

Using qualitative market mapping to explore Aflatoxin contamination along the Maize and Groundnut Value Chains

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TABLE OF CONTENTS

1. INTRODUCTION	3
2. THE MARKET MAP	4
2.1. What is a value chain?.....	5
2.2 The enabling environment.....	6
2.3 Service providers.....	6
2.4 Mapping the market	7
Identifying the actors	10
Guiding the discussion.....	10
3. NET-MAPPING	10
4. USING THE MARKET MAP AND NET MAPPING APPROACHES IN KENYA AND MALI.....	11
4.1 Kenya.....	11
4.2. Mali.....	14
4.3 Net mapping and Aflatoxin	15
5. REFERENCES	15
Annex 1. Mexico case study	17
Annex 2 Themes For Focus Group Discussions In Kenya	22
Annex 3. Focus group discussion guide with farmers in Mali	25

TABLE OF FIGURES

Figure 1 Market map showing the three inter-linked components.....	4
Figure 2 A simplified value chain.....	6
Figure 3 Flow diagram showing tools and approaches used in for value chain research (based on Hellin 2006)	8
Figure 4 Agro-ecological zones in the Kisii - Homa Bay area (UM = upper midlands, LM = lower midlands)	13
Figure 5 Agro ecological zones in the Embu – Mbeere area (UM = upper midlands, LM = lower midlands).....	14
Figure 6 Actors in seed input chains in La Frailesca, Chiapas	18
Figure 7 Semi-structured interview with a seed distributor in Mexico	19
Figure 8 Focus group meeting with farmers in Chiapas.....	22

1. INTRODUCTION

The Aflacontrol Project aims to provide evidence-based information on the cost effectiveness of existing control technologies used to reduce the risk of human and animal exposure to aflatoxin contamination in developing countries. It also aims to understand what constraints are preventing these mechanisms from being adopted. In developing countries, more often than not, actors in the maize and groundnut value chains (farmers, traders, processors, and consumers) are unaware of the aflatoxin problem and its potential health risks. A first step in solving the problem, therefore, is to determine the local practices that influence aflatoxin contamination along the value chain, the institutional context which may influence these practices, the reasons for the lack of understanding surrounding aflatoxin risk, and the constraints that prevent risk mitigation efforts.

Mapping the markets for groundnuts and maize in Mali and Kenya will allow us to identify different value chain actors, their roles, and the relationships between them and to shed light on the awareness, attitudes, perceptions, and knowledge of value chain actors regarding aflatoxin. It will also help to identify factors that determine market efficiency and constraints in the policy and institutional environment that limit the efficiency of the maize and groundnut markets, as well as the accessibility and availability of support services (such as input supplies, market information, financial services, etc.) to value chain actors.

The mapping follows an iterative process; while predetermined topics for discussion can be identified, it is far harder (and somewhat restrictive) to try and prescribe specific questions. Following the analogy of painting a house, the qualitative analysis of the ways in which maize and groundnut value chains work is the equivalent of applying the undercoat or first couple of layers of paint. More detail and richness will come from the use of subsequent “layers” or research methodologies, such as cost-benefit analysis and other quantitative analytical tools. These complementary methodologies add color to the value chains and shed more light on where aflatoxin problems occur and on value chain actors’ ability and willingness to pay for control technologies.

In this document, we present: the conceptual framework that will guide our work – the market map; an introduction to network mapping, a tool that, combined with the market map, provides a comprehensive background to the journey of maize and groundnuts through the value chains; the different actors that influence that journey and therefore play a part in the potential risk of aflatoxin contamination; and how we plan to use the market mapping tool in Kenya and Mali as part of the aflatoxin project.

