.

## Description of the system

### Sierra Leone

Sierra Leone is a small country on the west coast of Africa, surrounded by the two countries Guinea and Liberia. In comparison to most African countries, Sierra Leone is with its population of 5.9 million a relatively small country. Despite of the fact, that the country is rich in natural resources like diamonds, gold, bauxite and rutile, it is one of the world's poorest countries, with 66 % of the population living under the poverty line and a GNI of 340 \$ per capita (cp. World Bank, 2011).

According to the Human Development Index form the UNDP, which is measuring health, education and income, Sierra Leone is, with a HDI of 0.336, on rank 180 of 187 countries with comparable data (cp. UNDP, 2011). The given graph illustrates the low HDI of Sierra Leone in comparison to the World and the Sub-Saharan indices.

The national infrastructure is very poor, one can find just several paved roads (most of them connecting the main cities in Sierra Leone, few inside the bigger cities). The majority is unpaved, which makes transportation very difficult, especially in the rainy season. The national power grid system is poorly established and just supplies the upper middle class and the upper class in the three biggest cities in Sierra Leone. Generators, rarely available, dominate the countryside.

Sierra Leone belongs to the tropical zone, which is characterised through a distinctive difference in rainy season and dry season and a high precipitation rate of approximate-

ly 3000 mm per year, a daily minimum mean temperature of 23°C in August and a daily maximum mean temperature of 31,2°C in April (Freetown Data, WMO, 2012). And even the climate change is leaving one's mark, shifting the start and end of rainy and dry season by several weeks and changing precipitation intensity.

Agriculture is regarded as the backbone of the economy and provides a living to 60-70 percent of the work force, around 400.000 farm families. According to World Bank data (2011), there is an average cereal yield of 989 kg/hectare, which can be seen as an indicator for the low agricultural production. And in fact, most Sierra Leonean farmers are using very rudimentary tools and practices - fewer than 5 percent of households have access to fertilizers, insecticides, herbicides, tractors and power tiller farm equipment (cp. FAO, 2011).

The country is facing a lot of problems and constraints, and it is obvious, that Sierra Leone is still in the process of reconditioning the civil war the country was facing more than ten years, ending in 2002.

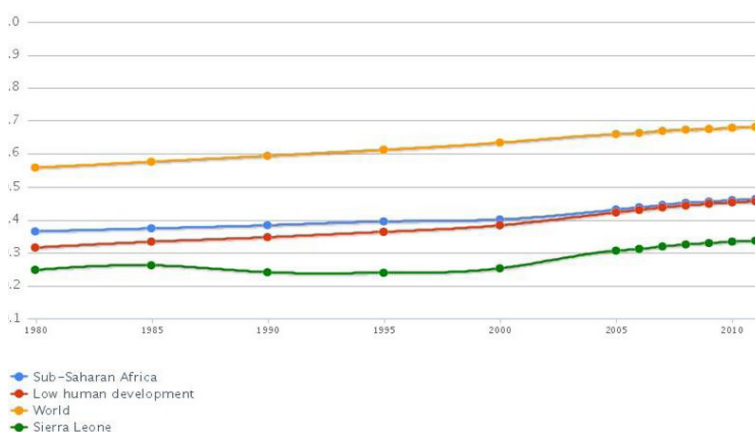
### Description and demarcation of the analysed semi-rural system

The agricultural system I was analysing must be categorised more accurately to create a better understanding of the system. The agricultural system is a very simple one and maybe comparable with a system we had hundreds of years ago. There are no specific data for the average acreage in Sierra Leone available, but the Sub-Saharan Africa mean farm size is 2,4 ha, whereby 69% of all farmers are cultivating under two hectares (Eastwood et al., 2010). And in my opinion, these figures can be applied for Sierra Leone, or rather for the area I was analysing, too.

