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Farmers Food Insecurity Monitoring

Identifying Situations of Food Insecurity and Famine

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Abstract

Hunger, malnutrition, food insecurity and famines are still persistent in many regions globally. Especially on a local level new concepts of targeting food insecurity need to be implemented. Prior to applying new practical concepts the initial situation has to be understood accurately. Therefore, this methodology paper aims at enhancing monitoring systems in times of food scarcity. The overall aim of the “Farmers Food Insecurity Monitoring” system presented is threefold: First, to accelerate the processes between data gathering and data evaluation; second, to close the gap between recognising a food supply problem and taking actions; and third, to integrate the perception, knowledge, and experience of affected people on a local level. The spatial framework should also integrate urban areas and peri-urban areas, while the current models mostly focus on rural areas. Fulfilling these requirements enhances the opportunities of affected societies to deal with food shortages.

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List of Acronyms

FAD	Food Availability Decline
FaFoInMo	Farmers Food Insecurity Monitoring
FAO	Food and Agriculture Organization of the United Nations
FED	Food Entitlement Decline
FFS	Farmer Field School
FVAM	Famine Vulnerability Analysis Model
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
UPA	Urban and Peri-urban Agriculture
WFP	World Food Programme
WSFS	World Summit on Food Security

1. Introduction

In this paper we take a closer look at famine and food (in)security research and present a monitoring system for the analysis of food (in)security of farmers as an innovative approach, recently developed by Engler (2013).

Avoiding or mitigating current and future situations of food insecurity and famine are great challenges for mankind. According to various organisations and initiatives, around 850 million people are undernourished globally (FAO 2010; FAO, WFP and IFAD 2012; Feed the Future 2011; Grebmer et al. 2013). Although estimates show declining trends since 2010, almost 1/8 of the global population still face severe hunger. On average, one in four people suffer from chronic malnutrition in Sub-Saharan Africa (FAO, WFP and IFAD 2012).

Food crises are not 'black swan' events. They occur regularly and their slow-onset pathology is well understood. They can be anticipated several months in advance, so are never unexpected. They are, however, devastating (Bailey 2013, ix).

In his statement, Bailey assumes two things: First, that famines and food insecurity are well understood; and second, that their outbreak is foreseeable. Even though the authors agree with Bailey's quotation on a general basis, famines and food insecurity research still have a lot of research potential.

Beginning with an examination of the assumption that famines and situations of food insecurity are well understood, the authors will take a closer look at famine, famine theory, and food insecurity in section two. Even at first sight, it becomes obvious that for example the definition of term "famine" itself and the related theories that arose over the past decades to explain the causes of famines are incomplete. Generally, these theories lack interdisciplinarity (e.g. either social or environmental sciences), which limits their scope. In terms of food security, new concepts, such as food sovereignty, have emerged and need to be understood to reach the goal of sufficient food accessibility.

Bailey (2013) also stresses that it is crucial to link early warning with early action in times of crisis. Gathering more data in a shorter amount of time, developing faster evaluation tools, and finding sufficient adaptation strategies, which are accepted and established by the affected people are just some examples of such coordinated action, both ongoing and for future development. These developments will further help to solve the problem of food scarcity and famines, which is also a basic motivation for famine and food security research.

In this context we put forth the idea of a locally applicable monitoring system, the "Farmers Food Insecurity Monitoring" (FaFoInMo). This monitoring system is based on the hypothesis that the vulnerability to food insecurity can only be transferred into suitable, flexible, and accepted adaptation or transformation strategies if the affected people perceive themselves as being susceptible or exposed to those impacts. Therefore, the FaFoInMo will draw on the perception of affected people as well as on expert knowledge.

The remainder of this paper is organised as follows: Section two focuses on the understanding of famine and food security as well as insecurity, and section three elaborates the concepts of vulnerability and resilience that frame the “Farmers Food Insecurity Monitoring” system. In section four we will describe the new “Farmers Food Insecurity Monitoring” itself. The paper ends with some conclusions and prospects for future research.

2. Current State of Research – Famine and Food Security

This section discusses the current state of research on famine and food security that forms the basis for the FaFoInMo presented in the following sections.

2.1. Famine and Food Security

While Moore (1990, 1) states that “everybody knows what a famine is”, usually the presentation, explanation, and perception of the term does not go much further than the media’s representation of poverty, disease and death. From an academic perspective, in fact, a single definition eludes the scientific community.

Wolde-Mariam (1984, 9), who observed the vulnerability to famines in Ethiopia between 1958 and 1977, defines famine as “general hunger affecting large numbers of people in rural areas as a consequence of the non-availability of food for a relatively long time”. In this definition he focuses on two aspects, the spatial spreading of hunger and its duration. However, Wolde-Mariam excludes famines in an urban framework and remains rather fuzzy or vague on the concept of time in the context of his case study. De Waal (1997, 115) also refers to the “time factor” and states that an external observer “can only see a single year of drought, and that is not enough to cause famine”.

In addition to Wolde-Mariam’s approach of a non-availability of food, Sen has proposed the idea of entitlement problems. Food Entitlement Decline (FED) focuses on the distribution of food, rather than solely on availability (for more information on the theories, see section 2.2.). According to Sen (1984, 497), “entitlement refers to the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces”. Further Sen (1981, 43) describes this distribution problem as “the group contrast”. He states that “while famines involve fairly widespread acute starvation, there is no reason to think that it will affect all groups in the famine-affected nation” (Sen 1981, 43).

Ó Gráda (2009, 4) includes a new factor, purchasing power, into the mix of famine definitions: “famine refers to a shortage of food or purchasing power that leads directly to excess mortality from starvation or hunger-induced diseases”. However, Ó Gráda’s direct connection between famine and excess mortality, even though it is mostly appropriate, can be problematic. In his study on the famine in Darfur 1984/1985, De Waal (1989) states that the main threat perceived by the Sudanese people was not the possibility of dying, but the

change of their traditional lifestyle. That said, the specific excess mortality and lack of the fear of the risk of dying are two different levels of analysis. However, the latter indicates that a definition of famine has to be broader than just referring to excess mortality as a consequence or aftermath of food crises. Therefore, we define “famine” as

an extreme scarcity of food or a drop in exchange entitlements in a certain region over a multi-year period that threatens the way of life of the already-vulnerable resident population and frequently leads to a higher mortality rate”. (Engler 2012a, 159).