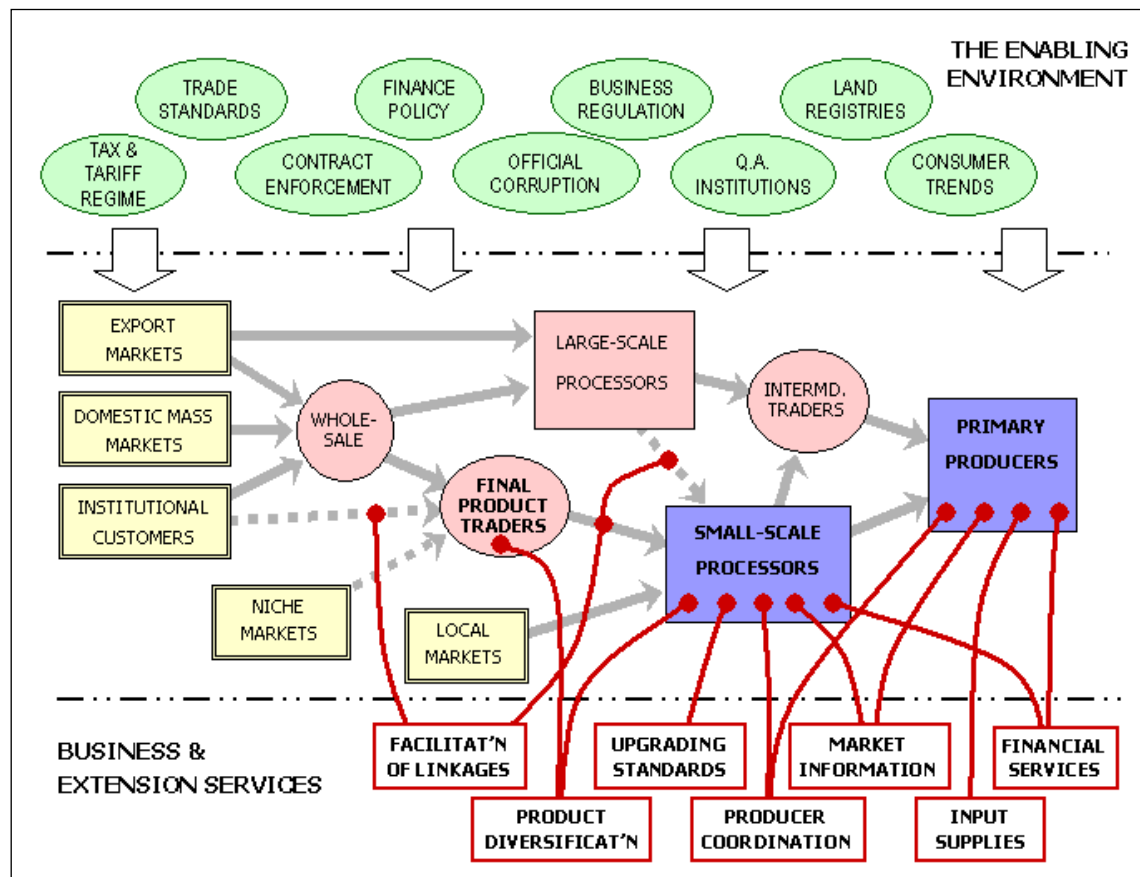
2. THE MARKET MAP

The market map is a conceptual and practical tool that helps us identify policy issues that may hinder or enhance the functioning of a value chain and also the institutions and organizations providing the services (such as market information and quality standards) that the different value chain actors need in order to make better informed decisions. This is important in light of the likely public- and private-sector interventions needed to raise actors' awareness of aflatoxin and to facilitate actors' access to aflatoxin control technologies.

The Market Map is made up of three inter-linked components (see Figure 1):

1. Value chain
2. Enabling environment (infrastructure, policies, institutions, and processes that shape the market environment)
3. Service providers (the business or extension services that support the value chains' operations)

Figure 1 Market map showing the three inter-linked components



Source: Hellin et al. 2005

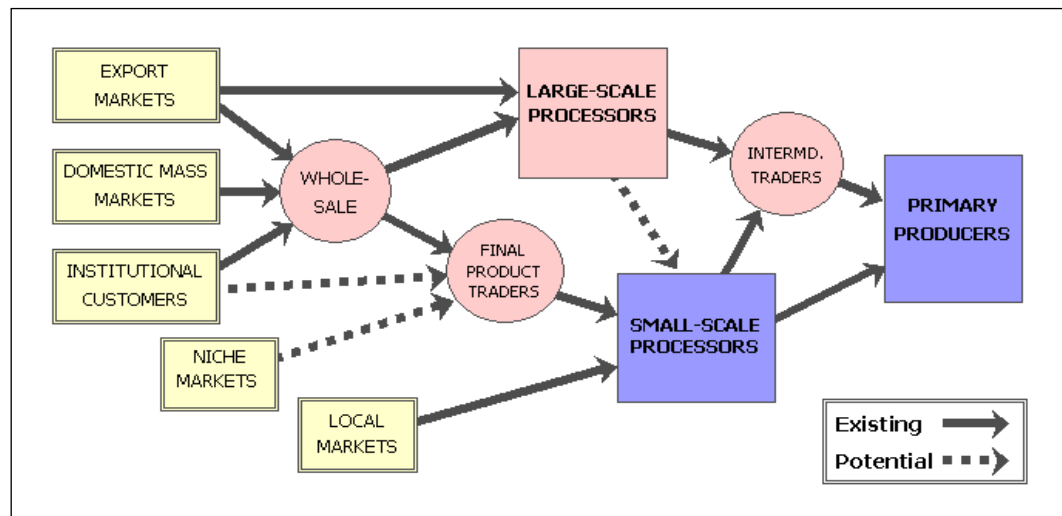
Researchers have used a qualitative market mapping approach to map agricultural value chains in South America (Devaux et al. 2009), Mexico (Hellin et al. 2009, 2010a, and 2010b; Keleman and Hellin 2009), India (Hellin and Erenstein 2009), and parts of Africa (Anderson et al. 2010).

2.1. What is a value chain?

The first step in mapping the market is to delineate the value chain. The flow of groundnut seed or maize from production through processing to the market occurs along chains. These can be referred to as value chains because as the product moves from chain actor to chain actor, such as from producer to intermediary to consumer, it gains value. A value chain is *the full range of activities which are required to bring a product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use* (Kaplinsky and Morris, 2000:4).

If we want to understand more about reducing the risks of aflatoxin contamination, we need to know about the factors that influence the way in which the value chain works and where aflatoxin contamination is likely to occur. Value chain actors are those individuals or institutions that conduct transactions in a particular product as it moves through the value chain. These may include seed suppliers, farmers, traders, processors, transporters, wholesalers, retailers, and final consumers. In many cases, there is more than one type of source actor, as well as multiple channels that supply more than one final market. A comprehensive mapping, therefore, describes interacting and *competing* channels (including those that perhaps do not involve smallholder farmers at all) and the variety of final markets into which these connect (see Figure 2).

Figure 2 A simplified value chain



Source: Hellin et al. 2005

Figure 2 shows the flow of income from markets to primary producers, rather than the conventional flow of goods in the opposite direction. This counterintuitive view emphasises a demand-led perspective.

2.2 The enabling environment

The enabling environment consists of the critical factors and trends that are shaping the value chain environment and operating conditions, but that may be amenable to change. These “enabling environment” factors are generated by structures (national and local authorities, research agencies, etc.) and institutions (policies, regulations, and practices) that are beyond the direct control of economic actors in the value chain. The purpose of charting this enabling environment is not simply to map the *status quo*, but to understand the trends that are affecting the entire value chain and to examine the powers and interests that are driving change. This knowledge can help determine avenues and opportunities for realistic action, lobbying, and policy entrepreneurship.

