

GRASPING 'THE BLUE BAGS'

A settings approach to perceptions on chlorpyrifos-treated bags in plantain production
(Costa Rica)



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Summary

Introduction and theory

This research explores reasons for the continuous use of chlorpyrifos-treated bags in plantain production in the Bribri and Cabécar Indigenous Territories of Talamanca Costa Rica. It explores perceptions of the users and relevant other actors on the use, and on alternatives, and places these perceptions in the perspective of different environmental elements. The settings approach to health promotion has been taken as a viewpoint for this research, with a specific focus on the work setting, home setting and community setting.

Methods

This research is of explorative nature and has an observational study design, in which qualitative methods are used. Data were collected through literature research, semi-structured interviews and observations. The sample consisted of 31 plantain producers, eleven intermediaries, two hired workers, three governmental organizations and five non-governmental organizations. To structure the obtained data, the ANGELIPU-framework was used. In this framework a distinction was made between settings and sectors, and the physical, economic, political and socio-cultural environment.

Results

The results of the literature review showed that economic considerations seem to be the main motive for the continuous use of chlorpyrifos-treated bags. The economic situation can lock producers in the use of the bags, because they cannot find opportunities to change the use. Producers in the territory are dependent of intermediaries and mention the rules of the intermediaries as a reason to use the bags. Pollution forms a main concern related to the use of the bags. Health risks seem to receive less concern. Alternatives would only succeed when the economic needs of producers and the quality standards for plantain are taken into account.

The results of the interviews on perceptions about the use of the bags confirm that economic considerations are the driving force for producers to use the bags. A higher price is paid for bagged plantain because of existing quality demands (for which the bags are needed) on the national market. From the intermediaries' perspective the use of the bags therefore is dependent on the national market. The intermediaries' monopoly on trade in plantain appears to be mainly dependent on contacts in the national market, and not only on the monopoly on transport that intermediaries have.

The people that effectively are in contact with the bags, the hired workers, have to place the bags because it is part of their job and there are no other options for work. The fact that most respondents do not place the bags themselves but hire workers to do so, is an important point that can be related to down-playing health risks and the continuing use of the bags despite possible negative health effects.

The fact that potential health risks are not perceived to be the most pressing problem by most parties, plays an important role in the continuous use. Environmental problems, which are considered to be a big problem, could be solved without diminishing the use of the bags.

The results of the interviews on perceptions about alternatives to chlorpyrifos-treated bags suggest that mainly economic uncertainty makes the producers critical about alternatives. The main barrier that will have to be faced when trying to diminish the use of chlorpyrifos-treated bags, is that both producers and intermediaries believe that it is impossible to meet the quality criteria without using the bags. If the requisites cannot be met, the economic risk is likely to be too big for the producers. A successful alternative should guarantee a similar level of income compared to what the producers have now. Using a different type of bag (without chemicals) has a chance of success because it is very similar to the current production style.

A second important issue is that the perceived problem is the environmental pollution caused by the bags, and not the use of the bags itself. From the perspective that the environmental pollution is the only urgent issue, setting up a good collection and recycling system would be a good starting point for intervention strategies.

The fourth results section, in which lessons for intervention are summarized, suggests that perhaps the most important lesson is that the problem that 'we as outsiders' consider to be the problem (the use of chlorpyrifos-treated bags), is not what the respondents perceive to be a problem. When wanting to change something it is important to take the community's problem perception into account (in this case environmental problems). Other factors to take into account in a future intervention are that there is most trust in the option of an 'organic' bag and that income security is a crucial point.

Conclusion

Economic considerations form the main reason for the continuous use of chlorpyrifos-treated bags. The same economic dependency (having no other options) and income insecurity also form a potential barrier for changing to alternative modes of production. Using a different type of bags (without chemicals) and setting up a good collection and recycling system are solutions that are most supported by the respondents.

Resumen

Introducción y teoría

Esta investigación explora las razones del uso continuo de las bolsas tratadas con clorpirifos en la producción de plátano en los Territorios Indígenas Bribri-Cabécar de Talamanca en Costa Rica. Se exploran las percepciones de los usuarios y otros actores relevantes sobre la utilización de las bolsas y sobre las posibles alternativas, y se ponen percepciones en la perspectiva de los diferentes elementos del ambiente. El *settings approach to health promotion* ha sido tomado como un punto de vista de esta investigación, con un enfoque específico en el ámbito laboral, ambiente del hogar y entorno de la comunidad.