Before a famine emerges, the affected populations are in a state in which they are more or less food secure. Therefore, it is also important to take a closer look at the concept or demand of “food security”. Over the past decades the consideration and understanding of food security varied extremely (Shaw 2007). Starting with a focus on grain reserves and storages, the definitions of food security changed to more complex formulations (Tansey 2011). At the end of the twentieth and the beginning of the twenty-first century the following definition by the “World Summit of Food Security” (WSFS 2009, 1) became widely used in scientific and political contexts:

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security (World Summit on Food Security - WSFS 2009, 1).

While the terms *availability* and *access* are self-explanatory, *utilization* and *stability* need further clarification. *Utilization*

is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food. Combined with good biological utilization of food consumed, this determines the nutritional status of individuals (FAO 2008, 1).

Stability refers to the other three dimensions of food security. Thus, food security only exists if availability, access, and utilization are assured over a certain time (FAO 2008). In addition to these well-established basics by the FAO, Tansey (2011, 116) suggests to look at food systems and to include new features: (1) Food systems, “which are diverse, ecologically-sound and resilient” and (2) “which build capabilities and skills needed for future generations”.

2.2. Famine Theories

In addition to the normative examination of famine and food security in the scientific community, the presentation and categorisation of underlying famine theories (which are, on a different scale, also applicable in the context of food security) diverge greatly.

Following Engler (2013), we emphasise categorisation under four main groups: climate theories, demographic theories, socio-economic theories, and political theories (Table 1).

Table 1: Categorisation of famine theories

Theory groups	Theories and Concepts	Market situation
Climates theories	<ul style="list-style-type: none"> ▪ Famine belts ▪ Droughts 	<ul style="list-style-type: none"> ▪ Food supply ▪ Food supply
Demographic theories	<ul style="list-style-type: none"> ▪ Malthusian theory ▪ Neo-Malthusian theory 	<ul style="list-style-type: none"> ▪ Food supply ▪ Food supply
Socio-economic theories	<ul style="list-style-type: none"> ▪ Food Availability Decline (FAD) ▪ Food Entitlement Decline (FED) ▪ Market failure 	<ul style="list-style-type: none"> ▪ Food supply ▪ Food demands ▪ Both
Political theories	<ul style="list-style-type: none"> ▪ Political mismanagement ▪ War 	<ul style="list-style-type: none"> ▪ Both ▪ Both

Source: Engler 2013, 6 (compiled and enhanced from Leftwich and Harvie 1986, 29; Devereux 1993, 35)

Climate theories

Explaining famines with a climatic factor was well established in the 1970s. Several of these examples can be found in the literature on the Sahelian famines of the same decade. This led to the concept of “famine belts” (Cox 1981, 8), in which Cox directly links climate conditions to famine. In the national or local debates, climate-linked phenomena (e.g. droughts, floods, etc.) are seen as a major factor causing famines:

Due to droughts, the country's famine cycles have reduced from 20 years (1964- 1984), to 12 years (1984-1996), to two years (2004-2006) and to yearly (2007/2008/2009)” (Government of Kenya, 2010, 34).

However, a whole theory that focuses only on climate aspects is incomplete and deterministic. This can be illustrated by the inverse argument: Why do famines not occur in drought stricken regions, such as the Middle East or even some parts of Spain, on a regular basis (Devereux 1993)?

Demographic theories

Demography related factors are still widespread in the debates on food insecurity and famine. The Malthusian and Neo-Malthusian theories are deeply rooted in demographic factors. Especially from a non-scientific perspective these argumentations seem understandable. However, a closer consideration of both

theories exposes contradictions and inconsistencies. The Malthusian theory is based on a section in Malthus's book "*An Essay on the Principle of Population*":

I think I may fairly make two postulata. First, that food is necessary to the existence of man. Secondly, that the passion between the sexes is necessary and will remain nearly in its present state [...] Assuming then my postulata as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man. Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio" (Malthus 1798, 4).

According to Malthus, an increasing population will thus exceed the food supply, which leads to famines or at least food insecurity caused by overpopulation. The current state of the art, however, shows that Malthus's assumptions do not consider the possibility of basic and far-reaching improvements in agriculture, transportation, and communication in groups, communities, or whole societies (Devereux 1993; Wisner et al. 2004).

Today, Neo-Malthusian theory, a further development of the basic Malthusian theory, is still "focused on potential famine-inducing consequences of rapid population growth outstripping the limits of global and regional food production" (Wisner et al. 2004, 133). Neo-Malthusians understand the "people: arable land ratio" (Devereux 1993, 183) as a formula for calculating the risk of food insecurity or famine. This makes use of the concept of the carrying capacity of a biological species.

Socio-economic theories

In other debates, socio-economic theories are normally called just "economic theories", because they address the role of market developments and price situations. Despite the mentioned normative framing, problems such as social disparities between rich and poor or gender aspects also play a role. Therefore, "socio-economic" seems to be a more appropriate terminology.

The following subsections focus on three socio-economic theories: (1) Food Availability Decline (FAD), (2) Food Entitlement Decline (FED) and (3) market failure approaches.

(1) The "Food Availability Decline" theory is supply oriented. Food scarcities occur because the available food is less than the food necessity of the population. It considers natural drivers as the main cause for food insecurity and famine and analyses their influence on harvest failures, advances in prices, etc. It thereby differs from climate theories. The theory is vulnerable to criticism due to various issues (Devereux 1993; Mauelshagen 2010; Abel 1974; Engler 2013):

- *Famines are often caused by non-natural drivers;*
- *Due to global markets some countries are independent from food production systems of their own (e.g. Singapore);*
- *Focusing on prices can be misleading, because today they are influenced by many circumstances and not only harvest shortfalls (e.g. on account of speculation).*

(2) “Food Entitlement Decline” theory focuses on food entitlements of the population. Therefore, the distribution of food is far more important than its alleged availability. Sen (1984, 497) defines entitlements as a “set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces”. In his theory access to food also refers to questions such as rich or poor, privileged or underprivileged, male or female, etc. Thus he opens the discussion on discrimination, which he entitles as the “group contrast”: “While famines involve fairly widespread acute starvation, there is no reason to think that it will affect all groups in the famine-affected nation” (Sen 1981, 43).