The land use system is based on slash-and-burn techniques, whereby – because of the different cultivation areas in rainy and dry season – this method has to be applied every year anew. The degree of mechanization is very low and mainly reserved for big farmers or farmers, who work in collaboration with NGO's or other beneficial institutions. Working animals are not in use (maybe because of the climate conditions). Most of the farmers are still using the traditional hoe, shovel or spade. Sowing is all done by hand, what imitates the cultivated area essentially. Soils are, in general, very poor and partly degraded because of wrong land use systems. The main crops are rice, cassava, maize, sesame, ground nuts, chilli and sweet potatoes, whereby crops like rice, maize and sesame are cultivated in a mixed cropping system approach. The most important fruit trees are mango, avocado, papaya, cashew nuts, orange, lemon, lime and oil palms.

The farm, or rather the area where I was working, was situated about six kilometres away from the next biggest city named Waterloo, which is about 30 kilometres south-eastern from the capital Freetown. The asphalted main road, which is – in comparison to most of the other streets in the country – in a relatively good condition, connects Freetown with the other big district headquarter cities, is running through Waterloo. This as well as the fact that a large number of fish from the nearby fishing villages is brought through Waterloo to Freetown, making Waterloo to a very important

Figure 1. Human Development Index (UNDP, 2011)



trading and reloading place. This situation creates advantages as well as disadvantages for the surrounding farmers.

Waterloo is more exposed to impacts from the world market, for instance cheap imports of rice from Vietnam or Thailand or from onions from the Netherlands. Sierra Leone can just supply 70 % of their annual rice need of 500,000 tonnes with its own production, the rest must be imported (cp. FAO, 2011). Because of high transportation costs, onions and cheap import rice is not offered frequent at local markets in rural areas. Food stuffs still have a higher value in rural areas than in more urban areas like Waterloo, which means lower prices and a more competitive situation for the surrounding farmers.

The better infrastructure with the result of lower transportation costs and the relatively good access to the market can be seen as a significant advantage for farmers. Furthermore there are existing possibilities to create more value through given technologies, e.g. community processing machines. But most processing facilities are combined with NGO projects and up to now, they are very rare. Additionally it must be said that all these advantages have to be seen in relation to the worst situation in the rural regions. Because of the closeness to this trading and reloading place and other differences to agricultural systems in the back-up areas, I gave the agricultural system the attribute »semi-rural«.

Every system with its interlinked components has to have borders, which have to be defined. The physical border of the described system is a radius of about 20 to 30 kilometres around Waterloo. Impacts from the world market might be the same even more outside, but transportation costs are significantly higher and access to markets are limited.

### Actors and factors

Before thinking about the restraints more in detail, one has to find out the key actors in the system. As key actors, one stated out the following (the parameters in brackets are sub-linkages):

- Farmers (almost self-supporters, small scale farmers, big scale farmers, NGO led farms and farms led by religious institutions)
- Traders (local market traders, national traders, importers, exporters)
- Local authorities (chiefs, mayors)
- National authorities (ministry of agriculture, min. of education, min. of trading, min. of infrastructure)
- Processing companies (small scale companies, big scale companies)
- NGO's (local NGO's, international NGO's)
- International institutions (WTO, IMF,...)
- World market (international investors)

Sub linkages have been made, because problems and restraints differs between the different levels of organisation. Despite they are in the same group, an import-export company will probably be faced with other problems as a local market trader. Additionally it must be said, that some actors are just listed for the sake of completeness. Importers and exporters, which were, in fact, unrepresented, can be named as an example for this. Nevertheless, they are mentioned.

The majority of the farmers in the region can be categorized as small scale farmers. There were just a few bigger farms and few, which were in collaboration with NGO's or other beneficial organisations. Therefore, the degree of

mechanization in the analysed area was very low.

Local authorities play a great roll. They are in most cases the last instance, if we consider points like conduction of meetings or decision-making. Problems inside the community or between the communities are regulated by the chiefs and mayors. Unfortunately, this is even a weak point as far as, for example, corruption is concerned.

The world market is mentioned as an actor, but must be understood as a physical and non-physical actor. As an actor is a part of the system through the active and even passive interaction with the other parts of the system, so the world market does with its international investors (as »active« parts) and all its rules and regulations (as »passive« parts).

### ■ Problems of the agriculture in semi-rural areas – ■ Data collection for the mind map

In the Figure 2, you see the restraints, clearly represented in a mind map. As already mentioned above, there are seven super categories: infrastructure, climate and site conditions, economical parameters, technology, education and know-how, political power status and historico-cultural background.