2.3 Service providers

In most effective value chains, the actors who actually form the chain (those who conduct transactions in the main product) are supported by business and extension services from other enterprises and support organizations (e.g. seed suppliers and intermediaries). There is an on-going need for chain actors to access services of different types, both market and technical. The third component of the Market Map framework is concerned with mapping these services that

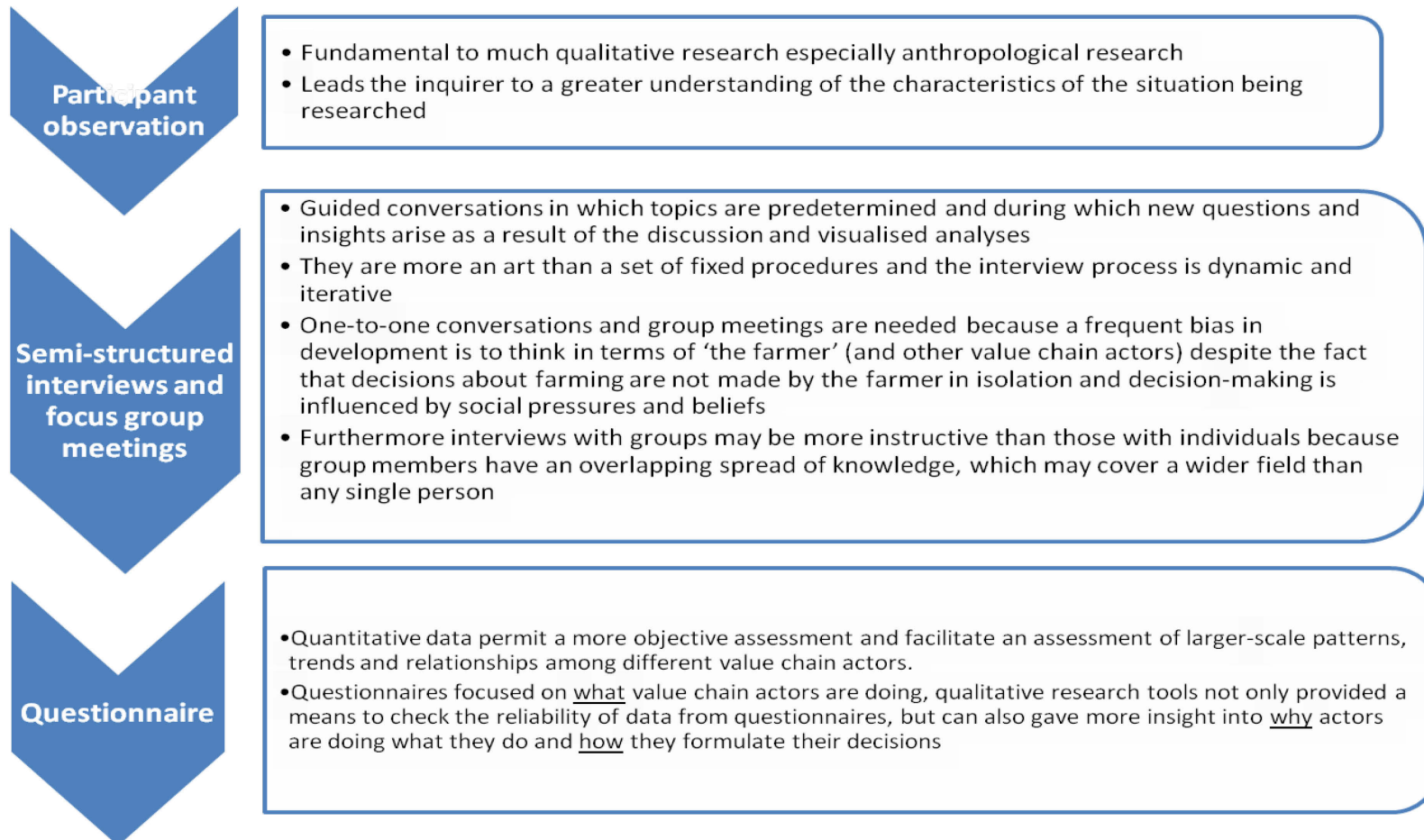
support, or could potentially support, the value chain's overall efficiency. The services that can potentially add value and determine chain actors' adoption of aflatoxin control practices and technologies include:

- Input supplies (seeds, livestock, fertilizers, etc.)
- Market information (prices, trends, buyers, suppliers)
- Financial services (credit, savings, or insurance institutions)
- Transport Services (such as for grain purchasing)
- Quality assurance (monitoring and accreditation)

2.4 Mapping the market

Value chains, the enabling environment, and the service providers that impact the value chain can be mapped and analyzed using a judicious combination of quantitative and qualitative research tools (see Figure 3).

Figure 3 Flow diagram showing tools and approaches used in for value chain research (based on Hellin 2006)



Box 1 Unlocking the complexity of value chain actors' realities: combining qualitative and quantitative research

One of the most widely used quantitative research tools is the questionnaire. There are many advantages to questionnaires, but the drawback of relying exclusively on questionnaires is that there is no way in which increased rigour during analysis can compensate for the unknown degree of inaccuracy involved in the measurement process.

Knowledge systems are often not verbally or numerically codified, and questionnaires often fail to capture many of the nuances of actors' realities. Qualitative data, such as that gained by participant observation techniques and semi-structured interviews, may better represent participants' perceptions and realities. Observation, interviews, and casual conversation may also cause less suspicion and less guarded comment than research methods that involve outsiders writing down responses. Furthermore, a real understanding of the way in which a particular value chain works can "unlock doors." Farmers, processors, and other value chain actors who are subject to surveys are also evaluating the surveyors on the basis of our behaviour, attitudes, and questions. Irrelevant and culturally insensitive questions can result in scepticism, distrust, and lack of co-operation. Much can be gained by building an understanding of how these chains work before designing a questionnaire.