Notwithstanding a broad approval, Sen’s “entitlements” have been criticised for “being ahistorical, apolitical, economistic and static” (Devereux 1993, 82). Devereux (2001, 259) characterises the missing interdisciplinarity further as “a failure to recognize individuals as socially embedded members of households, communities and states, and second, a failure to recognize that famines are political crises as much as they are economic shocks or natural disasters. The result is an elegant analytical framework that privileges the economic aspects of famine and excludes the social and the political”. Bowbrick (2008, 63) also argues that importing food in a situation of existing insecurity is the only way to minimise the food problem and to “save lives”.

(3) Terminologically, the theory of “market failure” is self-explanatory. Food insecurity and famine occur due to malfunctioning markets in affected local areas. That does not mean that markets do not operate at all – even though this may also be the case – they just do not meet the demand of the local people at the right time and place (Devereux 1993).

Political theories

Theories that look at the factors of war, political mismanagement, political discrimination of specific ethnic groups, tax policy in the food sector, corruption, etc. are grouped under the title “political theories”. According to Bose (1990), many twentieth century famines had causes closely related to politics. This trend also holds true for previous and later famines (Pfister and Brázdil 2006; Keller 1992; Ó Gráda 2009). Ó Gráda underlines this by stating, “civil war alone was enough to trigger a major famine in Nigeria in 1968-70” (2009, 20f.). However, most political theories have a limited perception of famines and neglect causal factors taken into account in other theories.

Recent studies focus on “land grabbing” in the debate on food insecurity and famines.

The term land grab refers to the purchase or lease of vast tracts of land by wealthier, food-insecure nations and private investors from mostly poor, developing countries in order to produce crops for export (Daniel / Mittal 2009, 1).

While Daniel and Mittal (2009) define “land grabbing” as a process driven by wealthier food-insecure nations, it is not restricted to food-insecure states. Despite its major importance for the analysis of food insecurity and famines,

“land grabbing” is characterised as one potential cause of famine in the “exploited” states and not as an entire theory (cf. e.g. Kress 2012).

As shown, all theories have certain limitations. Therefore, Devereux (1993, 8) has put forth the idea “that there is no single correct theory of famine”. We therefore emphasise the use of a set of certain vulnerabilities and resiliencies of affected people for the analysis of the causation, impact, and reaction to food insecurity and famine.

3. Vulnerability, Resilience and Perception of Food Insecure People

In this section, we describe the concepts of vulnerability, resilience and risk perception and show how they frame the Farmers Food Insecurity Monitoring (FaFoInMo).

3.1. Vulnerability and Resilience

In this context it is crucial to include elements from historical scholarship, such as vulnerability and resilience, in our analysis, because they have a direct influence on peoples’ perception, preparedness and action today.

Vulnerability describes a central concept in climate change research as well as in the research communities dealing with natural hazards and disaster management, ecology, public health, poverty and development, secure livelihoods and famine, sustainability science, and land change (Füssel 2007, 165).

Due to this wide use across various disciplines, vulnerability concepts can be used as a basis for interdisciplinary research. Chambers (1981, 1) was one of the first researchers to define vulnerability. He describes it as

exposure to contingencies and stress, and difficulty in coping with them. Vulnerability has thus two sides: an external side of risks, shocks and stress to which an individual or household is subject; and an internal side which is defencelessness, meaning a lack of means to cope without damaging loss.

Further, as the Intergovernmental Panel on Climate Change (IPCC) has recognised: “Vulnerability is a result of diverse historical, social, economic, political, cultural, institutional, natural resource, and environmental conditions and processes“ (IPCC 2012, 32). Collet (2012) underlines the importance of a historical perspective and states that vulnerability models should fulfil five requirements:

- *The historicity of vulnerability;*
- *The dynamic rather than deterministic representation of famine processes;*
- *The entanglement of climatic, political and cultural factors;*
- *The treatment of problems of scale (from national to individual and from regional to local levels);*

- *The encouragement of diachronic and synchronic comparisons.*

To get a more detailed perspective on vulnerability, Engler (2012a, 2012b and 2013) and Engler et al. (2013) divide vulnerability into two subcategories: social and environmental vulnerabilities. Those two categories are again related to the missing connection between social and environmental factors in the underlying theories of famine, which should both be considered here.

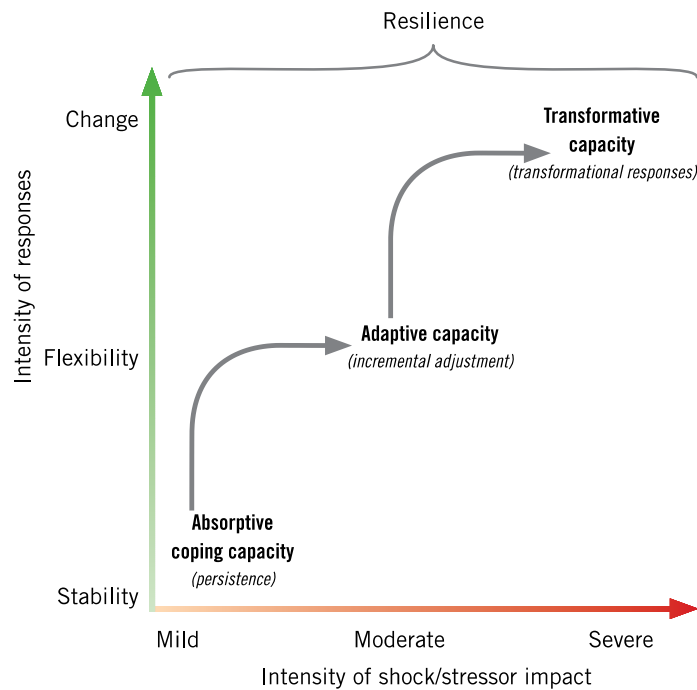
Referring to social vulnerability, Bang (2008, 4) emphasises that an analysis necessarily covers subjects such as “poverty, inequality, health, marginalization, food entitlements, housing quality, social status and access to resources and insurance“. Bang (2008, 4) also mentions that disadvantaged people are also more vulnerable “before, during and after disasters”.