Summa summarum, 36 sub restraints could be detected. Beside these restraints, there are a few points, which can be seen as a result of the given problems. Nevertheless, they are mentioned in the mind map as »problems of a higher level«.

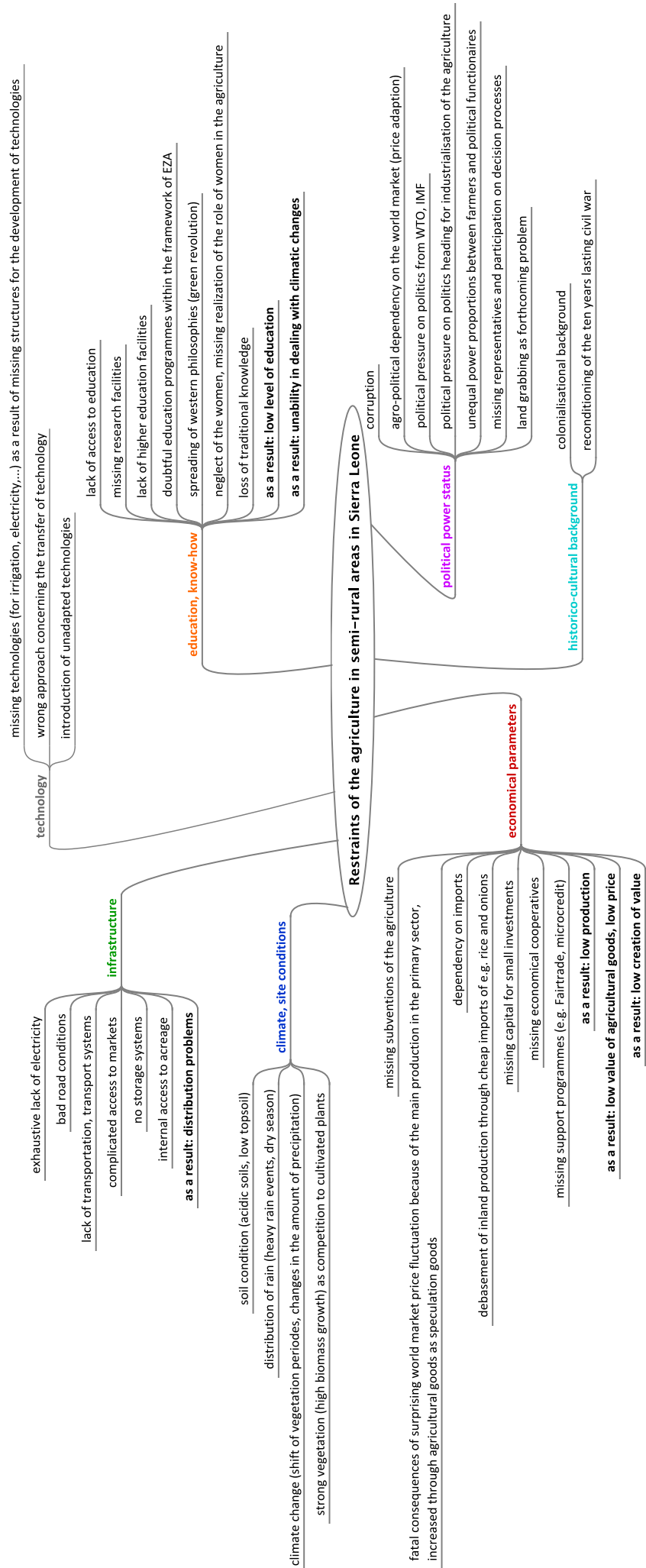
As already mentioned above, the basic infrastructure constitutes a big problem in Sierra Leone. Bad road conditions and the lack of transportation systems often result in a complicated access to markets. The exhaustive lack of electricity allows for example no storage systems, even at the bigger market places. Because of the strong growing vegetation and the steady change of the land under cultivation (because of dry and rainy season), the internal access to the acreage is often complicated. Acidic soils and the low topsoil level, together with the signifying difference in precipitation rates between dry and rainy season, makes agriculture more difficult. A new problem, which was detected in the last years, is the climate change with shifts of vegetation periods and changes in the amount of precipitation.