Métodos

Esta investigación es de carácter exploratorio y tiene un diseño de estudio observacional, en el cual se utilizan métodos cualitativos. Los datos han sido recolectados a través de una investigación literaria, entrevistas semi-estructuradas y observaciones. La muestra consiste en 31 productores de plátano, once intermediarios, dos trabajadores contratados, tres organizaciones gubernamentales y cinco organizaciones no gubernamentales. Para estructurar los datos obtenidos, se ha utilizado el marco ANGELIPU. En este marco se hace una distinción entre los *settings* (microambientes) y *sectores* (contextos), y entre el ambiente físico, económico, político y socio-cultural.

Resultados

Los resultados de la revisión literaria muestran que las consideraciones económicas parecen ser el principal motivo del uso continuo de las bolsas tratadas con clorpirifos. La situación económica puede llevar a los productores a usar estas bolsas, porque no pueden encontrar oportunidades para cambiar su uso. Los productores en el territorio dependen de los intermediarios y mencionan que las reglas para la comercialización impuestas por los intermediarios, constituyen una razón para utilizar las bolsas.

La contaminación constituye una de las principales preocupaciones relacionadas con el uso de estas bolsas. Los riesgos para la salud parecen recibir menos preocupación. Las alternativas sólo tendrán éxito cuando se tomen en cuenta las necesidades económicas de los productores y los estándares de calidad del plátano.

Los resultados de las entrevistas de las percepciones sobre el uso de las bolsas, confirman que las consideraciones económicas son el motivo principal que impulsa a los productores a utilizarlas. En el mercado nacional, se paga un precio más alto por el plátano embolsado debido a que existen demandas o estándares de calidad (para los cuales el uso de las bolsas es necesario). Por lo tanto, el uso de las bolsas, desde la perspectiva de los intermediarios, depende del mercado nacional. El monopolio de los intermediarios en el comercio del plátano parece depender principalmente de los contactos que tengan en el mercado nacional, y no solamente del monopolio del transporte que tienen estos intermediarios.

Las personas que efectivamente están en contacto con las bolsas, los trabajadores contratados, tienen que colocar las bolsas porque es parte de su trabajo y no existen otras opciones de trabajo. El hecho de que la

mayoría de los productores encuestados no coloquen las bolsas ellos mismos, sino que contratan trabajadores para hacerlo, es un punto importante que puede estar relacionado con la degradación de los riesgos en materia de salud, y el uso continuo de las bolsas, a pesar de los posibles efectos negativos. El hecho de que los riesgos potenciales para la salud no se perciben como el mayor problema por la mayoría de las partes involucradas, juega un papel importante en el uso continuo. Los problemas ambientales, que son referidos como un gran problema, se podrían resolver sin disminuir el uso de las bolsas.

Los resultados de las entrevistas de las percepciones sobre las alternativas a las bolsas tratadas con clorpirifos sugieren que la incertidumbre económica hace que los productores sean críticos acerca de las alternativas. El obstáculo principal que tendrá que tomarse en cuenta cuando se trate de disminuir el uso de las bolsas tratadas con clorpirifos, es que los productores y los intermediarios creen que es imposible cumplir con los criterios de calidad sin utilizar las bolsas. Si los requisitos no pueden ser satisfechos, el riesgo económico probablemente sea demasiado grande para los productores. Una alternativa debe garantizar un nivel de ingresos similar al que los productores tienen ahora. El uso de un tipo de bolsa diferente (sin químicos) tiene una probabilidad de éxito porque es muy similar al estilo de producción actual.

Una segunda cuestión importante es que el problema que los encuestados perciben como más urgente, es la contaminación ambiental causada por las bolsas, y no el uso de las bolsas en sí mismo. Desde la perspectiva de que la contaminación del medio ambiente es el único problema urgente, la creación de un buen sistema de recolección y reciclaje sería una buena salida para las estrategias de intervención.