In our case, environmental vulnerability analysis includes all aspects of nature that interact with the society (e.g. temperature, precipitation, soil quality, etc.) in the context of food insecurity (Engler 2012a). For example, Febvre describes the role of plants as food sources for agricultural societies: “the action of climate on the natural environment in which man lives must be known before we can understand the action of climate on man” (Febvre 1924, 115).

In contrast to vulnerability, the concept of resilience focuses on the capacities of affected people to react to crisis situations. According to Füssel (2007) “resilience focuses on the ability of the system to maintain its basic functions and return to the original state after a perturbation”.

In the context of food (in)security, the Global Hunger Index (Grebmer et al. 2013) divides the resilience concept into three sub-phases: the absorptive, the adaptive and the transformative capacities (Figure 1).

Figure 1: Resilience as a result of absorptive, adaptive and transformative capacities



Source: Grebmer et al. 2013, 21

The three sub-phases differ in their impact intensities, response intensities, and time factor. That means absorptive coping capacities tend to be more related to short-term actions, while the transformative capacities are related to long-term changes. Thus, transformative capacity describes a process in which a (food) system will be completely transformed. One current example for such a movement is the development of food sovereignty approaches in science and in practice (see excursus box 1 *“Food Sovereignty”*).

Excursus box 1: Food Sovereignty and Urban and Peri-urban Agriculture (UPA)

In 2007-2008 a rapid increase and volatility of food prices characterized the global food markets. In this context and in light of demographic growth, resource-intensive lifestyles, and climate change impacts, countries are prompted to consider new ways to achieve food security. While food security is already a part of the development debate since the 1970s it must be acknowledged that many approaches have had only partial success, lacked sustainability, or failed to reduce the vulnerability of people living in the Global South (Devereux and Maxwell 2001, 13, and Aerni 2011, 33).

While food security focuses on *availability, access, utilization* and *stability* of food, the new concept of food sovereignty goes much further – it looks at the social control of food systems. Moreover, it emphasises the need for diverse, ecologically sound, and resilient food systems. Food sovereignty makes claims on rights and democracy (Patel 2010, 189). Definitions of food sovereignty have evolved rapidly over the past decade - most common aspects were summarized in the Nyéléni Declaration on Food Sovereignty in 2013:

Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. [...] Food sovereignty prioritises local and national economies and markets and empowers peasant and family farmer-driven agriculture [...] (Nyéléni 2013, 1).

When La Via Campesina, at the forefront of civil society's articulation of food sovereignty, introduced the first ideas and principles in 1996, it was still a rather new concept. Since the "Forum for Food Sovereignty" in Sélingué, Mali, in 2007 it has become well known. Recently, many researchers regard farming in the framework of the food sovereignty concept as an "alternative narrative of future sustainability" (McMichael and Schneider 2011, 135, and Fairbairn 2010). In the last decade the discourse on food sovereignty has entered the international stage and strives for approval by the General Assembly of the United Nations, promoted through several NGOs and civil society networks such as the International Planning Committee for Food Sovereignty (IPC). In 2008 the Government of Ecuador was the first to integrate food sovereignty into the national constitution (Wittmann et al. 2010, 8).

Localized food systems, peasant farming, participative ways of decision-making are not only key terms of food sovereignty but also the central elements of UPA. Worldwide, urban and suburban areas are growing extremely rapidly. It is estimated that the urban population will be twice as high in 2041 than it is today (FAO 2011, 1). UPA is already widely used. In fact, it is estimated that already 800 million people are active in UPA or associated businesses (FAO 1999). While for a long time it was only of interest for marginalized people, its advantages are becoming more and more recognized by all groups of society in the Global North and South. UPA in connection with food sovereignty is a potential bread basket for increasingly urbanized regions, e.g. in Africa. Still, both concepts have to deal with several challenges, such as land ownership rights and the lag of technical capacities of the farmers. This calls for significant research efforts to guide farmers and decision makers towards safe and sustainable production practices in these densely populated spaces.

Generally, coping and adaptation strategies are frequently mixed-up. Table 2 gives a brief overview of the differences between the two concepts.

Table 2: How is adaptation different from coping?

COPING	ADAPTATION
<ul style="list-style-type: none"> ▪ Short-term and immediate ▪ Oriented towards survival ▪ Not continuous ▪ Motivated by crisis; reactive ▪ Often degrades resource base ▪ Prompted by a lack of alternatives 	<ul style="list-style-type: none"> ▪ Oriented towards longer term livelihoods security ▪ A continuous process ▪ Results are sustained ▪ Uses resources efficiently and sustainably ▪ Involves planning ▪ Combines old and new strategies and knowledge ▪ Focused on finding alternatives

Source: CARE 2009, 7 (shortened version)

Coping strategies in the context of food (in)security are “the bundle of producers’ [and consumers] responses to declining food availability and entitlements in abnormal seasons or years” (Davies 1996, 45). By contrast, the IPCC (2007, 6) defines adaptation as “the adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”.

Therefore, the difference between coping and adaptation strategies is that adaptation strategies involve responses to “expected” processes. Thus, the related changes in societies are more far-reaching and systematic. According to diverse authors (Abel 1974; Devereux 1993; Engler 2013; Ó Gráda 2009; Okorafor Ndubuisi 2011; Singh 2011) certain coping and adaptation strategies are common in the context of food insecurity and famine (Table 3).