Because of the high dependency on imports, surprising world market price fluctuations have fatal consequences on inland prices. Subventions, which could support the inland production, are not given. Missing economical cooperatives and support programmes like FAIRTRADE or microcredit programmes to allow small holders to make small investments result – in conclusion – to low production, low creation of value and a generally low value of agricultural goods.

Development aid, how it's mainly practiced nowadays, often offers a wrong approach concerning the transfer of technology. The introduction of unadapted technologies into a system and the spreading of western philosophies like conventional farming methods with ist mineral fertilizers and pesticides, are often worsening the situation for farmers.

And because of the lack of access to education, especially of farming households in the countryside, farmers are often leaving their old farming systems' ideology and come along with the new western ideas of agriculture, which often ends in the loss of all their money. This continuous process is leading to a long-term loss of traditional knowledge. Missing research facilities and the lack of higher education facilities are not contributing to a better understanding of the farming system too.

Figure 2. Restraints of the agriculture in semi-rural areas in Sierra Leone - Mind Map.





Another big problem is the corruption, which can be found at any level of the system, which has – with regard to the agricultural sector now – its origin in the unequal power proportions between farmers and political functionaries and in the missing representation and participation on decision processes. Additionally, there is a lot of pressure on the politics, from international institutions like WTO or IMF and other organisations, pressing for an advancing industrialisation of the agricultural sector. Land grabbing is not that obvious at the moment, but will be a forthcoming problem.

All these comprising problems must be seen in consideration of the colonisation background (Sierra Leone got independent in 1961) and the ten years lasting civil war, which had fatal consequences on the whole country. The reconditioning work of the war, which ended in 2002, is still in progress.

### ■ Combining actors and factors – Influence diagram ■

The next step, after creating the mindmap of the problems and the collection of the different actors in the system, was now to create an influence diagram (Figure 3). The thickness of the arrows represents the relative importance. The colours of the arrows show the direction of the influence.

In this case, the influence of the national authorities and NGO's on the farmers is the strongest force in the diagram. Missing support programmes and wrong sanctions to support the agriculture like introduction of unadapted technologies and the debasement of inland production through cheap imports have a direct negative effect on the farmer's situation. On the other hand, this is not surprising, because western philosophies are strongly introduced through, among others, international institutions like WTO and IMF. By that, structural adjustment programmes and other restrictions decimate the scope of governments and ministries' action and they are almost forced to adopt western philosophies. International NGO's try to implement western strategies in an indirect way by influencing aid programmes of the government. On the other hand, problems are created in a direct way by the transfer of often unadapted technologies and missing sustainable, long-term support programmes. Farmers are often underrepresented and are not included in important decision processes.

Climate and soil conditions are influencing most actors, but the farmers in a more direct way as the difficulty in production increases. Furthermore, infrastructural problems are arising for the participating traders and processing companies, leading to uncontinuous or delayed deliveries. This point could also be seen as an extrinsic factor that is influencing all other actors. But I choose it to be an intrinsic one, because it affects the farmers most.

Another big problem, which has its origin in the national authorities, is the missing offer of access to education and missing research and higher education facilities. I just want to mention storage facilities as an example. In the analysed area, as well as mostly all over the country, there were no market storage facilities found, which would be, especially in these climate, of great importance.

Sierra Leone has created a situation of strong dependency on imports and, as a consequence, on the world market. Surprising fluctuations in world market prices can have a disastrous effect on local prices and the regional economy. Farmers as well as traders and processing companies are suf-

fering under this circumstance. This dependency is again strongly linked with restrictions of international, free trade promoting, institutions like IMF or WTO.

Economical cooperatives could create a win-win situation for all parties concerned, for the processing companies, for traders and especially for the farmers themselves. Cooperatives already happen in small scale, but should be promoted much more. By that, a structured buy-off could serve for a safeguarding for both parties.