Semi-structured interviews (and focus group meetings) consist of an interview process that is dynamic and iterative. The process involves conversations in which topics are predetermined, but in which questions and insights arise during the discussion. When quantitative studies are combined with a credible understanding of complex real-world situations that characterize good qualitative studies, we can gain a sound understanding of the problems and opportunities faced by different players in various value chains. Each approach has its strengths and weaknesses, but there are strong grounds for recommending that a qualitative approach be used first, followed (time and resources permitting) by a quantitative study.

See Hellin et al. (2005) for more details on the methodology and the examples below in which researchers have used a largely qualitative approach to mapping the market. A good example is from seed input chains in southern Mexico (Box 1).

The market map proved to be a useful tool in southern Mexico during research regarding farmers' access to improved maize seed (Hellin et al. 2010b). During qualitative research (later confirmed by quantitative data), farmers and seed suppliers pointed out that seed availability is strongly influenced by the subsidies that the state and federal government make available to producers of hybrid and open-pollinated varieties (OPV) of seed. There is evidence that these subsidies are undermining farmers' traditional seed recycling practices; with the subsidy, OPV seed is free so there is little incentive to continue growing land races when producers can get hold of a 20 kg bag of treated seed at no cost. In the context of the market map, one of the biggest influences on which seed farmers purchase is, therefore, the policy environment.

Identifying the actors

The first step to any mapping exercise is to identify the important actors and build up a list of the people and institutions that play a part in the value chain. This must be a dynamic and iterative process—such a list should not stay constant, but change and grow as our understanding of the market map evolves.

It is easiest to start this process with the people most obviously involved in the value chain—farmers/producers, traders, and wholesalers. Through focus group interviews and informal individual interviews with these different actors, it is possible to identify more clearly the groups and individuals most involved in different aspects of the value chain—for example, the roles of different family members (women, young men, household heads) in tasks and decisions relating to production, processing, and marketing.

Focus group interviews should take place in different areas that reflect the variation that exists within the value chain (accessibility, market opportunity, rural/urban producers) and the actual route taken along the value chain (local markets, regional markets, urban centers). Finally, these focus group and individual interviews provide a rich source of information to identify institutions and service providers that impact production and marketing; these contacts can then be used for further follow-up interviews

Guiding the discussion

The subjects for discussion will vary depending on the individuals or actors involved—their scope of understanding and experience of the issues, as well as their relationship to the different institutions and service providers involved in the value chain. Just as identification of the individuals and institutions involved in the value chain is an iterative process, the subjects for discussion should likewise be iterative. Using a discussion guide can be vital to ensure that all necessary topics are covered; however, it should not be used as a rigid tool and should be expanded upon as knowledge grows. Annex 1 includes a description of a case study from southern Mexico that describes the processes that researchers and development practitioners used to map the market for maize. This study provides more detailed examples for researchers and development practitioners who wish to undertake a similar study.

3. NET-MAPPING

Another approach used in this study is called Net-Map. This is an interview-based mapping tool that helps people understand, visualize, and analyze both actors' characteristics and actors' links in a comparative, structured way that can provide researchers with both qualitative and quantitative data. The tool was developed by Eva Schiffer at the International Food Policy

Research Institute (IFPRI). Net-Map merges characteristics of two existing methods, namely Social Network Analysis (Hanneman 2001) and the Power Mapping Tool (Schiffer 2005). It uses a participatory approach in which interviewees and interviewers together draw a network map of the actors involved in the policy arena, characterizing the different kinds of links between all actors, and then adding “influence towers” made of checker pieces to transfer the abstract concepts of power and influence into a three-dimensional sketch. Finally, the interviewee assesses the goal orientation of the different actors (for instance, for or against a certain intervention).

Net-Map can be used both as a research tool and as an instrument for organizational development and strategic network planning. Net-Map, with its special focus on influence, linkages, and goals of actors, can be used to monitor a project’s impact on outcomes and can equally serve as an early warning mechanism in case developments do not progress as desired. Net-Map provides a structured approach that allows for the comparison of the situation before, during, and after an intervention, between different sites where an intervention has been carried out, or between sites with and without interventions. In combination with more standard performance-based indicators, Net-Map can, in the long run, improve the understanding of what kind of social processes support successful project implementation and, in the end, the improvement of local people’s livelihoods.

4. USING THE MARKET MAP AND NET MAPPING APPROACHES IN KENYA AND MALI

The project proposes to use the market mapping methodology in Kenya (for maize) and Mali (for groundnuts). The objective of this work is to identify critical points along the value chain that need to be monitored for aflatoxin levels and to identify policy and institutional hindrances to value chain efficiency, as well as the business service providers available to value chain actors. It will also be used to inform the development of survey instruments (questionnaires) that will further investigate the livelihood impacts of aflatoxins and other issues relating to people’s knowledge, attitudes, and perceptions toward aflatoxins and their willingness to pay for safe products and technologies to reduce aflatoxin contamination.

4.1 Kenya

Maize is the single most important food crop in Kenya, constituting 3 percent of Kenya’s Gross Domestic Product (GDP), 12 percent of the agricultural GDP, and 21 percent of the total value of primary agricultural commodities. The crop accounts for a quarter of cropped area. Maize is produced by more than 90 percent of Kenyan households and is both a subsistence and

commercial crop. More than 70 percent of the maize area is cultivated by small-scale farmers, i.e., those owning less than 20 hectares of land (Doss et al. 2003). There are about 3.5 million small-scale maize farms in Kenya. About 60 percent of smallholder maize production is based in the maize surplus districts of Western, Nyanza, and the Rift Valley provinces. However, Kenya is characterized by a wide range of agro-ecological zones, and maize is commonly grown in drier regions to the north and east of the most productive humid zones.