Table 3: Selected coping and adaptation strategies in the context of food scarcity

Coping strategies	Adaptation strategies
<ul style="list-style-type: none"> ▪ Famine Foods ▪ Drawing on savings ▪ Ban of exports ▪ Effort to increase imports ▪ Migration 	<ul style="list-style-type: none"> ▪ Building storages ▪ Inventing new technologies / cultivation methods ▪ Increasing knowledge ▪ Migration

Source: Own composition

Nevertheless, there are certain cases in which a process may be both a coping strategy and an adaptation strategy. In the context of food insecurity and famines, migration is one such process (Engler et al. 2013; Fitzgerald / Lampkin 2008). On the one hand, it may be a short-term reaction to a food shortage. On the other hand, it can be a long-term adaptation, by seeking better soil grounds, living conditions, etc. abroad.

3.2. Perception of Risk in the Context of Food (In)security

To implement a monitoring system on farmers’ food insecurity, we need to add one more theoretical element as an explanation: affected people’s / farmers’ perception of their situation. In the context of food (in)security and famine, the analysis of vulnerability and resilience necessarily includes such a household risk perception, because it makes no sense to have information on vulnerability if the affected do not identify themselves as vulnerable or do not possess sufficient knowledge of their vulnerability. That is also the way in which the FaFoInMo differs from other monitoring systems (e.g. Famine Early Warning Systems Network - FewsNET or Integrated Food Security Phase Classification - IPC; for more information cf. Section 4), which do not or only insufficiently include the perception of affected people and try to impose external criteria. In the following section, risk perception is always mentioned in the context of food (in)security.

Risk perception is considered by many researchers as the process of attributing risk to an object, situation or an action and conceptualised within social science research as a socially constructed process (Bang 2008, 4 in reference to Plapp 2001).

We regard the concept of “bounded rationality” as suitable for understanding people’s risk perception in times of food insecurity. Before further elaborating on bounded rationality, we have to stress that our aim is to show the importance of the concept for food (in)security perception research and not to define the term. The theory of a bounded rationality goes back to the publication of Simon (1957). The idea behind it is that

full rationality requires unlimited cognitive capabilities. Fully rational man is a mythical hero who knows the solutions of all mathematical problems and can immediately perform all computations, regardless of how difficult they are. Human beings are very different (Selten 1999, 3).

Thus, bounded rationality contradicts well-established concepts of “fully rational Bayesian maximizers of subjective utility” (Selten 1999, 2) in economics (for further information: cf. Berger 1985; Wittek et al. 2013). Moreover, Simon’s analyses provide crucial factors for an enhanced understanding of risk perception (Simon 1957; Selten 1999):

- *Decisions are based on search processes*
- *Aspiration levels¹ underlie the decision making*
- *It is a dynamic process*
- *Cognitive-, emotional-, motivational-, etc.-bounds*
- *A time frame of the decision.*

One key aspect in the concept of bounded rationality is the existing experience of the affected people. “A problem is familiar if the decision maker knows the optimal way to attack it” (Selten 1999, 5). McEntire (2004) underlines this aspect and directly links it to the concepts of vulnerability and resilience. According to Tashi (2011), it can be estimated that an increase in risk perception is bound to negative experiences, such as certain social and environmental disasters.

By contrast, we suggest that people’s risk perception is not only bound to negative experience. Shakya (2011, 35) underlines this by stating that “a range of personal factors such as knowledge, experience, education, gender, culture, social norms, values, beliefs and attitudes” have an influence on affected people’s perception. We regard these inherent “structures” as highly important and consider them in all analysis and evaluation phases of the FaFoInMo. For example, the analysis (questionnaires, interviews or other participative methods, such as group discussions) and the development of recommendations are deeply connected to the perspectives, perceptions and experiences of farmers (for further information see Section 4). We emphasise a *culture of participation* (Leggewie / Nanz 2013) as the best way of gaining knowledge of locally embedded farmers.

¹ “An aspiration level is a value of a goal variable which must be reached or surpassed by a satisfactory decision alternative” (Selten 1999, 2).

As it was shown in sections 3.1 and 3.2, it is important to complement the concept of a “bounded rationality” (as a risk perception) with vulnerability as well as resilience in the context food insecurity and famine (Messner / Meyer 2005). The merging of these concepts will help to develop a more complete monitoring system (cf. section 4).

4. Farmers Food Insecurity Monitoring

As we explained in the previous sections (3.1. and 3.2.), the underlying concepts of vulnerability, resilience and risk perception of affected people are required to develop a monitoring system to mitigate further situations of food insecurity. The early detection of these challenging situations opens an opportunity to support people in local areas. Furthermore, a monitoring system may help to assess the quality and impact of the programmes undertaken by locally operating organisations. However, early warning/detection and early action do not always accompany each other. In fact, Bailey (2013, 10) explains that they often counteract each other, which he calls “the early warning paradox”.

Currently, the “Famine Early Warning System Network” (FEWS NET) of the FAO and USAID is the primary tool for decision-makers. Analytically, it is based on the “integrated food security phase classification” (IPC), which is a broadly accepted research tool (IPC Global Partners 2008). The IPC analysis focuses on four different aspects:

- *Building Technical Consensus*
- *Classifying Severity and Causes*
- *Communicating for Action*
- *Quality Assurance.*

Although the IPC is a far-reaching monitoring system, which also partially includes local Non-Governmental Organisations (NGOs), it still proceeds on a macro-scale. One of its primary goals is to assist decision-makers:

The IPC is designed from the perspective of decision-making. Thus, rather than ‘pushing’ complex information to decision-makers, the IPC is designed to be demand driven – taking stock of the essential aspects of situation analysis that decision-makers consistently require, and focusing on providing that information in the most reliable, consistent and accessible way (IPC Global Partners 2012, 9).