The given influence diagram indicates, that corruption, which is one of the biggest restraints in the system, can be found in nearly all sections. It's one of the most important factors when talking about deceleration of economical growth and social empowerment. Many opportunities and many projects with good intentions are destroyed because of corrupt functionaries, especially in higher social positions. The black arrow should illustrate this circumstance. Despite of the fact, that corruption is found in any position, actors with relatively less corrupt interrelations like farmers are not connected with this arrow. Furthermore they are, in most cases, the weaker part of an interaction and therefore, they are suffering under the victimhood.

Some problems, you will find in the mind map, are not mentioned in the influence diagram, because some are not exactly classifiable. To find leverage points, which are realizable in practice, one's have to choose those relevant points, which can be dedicated to certain actors.

### ■ Discussion – Finding out the leverage points ■

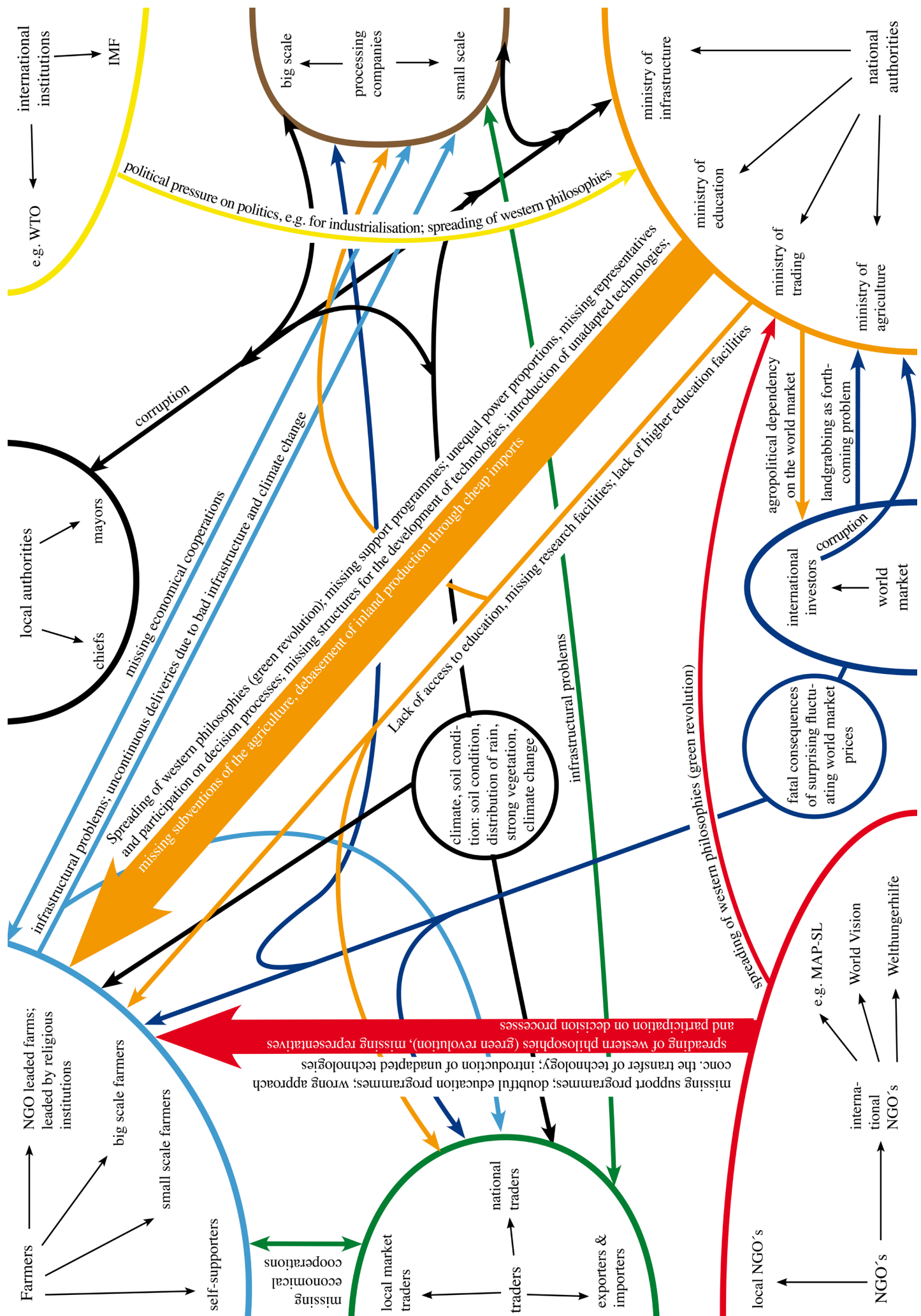
We have defined now several problems of the agriculture in the particular semi-rural area, but some of them are better suitable as leverage points than others. Meadows (2008, 145) defines leverage points as places in a system where a small change could lead to a large shift in behaviour.