En la cuarta sección de los resultados en que se resumen las lecciones de la intervención, sugiere que tal vez la lección más importante es que lo que "nosotros, como extranjeros" consideramos como el problema (el uso de las bolsas tratadas con clorpirifos), no es lo que los encuestados perciben como un problema. Cuando se quiere cambiar algo, es importante tomar en cuenta la percepción del problema de la comunidad (en este caso los problemas ambientales). Otros factores a tener en cuenta en una futura intervención son que hay más confianza en la posibilidad de una bolsa 'orgánica' y que la seguridad de los ingresos es un punto crucial.

Conclusiones

Las consideraciones económicas son la principal razón para el uso continuo de las bolsas tratadas con clorpirifos. La misma dependencia económica (que no hay otras opciones) y la inseguridad de los ingresos también forman una barrera potencial para cambiar a los modos alternativos de producción. El uso de un tipo de bolsa diferente (sin químicos) y la creación de un buen sistema de colección y reciclaje son las soluciones que están más apoyadas por los encuestados.

Abbreviations and glossary

| | |
|-------------------|---|
| AAXPUS | Asociación Agro Exportadores Productores Unidos de Suretka. <i>A producers' organization that mainly focusses on the collection of used chlorpyrifos-treated bags for recycling. Were inactive at the moment of research because their truck had broken down.</i> |
| ACOMUITA | Asociación Comisión de Mujeres Indígenas de Talamanca. An association for indigenous women of Talamanca with the main goal to improve the quality of life of women and their families in the community. They help women to earn a living by commercializing organic cacao, and organizing 'chocolate tours' for tourists. |
| ADITICA | Asociación de Desarrollo Integral del Territorio Indígena Cabécar. <i>Indigenous development association for the Cabécar community. Forms one of the local indigenous governments.</i> |
| ADITIBRI | Asociación de Desarrollo Integral del Territorio Indígena Bribri. <i>Indigenous development association for the Bribri community. Forms one of the local indigenous governments.</i> |
| APPTA | Asociación de Pequeñas Productoras Orgánicas de Talamanca. <i>Organization of small producers in Talamanca. An organic organization located outside the territory, in Sandbox. APPTA commercializes organic banana and cacao from inside the territory.</i> |
| CCSS | Caja Costarricense de Seguridad Social. <i>Costa Rica Universal Health Service - the primary health care organization of Costa Rica, responsible for providing primary care and doing (statistical) health research. CCSS works mainly on 'cure' and not so much on 'prevention'.</i> |
| COOPETSIÖLA | <i>Indigenous Bribri for: 'Mountain of the Toucan'. A local producers' cooperative in Amubri that makes and sells chips of organic plantain.</i> |
| Corriente/ common | <i>Plantain on which no chemical pesticides are used and that do not meet the quality criteria for the national or export market</i> |
| Conventional | <i>See 'embolsado'</i> |
| Embolsado/ bagged | <i>Plantain on which chlorpyrifos-treated bags (and other chemical pesticides) are used</i> |
| IRET | Instituto Regional de Estudios en Sustancias Tóxicas. <i>Central American institute for studies on toxic substances. Located in Heredia, Costa Rica and part of the National University of Costa Rica (UNA).</i> |
| ISA | Infantes y Salud Ambiental (Infants and Environmental Health). |

A program run by UNA-IRET, that focusses on negative health effects for children caused by pesticides.

MAG

Ministerio de Agricultura y Ganadería. *Ministry of Agriculture.*

Non-conventional

See 'corriente'

UCANEHÜ

Indigenous organic producers' organization that commercializes organic banana from inside the territory.

UNA

Universidad Nacional de Costa Rica

WHO

World Health Organization

WU

Wageningen University

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Preface

A quote by the Dutch initiative ‘Loesje’ says *It was on a day like this that Marco Polo set off to China. What are your plans for today?* This quote nicely puts down the adventure-like feeling I had when I set off to Costa Rica, and a few weeks later had my first couple of days in the Talamanca jungle to explore the village where I would be doing my fieldwork. For me personally spending almost five months in the field, getting to know the Bribri and Cabécar-people, their community and their way of living has been an exciting and unique experience. Living there has shown me the beautiful environment, the Bribri and Cabécar traditions and allowed me to meet many friendly and interesting people. But it also showed me the sad reality of a polluted environment, producers and their families being affected by the use of pesticides, people living in poverty and the inequalities in health and socio-economic status that exist so closely together in one country. I hope that with this research report I can give an insight in the role pesticide-use plays in the lives of the people in the Bribri and Cabécar Indigenous Territories.