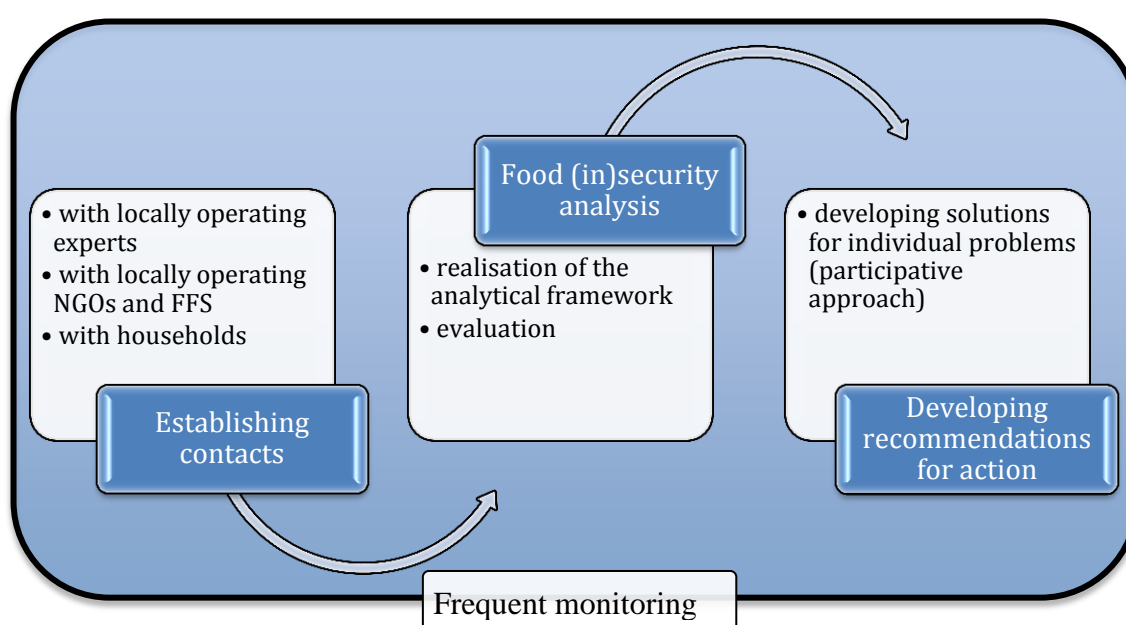
The “Farmers Food Insecurity Monitoring” (FaFoInMo; Engler 2013) will enhance the analysis at local, household and individual levels. Thus, it focuses on farmers in rural, peri-urban, and urban areas and supports the work of small-scale farmer programmes, such as Farmer Field Schools (FFS)² and locally

² “Farmer Field School Approach (FFS)” - is based on the concepts and principles of people centred learning, and was developed as an alternative to the conventional top-down test and verification (T&V) extension approach. It uses innovative and participatory methods to create a learning

operating NGOs. The perceptions of the affected people are at the centre of FaFoInMo (Figure 2). The conception of this monitoring system is built around the three simple but nevertheless highly relevant principles of Bailey (2013, 8): “Data collection, analysis & forecasting, dissemination & communication”. Therefore, the FaFoInMo is based on three phases (Figure 2):

- *Establishing contacts to the people in situ*
- *Realisation of the Analytical Framework*
- *Developing recommendations for action.*

Figure 2: Farmers Food Insecurity Monitoring (FaFoInMo)



Source: Engler 2013, 70

(1) Communication with locally operating experts, locally operating NGOs and FFS, and affected households and farmers is crucial as a basis for the analytical framework. “Gaining their trust and with that getting on closer terms with them is an often underestimated element of the success of a monitoring system or other actions by external researchers” (Engler 2013, 70).

(2) The analysis and evaluation of food insecurity characterises the second phase of the FaFoInMo. It relies on two research methods:

environment, including learning networks, in which the land users have the opportunity to learn for themselves about particular crop production problems, and ways to address them, through their own observation, discussion and participation in practical learning-by-doing field exercises. The approach is now being used to enable farmers to investigate, and overcome, a wider range of SLM problems, including soil productivity improvement, conservation agriculture, control of surface runoff, water harvesting and improved irrigation.” (FAO 2014).

First, the analytical framework is provided by an HTML5-App, working on the basis of a comprehensive digital questionnaire in correlation with statistical data. Questionnaire-based assessments of food insecurity are widely used. Consequently, the basis of the app builds on existing approaches (Coates et al. 2007, Kabbani / Weheli 2005, Labadarios et al. 2009, and Mwangi / Mbera 2006).

Further, transferring the perceptions and experiences of farmers and affected households into functional data and connecting this with statistical data to further promote food security is the main aim of the HTML5-App presented in this paper. Consequently, the underlying questionnaire of the HTML5-App, which is divided into six categories (population, politics, economy, agriculture, environment / climate and household), addresses two different levels of questions in each of the mentioned category: First, questions for farmers, which are formulated to gain insight into the circumstances, knowledge and experiences of the farmers' household (Figure 3); second, statistical questions (Figure 4) that are created to get background information on the research area. In addition, these questions may help to underline the ideas or needs of farmers or help to understand regional differences and particularities.

From a technical perspective, the HTML5-Application presents the survey questions via an HTML form in a browser. The questions are grouped into categories that are accessible via a navigation bar. Upon completion of the form, the answers are interpreted according to a given scoring scheme and immediate feedback is provided by summarizing the answers in a "results view" with a diagram. This diagram visualizes the vulnerability per category. Finally, all answers can be saved as a csv table for later analysis.

Instead of hard-coding the questions into the application, we decided to separate content and presentation. First, questions and the scoring scheme are defined in a csv table that can be easily edited and updated. Second, a Python (van Rossum 1991) script is used to parse the table and create the actual HTML5-Application (W3C 2013). On the one hand, the separation makes it possible to change the survey easily, without expert knowledge about the internals of the application. On the other hand, the application remains independent from the actual content so that it can be easily adapted to other surveys.

By keeping the entire application logic client-side in Javascript, we strived to make it independent of access to a server, which can be crucial in regions without reliable internet access. In line with this, the Python script downloads all external dependencies of the application from a content delivery network (Cloudflare 2013) and embeds them into the resulting HTML5-Application for offline use. The application provides two modes of distribution. Since it is a single HTML file, it can be stored locally on any computing device. Alternatively, it can be hosted on a web server and identify itself to the browser as being subject to caching (and hence being available offline as well). The latter mode has the advantage that the browser automatically persists the form data if the survey has to be suspended for any reason. The Twitter Bootstrap framework (Twitter 2013) has been used to create the graphical user interface of the application. The framework ensures a consistent appearance in all major

web browsers. The interactive features of the user interface have been implemented with JQuery³. JQuery is a Javascript library that provides predefined utilities for usual tasks needed by interactive HTML5 user interfaces. The visualization of results is performed with D3 (Bostock 2011), which allows modification of graphical objects in HTML via Javascript. Finally, Garlic framework (Potier 2012) has been used to achieve persistency of the form data when the browser is closed during the interview.