Physical structures are crucial in a system, but rarely a leverage point, because changing it is rarely quick or simple. The only way to fix a system, which is laid out poorly is to rebuild it. If we transfer this statement to our system, it would be less helpful to invest in infrastructural projects.

Another leverage point, which could be named first, is the establishment of agricultural subsidies. But subsidies are not combating with the core of the problem, but with the symptoms. Meadows further indicates, that companies and governments are often attracted to the price leverage point, trying to use subsidies, taxes or other stability sanctions (cf. Meadows, 2008, 154).

Positive feedback loops are often forgotten, but of great importance if we talk about good leverage points. The goal is to find leverage points where a feedback loop and a resulting reinforcement could happen. Meadows (2008, 156) mentions high-quality public education programmes as a leverage point with possible feedback loops. Therefore, education and all indicated categories are the first leverage point, I chose. In the influence diagram, it is pointed out as lack of access to education and missing research or rather higher education facilities. Working on this sector could improve farming methods to increase productivity and production, let people treat climate changes in a better way, could push to more self-ingenuity and might be able to bring an important impulse to more self-organisation under each other. The ability to self-organise is the strongest form of system resilience, which makes self organisation in form

Figure 3. Combining actors and factors – Influence diagram.





of economical cooperatives my second leverage point. The following empowerment of the afore suppressed social classes could lead the upper class, without or under pressure, to allow more participation on decision processes. With this step, representatives of the lower class (e.g. labour unions) could be established in parliament to represent the voice of the unheard. Participation on decision processes and the establishment of representatives would therefore be my third leverage point.

But with the new representatives, it is not granted for sure, that they abstract themselves from corruption. Especially in an economically poor surrounding, people can become affine to bribe and bribe money. If the whole system is corrupt, it is very difficult to be honest and not to be part of it.

The leverage point with the greatest lever action is paradigms. Paradigms are the sources of systems. From them come system goals and information flows, feedbacks, stocks, flows and everything else about the system. You could say paradigms are harder to change than anything else about a system, but there is nothing physical or expensive or even slow in the process of paradigm change. People, who have managed to intervene in systems at the level of paradigm have hit a leverage point that totally transforms systems (cf. MEADOWS, 2008, 163).

Unfortunately, corruption is, as one of the major restraints, inherent in the described agricultural system or rather in the nearer surrounding. It would be of great advantage and a great opportunity for everyone, if corruption could be stopped or rather minimized to an infinitesimal level. Therefore, the fight against corruption, which is already practiced, is the last and - in my opinion - the strongest leverage point.

## Conclusion

The agricultural site in Sierra Leone is facing a lot of problems. Up to now, most farmers are working with simplest methods, the mechanization rate is very low and working animals are missing. Electricity and advanced infrastructure can just be found in the biggest cities. Beside that physical ones, there are a lot non-physical restraints, which have a more inhibit effect on processes.

In the frame of this thesis, I have tried to present the problems of the agricultural sector in a clear way and, as a consequence, to sort out leverage points to enhance the situation.

As anticipated, matters of the leverage points are not physical like infrastructural measures. These have been practiced frequently in the frame of development cooperation in the past and can be seen as mainly failed.

Education, cooperation, participation on decision processes and paradigm change in form of fight against corruption have been worked out as the main leverage points, because further efforts in these areas could cause feedback loops, which, in the sense of a »perpetuum mobile«, could lead to a further improvement of the situation.

If we really want to improve the situation, the western civilisation has to think over their idea of development cooperation, because most implemented projects sustain the dependency rather than solve it. »Help for self-help« could constitute a suitable key motive in this context

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