Aflatoxin contamination in Kenya is most commonly reported for the eastern regions of the country where there have been sporadic cases of known aflatoxicosis. This analysis will be based on semi-structured interviews and focus group meetings with key informants along the value chains in two areas of Kenya: Kisii to Homa Bay in western Kenya, commonly perceived as an aflatoxin-free area (Figure 4), and Embu to Mbeere to the north-east of Nairobi (Figure 5), where aflatoxin contamination is a known problem. This information is supplemented by detailed economic analysis that took place in the first half of 2010. The sharp gradient of the Kisii to Homa Bay and the Embu to Mbeere transects allows us to cross several agro-ecological zones in a very short distance (less than 100 km). Observations organized by agro-ecological zone can then be extrapolated over the respective agro-ecological zones in Kenya.

In each region, focus group interviews will include villages with both good and poor accessibility to roads. The aim of the focus groups is to determine the role of maize in producers' livelihoods and to obtain information regarding: i) where farmers obtain agricultural inputs; ii) farmers' source of extension information on agricultural production and problems; and iii) how farmers store maize and their understanding of storage problems, including aflatoxin. In addition, semi-structured interviews will be conducted with traders and other key players along the maize value chains, including the National Cereals and Produce Board (NCPB), a major buyer of the grain. A discussion guide for mapping the maize value chain in Kenya has been developed for use with farmers; this guide is shown in Annex 2.

Figure 4 Agro-ecological zones in the Kisii - Homa Bay area (UM = upper midlands, LM = lower midlands)

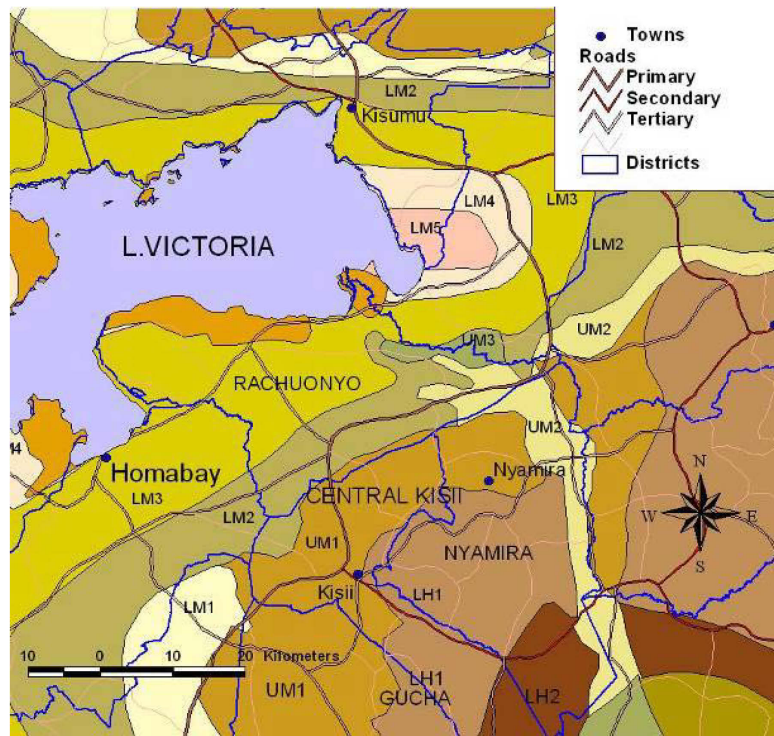
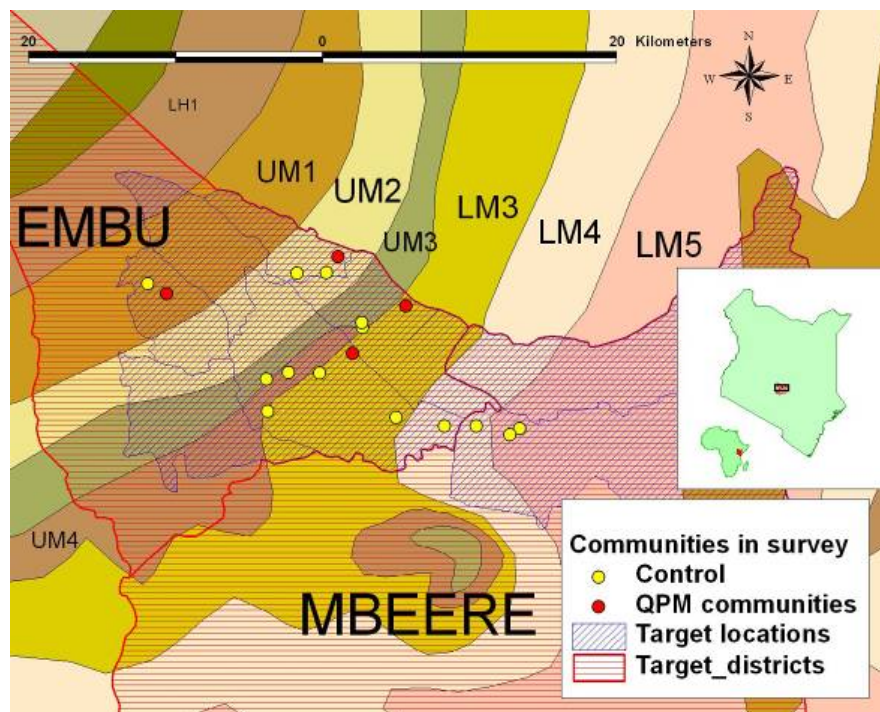


Figure 5 Agro ecological zones in the Embu – Mbeere area (UM = upper midlands, LM = lower midlands)



4.2. Mali

In Mali, groundnut production is concentrated in the West, South, and Center of Mali due to climatic conditions (rainfall ranging from 400–800 mm per year) suitable for groundnut production. This corresponds to the regions of Kayes, Koulikoro, Sikasso, and Segou, accounting for 97 percent of the total area under groundnuts and 98 percent of groundnut production in Mali.