Figure 3: Excerpt of the underlying questionnaire of the HTML5-App – examples for farmers' questions (category politics)

The screenshot displays the FaFolnMo application interface. At the top, a navigation bar includes buttons for 'New Survey', 'Results', 'Random Answers', and a series of category tabs: 'Population', 'Politics' (selected), 'Economy', 'Agriculture', 'Environment / Climate', and 'Household'. Below the navigation bar, a 'Survey name' section contains a text input field with the placeholder 'Give this survey a unique name.'. The main content area is titled 'Politics' and contains two questions. The first question is 'In times of failing harvests and food scarcities do you have any backup system? Multiple answers possible', followed by the instruction 'Multiple answers possible.' and a list of five options with checkboxes: 'family', 'neighbours', 'local networks', 'others', and 'no backup systems'. The second question is 'Do you think that the government is cooperative in situations of scarcity?', followed by two radio button options: 'yes' and 'no'. Below these questions is a text input field with the label 'Why? Or why not?'.

Source: Own composition

³ <http://jquery.com>.

Figure 4: Excerpt of the underlying questionnaire of the HTML5-App – examples for statistical questions (category population)

To fill in by the interviewer

How did the community's population develop in the past year?

☐ >-50%

☐ -49-25%

☐ -24-0%

☐ 1-24%

☐ 25-49%

☐ >50%

Does the government financially support education of rural people?

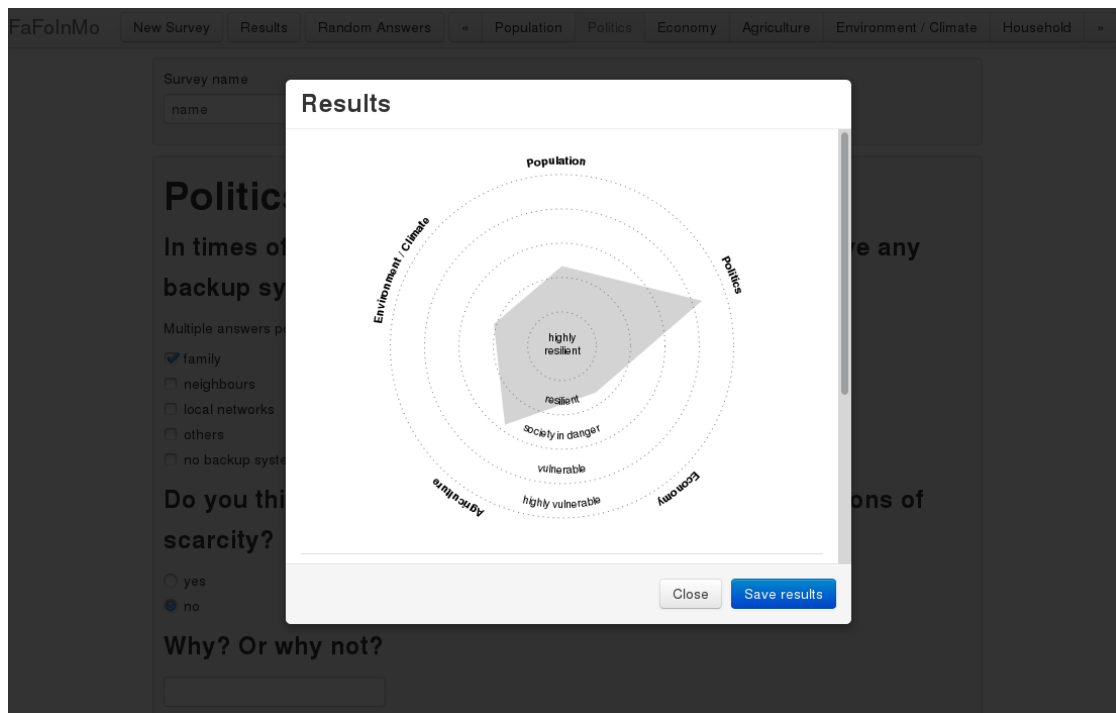
☐ yes

☐ no

Source: Own composition

Thus, HTML5-App has several advantages (Engler 2013, 71):

- *The design and categories of the HTML5-App are based on the idea and implementation of the “Famine Vulnerability Analysis Model” FVAM (for further information, see excursus box 2) and further case studies by other scholars. Therefore, it possesses a theoretical foundation.*
- *It is equally accessible from all internet-compatible electronic devices.*
- *It directly saves and plots the results after the survey is finished (Figure 6). Thus, it reveals the vulnerability as well as the needs of the affected people.*

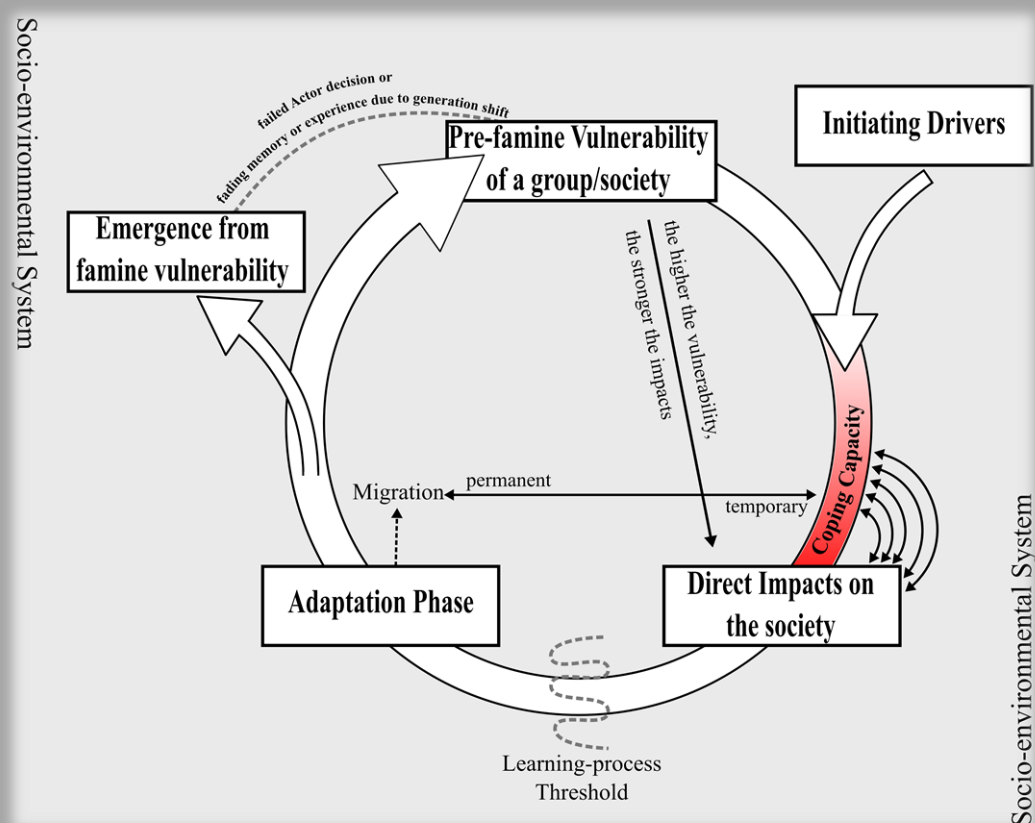
Figure 6: Excerpt of an evaluated survey with the HTML5-App

Source: Own composition

Excursus box 2: Famine Vulnerability Analysis Model (FVAM)

The FVAM enhances existing vulnerability approaches (e.g. by Birkmann 2006; Bohle 2001; Füssel 2007; Pahs 2006; and Turner II et al. 2003) by adding new components and ideas. A significant innovation compared to other models is that the FVAM (Figure 5) includes a detailed evaluation of the situation before a famine and its early stages. Pre-famine vulnerability analyses people's livelihood, food and nutrition security, before the initial drivers start affecting them (Engler, 2012a). By contrast, the focus of the mentioned other models is on the impacts of a famine and the subsequent reactions, which are also integrated in phases three and four of the FVAM (Engler, 2012b). The analysis of pre-famine vulnerability is based on an evaluation of 34 social and environmental indicators, which have been developed by a literature analysis of past and most recent famines and two specific case studies (Engler et al. 2013; Engler 2013). Complexity and flexibility are crucial features of the model. They are required so that the model can be applied to varying food insecurity and famine contexts.

Figure 5: Famine Vulnerability Analysis Model (FVAM)



Source: Engler 2012a, 161

The analytical framework of the FaFoInMo also draws on narrative or semi-structured interviews with experts of the local NGOs, FFS and with members of

the local government. This further enhances the results of the HTML5-App. It could also be conceivable and promising to bring “experts” and local farmers together in a participative manner. Open discussion arrangements are necessary in these situations. As mentioned before, the FaFoInMo is developed and designed to help local farmers and the NGOs be better prepared for possible upcoming situations of food insecurity. Once the analysis phases of the FaFoInMo have been sufficiently tested (momentarily this is an ongoing process), the description of the monitoring system and all of its underlying analysis steps (including the HTML5-App) will be freely available and adjustable for specific local needs and purposes. Thus, it can be used and conducted by everyone interested in or in need of a locally adapted food insecurity monitoring system. However, it is most effective if local NGOs, farmers and other involved parties (policy makers, civil society, etc.) work together closely.

(3) In phase three of the FaFoInMo, solutions for the most significant problems are developed. In this context ‘most significant problems’ refers to what is most significant for the affected people. Again we emphasise a culture of participation, meaning that all affected people need to be integrated in the process and not only the better or well educated. This will lead to better adaptation or concepts for the future. We suggest conducting phase three with diverse participation methods and also demonstrating possible new cultivation methods, etc. directly on the farmers’ fields. Thus, the style of the FFS teaching model (Braun / Duveskog 2008, 4) seems to be adequate.

Overall, the FaFoInMo is most effective if the affected groups repeat it in frequent intervals (at least once in every harvesting cycle).

5. Conclusion and Research Outlook

The future of research on and mitigation of food insecurity and famines is directly connected to new or alternative approaches. First, it is crucial to link early warning to early action (Bailey 2013). To achieve this goal we suggest implementing monitoring systems that gather data fast and propose locally adaptable solutions. The FaFoInMo meets those demands and offers following advantages in comparison to other questionnaire-based concepts for the evaluation of food insecurity (Engler 2013, 72):

- *It supports the locally operating experts and illustrates the vulnerability of the analysed people to food insecurity.*
- *It allows an evaluation of many farming households.*
- *It helps to develop individually suitable adaptation strategies for farmers.*
- *In-depth interviews will widen the empirical basis and are a complement to the results of the HTML5-App, which relies heavily on the perception of the affected farmers/households.*

- *The ongoing evaluation after certain periods illustrates the achievements of the locally operating NGOs or FFS.*
- *The handling is comfortable.*
- *The evaluation costs are low (compared to other approaches).*

Overall, the monitoring system combines expert knowledge (researchers, NGOs, FFS, etc.) and indigenous/traditional, individual knowledge of the farmers. Furthermore, all phases integrate perceptions of affected people. These aspects are seen as vital points in mitigating food insecurity and famines.

Second, in addition to implementing new models of analysis (FaFoInMo) it is crucial to foster new approaches of cultivation. The food sovereignty approach supports local farmers in producing their edibles independently and in an ecological and sustainable way. Therefore, many researchers perceive food sovereignty as an “alternative narrative of future sustainability” (McMichael / Schneider 2011, 135, and Fairbairn 2010).

Third, the number of urban residents is increasing drastically. Thus, the amount of urban and peri-urban agriculture (UPA) will also expand in the future. The task is to transfer UPA from an adaptation model of the urban poor into a useful, sustainable and affordable supplement to rural agriculture (FAO 1999).

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