The region of Kayes is the first groundnut producing region, accounting for 33 percent of groundnut area and 35 percent of groundnut production in Mali. The region of Koulikoro accounts for 21 percent of groundnut area and 24 percent of groundnut production in Mali. Kolokani in the region of Koulikoro is one of the largest groundnut-producing areas in the region of Koulikoro. This region has a history of repeated droughts one year out of three. Groundnut production is the main source of rural livelihoods in Kolokani, representing 37 percent of the total cultivated area. It is mostly planted as the sole crop and in rotation with cereals. Only about 8 percent of groundnut area is cultivated in association with pearl millet (*Pennisetum glaucum*). Groundnut is cultivated on collective plots by all household members or on individual plots owned by either men or women in the household (DNSI 1996/97).

Groundnut is cultivated as the sole crop or associated with cereals, such as pearl millet or sorghum, or other crops, such as “dah.” However, there are differences by region. While in Bougouni, groundnut is cultivated as mixed crop in 48 percent of groundnut-cropped area, groundnut is cultivated almost as the sole crop in 92 percent of groundnut-cropped area in Kolokani. Yields are higher in Kita (1,249 kg/ha) compared with 661 kg/ha in Bougouni and 760 kg/ha in Kolokani (CPS-IER, 1998). These low yields are explained by the poor quality of seed used by farmers in these regions. Thirty-two percent reported poor quality seed to be a major constraint to groundnut production. Almost all farmers complain of the low supply of seed of improved varieties. Farmers also use very little inorganic fertilizers.

In order to identify actors along the value chain and understand the functional relationship between actors, focus group interviews will be conducted with farmers/producers in the three major groundnut growing areas in Mali: the cercles of Kolokani Kita and Kayes (Map:). In each cercle, two villages will be selected based on road accessibility (poor and good road accessibility). In addition, in each market in the cercle, a group of traders will be interviewed and the value chain mapped at the local level. Individual interviews will also be carried out with wholesalers in the Ouelefebougou and Bagadadji markets in Bamako. In different villages,

groups of farmers will mixed whenever possible to include both men and women. A discussion guide for mapping the groundnut market in Mali has been developed for use with farmers; this guide is shown in Annex 3.

4.3 Net mapping and Aflatoxin

In this study, we aim to use the net-map tool to map out information networks related to aflatoxin in each site and to understand individual and group knowledge, attitudes, perceptions, and practices toward reducing the risk of aflatoxin contamination, as well as how and why these might change over time. In particular, the net-map exercise will be conducted to identify main channels of information flow and to assess critical entry points for possible intervention within the value chain. The initial network mapping activity conducted with maize and groundnut producers and traders at the beginning of the project, which was carried out by project collaborators, helped participants visualize the flow of the product along the value chain and identify constraints for adopting risk reduction strategies for aflatoxin contamination and exposure. (See http://programs.ifpri.org/afla/pdf/Kenya_netmap.pdf and http://programs.ifpri.org/afla/pdf/Mali_netmap.pdf.)

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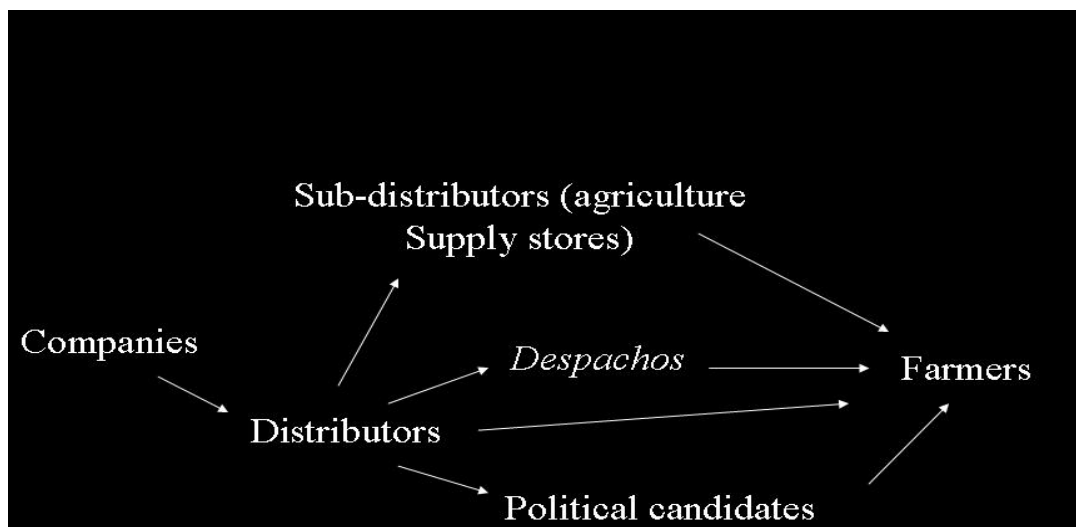
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Annex 1. Mexico case study

Research on maize in southern Mexico was carried out by the International Maize and Wheat Improvement Center (CIMMYT). CIMMYT has worked previously in southern Mexico and was somewhat familiar with the area and the main players in the value chain. Following our house painting analogy, we had, therefore, already applied more than one coat of paint. Had we not had this information, we would have had to build a rough map of the different chain actors and explore in more detail how they interacted with each other. The qualitative research focused on semi-structured interviews with the main value chain players; because the research project focused on seed, we focused on the main players in the seed input chains (Figure 6).

Figure 6 Actors in seed input chains in La Frailesca, Chiapas



We knew that the situation was fluid and that the relationship between the actors had probably changed. Hence, we went back to basics. We identified a number of issues that we wanted to explore further during the qualitative research:

1. Types of maize seeds that farmers are demanding
2. Reasons why farmers choose a particular seed (such as the seed's attributes or the existence of government subsidies for different seed types)
3. Frequency with which farmers purchase seed
4. Reasons why farmers continue or stop growing land races
5. Structure of the maize grain market and prices offered to farmers
6. Impact of the grain market on farmers' decisions about what types of seed to plant

These topics could only be comprehensively addressed by talking to all actors along the chain. For example, by talking only with the seed distributors, we could have dealt with number 1 (types of maize that farmers are demanding) but not number 2 (the reasons why farmers chose

a particular seed); number 2 could only be addressed by talking to the farmers themselves. Our qualitative value chain analysis enabled us to rapidly gain a greater understanding of the different actors in the input (seed) chains and output (grain). We achieved this by talking to key informants— in other words, going into a village and talking to farmers, and then driving to the nearby town and talking to seed distributors and grain purchasers. The qualitative approach is very much an “anthropological” one; using this approach enabled us to rapidly build a picture of the value chains.

Seed distributors

We knew that the formal seed market only dealt with hybrid and open-pollinated varieties (OPV) of maize, and we already had a list of all the seed distributors in the region. We spent two days visiting the offices of the main seed distributors (conveniently located in the same town) and talking about the seed distribution system (see Figure 7).

Figure 7 Semi-structured interview with a seed distributor in Mexico



We knew what information we wanted; guided by this, we explored the following with each distributor:

- What types of seed are they distributing?

- What volumes are they selling each year?
- At what price do they sell their seed?
- What percentage of sales is of subsidized seed?
- How does the subsidized seed system work?
- Where do is seed procured from (region and farmer?)

The iterative nature of this work is exemplified by the last question. The seed distributors' responses set us off on a path of further questions:

- What would happen to seed provision if the government removed the subsidy?
- Do you actively promote your hybrid or OPV seed during field days?
- Do you work with any local extension workers (known as *despachos*)?
- Do you sell seed via the village stores?

Again, answers to the above led to a further set of questions, particularly regarding the role of the *despachos* and the fact that they seemed to be playing a less prominent role in seed distribution than they did a few years ago. We wanted to find out more about why the role of the *despachos* has changed. The seed distributors had given us a list of some of the *despachos*, so we went to visit their offices in VillaFlores.

Despachos

The semi-structured interviews with the *despachos* focused on their (changing) role in the seed supply chain. The interviews encompassed the following questions:

- Can you explain how you work?
- What is your relationship with the seed distributors?
- What sort of maize seed do farmers ask for?
- How is your work financed (we knew that the *despachos*' work is partly subsidized)?

It became clear during the interviews that the continued role of the *despachos* in terms of agriculture and maize rested on their being a conduit for farmers' groups to access subsidized credit. We decided to go and talk to the organization that provides the credit.

Fideicomisos Instituidos con Relación a la Agricultura (FIRA)

FIRA is the government body, dependent of the Bank of Mexico, that provides credit to farmers. The questions posed to FIRA were straightforward:

- What does FIRA do?
- How does it channel credit to farmers?
- What are its views on the future of smallholder maize production?

We explored these topics during a 90 minute conversation in FIRA's office. From this meeting, we gained more insight into the ways in which farmers access seeds and credit. We then talked to farmers in a number of rural communities.

Farmers

CIMMYT took advantage of the fact that we had worked in several farming communities in La Frailesca. It was relatively easy to go the villages, arrange a meeting for later on in the day, and in the intervening hours, visit farmers' fields and talk to those farmers we met. The focus group meetings (see Photo 2) were conducted in a similar way to the semi-structured interviews in terms of having a few predetermined topics.

The discussions with farmers gave us the opportunity to explore in more detail:

- types of maize seed that farmers are demanding,
- reasons why farmers choose a particular seed (such as the seed's attributes or the existence of government subsidies for different seed types,)
- the frequency with which farmers purchase seed, and
- the reasons why farmer continue or stop growing land races.

Figure 8 Focus group meeting with farmers in Chiapas



Information regarding all of these topics was gleaned by asking questions based on our pre-determined topics. The research process continued with interviews with the maize buyers and the maize agro-processors. Using the qualitative research and complemented by secondary literature, CIMMYT built a comprehensive picture of the seed input and maize output chain actors, the relationships between them, and the policy environment that influences how the chains are structured and function. Throughout the process, the market map proved to be an invaluable conceptual tool to help us understand why the chains are set up as they are and why they function as they do. The qualitative data were complemented by quantitative data based on a survey of almost 100 farmers (for more details, see Hellin et al 2010b).

Annex 2 Themes For Focus Group Discussions In Kenya

10 minutes to warm up and introduce the group

1. Agricultural production strategies – maize, vegetables, animals
2. Agriculture (including livestock): what crops?
3. Livelihood options – list them and rank them
4. Agriculture vs. off-farm employment

1. Introduction of the project

- a. Brief introduction of the project, i.e. we are looking at production, management, storage, and marketing of maize
- b. Experience in maize production?
- c. Major constraints of maize production?

2. Production and purchasing

- a. Source of inputs (maize varieties (own seed, OPVs, hybrids), fertilizers, pesticides, insecticides). Seed companies hand outs and/or from veterinary shops?
- b. When did you plant this year?
- c. Area planted?
- d. When did you harvest this year?
- e. Problems in maize production?
- f. Do you purchase maize grain? When? From whom? How?

3. Storage

- a. Do you store maize
- b. Disease problems in stored maize
- c. What is the preparation prior to storage e.g. drying
- d. How do you know when maize is ready to store i.e. moisture content. And how is this conditioned by climatic conditions e.g. drought. Where did you learn this?
- e. Where do you store maize? Traditional granary? Sacks? Etc.
- f. How do you store (unshelled or shelled)? When
- g. Do you put maize in the bags? In (metal) silos?
- h. Do you use any treatment (actellic, ash, nothing) to store your maize?
- i. How effective is the actellic, ash etc. And effective against what? Weevil and/or Osama?
- j. Where do you source actellic etc?

- k. If you use silos where did the idea come from? How did you pay for the silo? Are they good? Do you want more?
- l. Are silos individually-owned or group-owned

4. Commercialization of maize seed and products

- a. Do you sell some of your maize production?
- b. Where do you sell your maize? To traders, intermediaries, local farmers? What are the price differentials?
- c. When do you sell your maize, i.e. how long is it stored?
- d. At what price do you sell your maize?
- e. Is some maize rejected by the buyers (for being moldy), and what do you do with the moldy maize?

5. Consumption

- a. What proportion of maize do you consume?
- b. How often do you consume maize per day?
- c. Who consumes it? Adults/children? How much? Malawi = 270 kg/person/year
- d. Coats, protein from fish. Sorghum is good for kids
- e. Do you pound and de-husk (germ and pericarp)?
- f. Do you sort maize prior to taking it to posho mill?
- g. What proportion do you keep as seed?
- h. How do you consume maize?
- i. Where do you mill your maize (posho mill)?
- j. When you take maize to posho mill, do you sort out the maize (i.e. the moldy maize) prior to or at the posho mill
- k. What do you do with moldy grain—is it given to chickens, cattle, and chang'aa or karumbu?

6. Information on varieties, fertilizers, pesticides, extension services

- a. Who is your major source of information regarding pesticides/insecticides?
- b. Who is your major source of information regarding extension services?
- c. Who is your major source of information regarding price, supply, and demand?
- d. Who do you trust as the source of information?
- e. What sort of media is better? Face-to-face, handouts, vouchers?

7. Aflatoxin

- a. Do you have/experience mold on your stored maize?

- b. What do you think causes the mold?
- c. Is that a problem to you? How? For what ?
- d. What do you do with the moldy grain?
- e. Have you ever heard of aflatoxins?
 - i. If so, where?
 - ii. Is it a concern? Why? (chronic or acute? health or market?)
 - iii. What are the effects of consuming contaminated grain?
 - iv. Where did you get that information?
 - v. Is it a problem if you use maize for local brew or feed?

8. Role of government

- a. *Testing*
- b. *Which agency would you trust? (government, WFP, Unga, millers, ...)*
- c. *Would you be interested in a check at the posho mill? Would you be willing to pay for it?*

Annex 3. Focus group discussion guide with farmers in Mali

1. Introduction of the project
 - a. Brief introduction of the project
 - b. Experience in groundnut production?
 - c. Major constraints of groundnut production?
 - d. Etc...
2. Production
 - a. Source of inputs (Varieties, fertilizers, pesticides, insecticides)
 - b. When did you plant this year?
 - c. When did you harvest this year?
 - d. Years of problems with groundnut production?
3. Storage
 - a. Where do you store groundnut?
 - b. How do you store (unshelled or shelled)?
 - c. Do you put groundnut in the bags? In barrels? No packaging?
 - d. Do you use any other insecticides to store your groundnut?
4. Commercialization of groundnut seed and products
 - a. Do you sell all your groundnut production?
 - b. Where do you sell your groundnut?
 - c. When do you sell your groundnut?
 - d. At what price do you sell your groundnut?
 - e. To whom do you sell the products?
5. Consumption
 - a. What proportion of groundnut do you consume?
 - b. What proportion do you keep as seed?
 - c. How do you consume groundnut (boiled, oil, paste, cake, etc.)?
6. Information on varieties, fertilizers, pesticides, extension advices
 - a. Who is your major source of information regarding varieties?
 - b. Who is your major source of information regarding fertilizers?
 - c. Who is your major source of information regarding pesticides/insecticides?
 - d. Who is your major source of information regarding extension services?
 - e. Who is your major source of information regarding price, supply, and demand?
 - f. Etc.

7. Aflatoxin

- a. Have you heard about aflatoxin?
 - i. If yes, from whom? What is it?
- b. Have you seen mold on your groundnuts?
 - i. If yes, what do you do about it?
- c. How do you distinguish between good and bad quality, as well as unclean groundnuts ?
- d. Have you ever heard of the existence of aflatoxin on groundnuts ?
 - i. If yes, where did you hear about it?
 - ii. If yes, what is it and can you describe it?
- e. Do you think it affects the quality of groundnuts?
 - i. If yes, what is the effect on groundnuts?
 - ii. If yes, does it have an effect on human health?
 - iii. If yes, what are the effects on human health ?
 - iv. If yes, does it have an effect on animal health?
 - v. If yes, what are the effects on animal health ?
- f. If you see aflatoxin on your groundnuts, what do you do about it?
- g. If you have never heard of aflatoxin, have you ever seen a type of mold on groundnuts?
 - i. If yes, can you describe it?
- h. Does it have an effect on groundnuts?
 - i. If yes, what is the effect on groundnuts?
 - ii. If yes, does it have an effect on human health?
 - iii. If yes, what are the effects on human health ?
 - iv. If yes, does it have an effect on animal health?
 - v. If yes, what are the effects on animal health ?
- i. When you observe mold on your groundnuts, how do you resolve the problem?
 - i. If yes, where have you seen the worst case?
 - ii. If yes, do you find differences between different varieties of groundnuts?
 - iii. If yes, please can you list the varieties that you cultivate and the incidence of mould on the different varieties?

8. Role of governments

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For more information about the Aflacontrol Project, please visit www.ifpri.org/afla/afla.asp.

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