This research has been conducted as part of the ISA (Infants and Environmental Health, *in Spanish Infantes y Salud Ambiental*) Program in the context of a collaboration between the IRET (Central American Institute for Studies on Toxic Substances), an institute that is part of the Universidad Nacional de Costa Rica, and Wageningen University. With this thesis I aim to obtain my master’s degree in Health and Society at Wageningen University.

I would like to thank my supervisors, Bettina Bock, Kees Jansen and Berna van Wendel de Joode, for their help and feedback. And Berna, an extra thanks for welcoming me so warmly in Costa Rica.

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To all the people I met in Talamanca, ‘wëstë’ for trusting me with your stories, sharing your ideas and showing me your way of life. I hope this research will be able to contribute to a more health-full life for you, your children and future generations.

Only when the last tree has been cut down
Only when the last river has been poisoned
Only when the last fish has been caught
Only then will you find that money cannot be eaten
American Indian proverb

1. Introduction

In the Bribri and Cabécar Indigenous Territories the biggest part of the population makes a living by producing plantain, banana and/or cacao. Especially in the plantain production chemical pesticides are used, such as fungicides (predominantly propiconazole, thiabendazole and imazalil), nematocides (predominantly terbufos and oxamyl), herbicides (such as paraquat, glyphosate and 2,4-D) and blue plastic bags treated with the insecticide chlorpyrifos (see Box 1) (Barraza et al. 2011).

Motive

This explorative research focuses on (the use of) chlorpyrifos-treated bags – or ‘the blue bags’ as they are better known – within the indigenous territories. Prior research has shown that chlorpyrifos-treated bags are used frequently by small plantain farmers in the Bribri and Cabécar Indigenous Territories and that these treated bags may have adverse health effects on children as well as on adults (Van Wendel de Joode et al. *in press*; Barraza et al. 2011; Bouchard et al. 2011; Fieten et al 2009; Rioux-Pelletier 2009; Polidoro et al 2008).

In children elevated exposure to chlorpyrifos has been associated to neurodevelopmental problems – children with a higher exposure had more difficulty remembering learned things and were slower in learning new things (Van Wendel de Joode et al. *in press*; Van Wendel de Joode&Aragón 2008). In adults chlorpyrifos exposure has been related to many adverse – both acute and chronic – health effects such as nausea, headache, rash, respiratory problems (wheeze – for women), depression and types of cancer (Fieten, et al. 2009; García 2003; Polidoro, et al. 2008; Wesseling, et al. 2010; Wesseling, et al. 2006).

Next to affecting human health, chlorpyrifos-treated bags also have a negative impact on the environment (Castillo et al 1997; Castillo et al 2000, Galloway and Handy 2003, Polidoro et al 2008). Since waste collection is absent in the indigenous territories, in general the bags are not appropriately disposed after use and many are left in the plantations, alongside roads or homes, or in the natural

Box 1: Chlorpyrifos

Chemical name: O, O-diethyl O-3,5,6-trichloro-2-pyridyl phosphorothioate (C₉H₁₁Cl₃NO₃PS)

Chlorpyrifos is an organophosphate and organochlorine insecticide that is used to protect the plantain’s peel against cosmetic damage caused by insects. The treated blue bags are put around the raceme of plantains while they are still growing on the plants to make sure that insects do not stain the skin and to protect the peel from the sunlight to keep the colour of the skin light and clean.

Chlorpyrifos has a harmful effect on human health because chlorpyrifos and chlorpyrifos-oxon inhibit the enzyme cholinesterase in humans. Cholinesterase normally regulates nerve impulses in the total neurological system by breaking down the neurotransmitter acetyl-choline. The oxon metabolite and chlorpyrifos bind to the enzyme cholinesterase and thereby disturb this process. Both the central and peripheral nervous system are affected by this process.

The World Health Organization classifies the acute toxicity of chlorpyrifos as moderately toxic, class II (WHO-IPCS 2005). The chronic toxicity is not taken into account in this classification.

environment (Carranza Ramirez 2012). When the water of the Telire¹ river rises (each year around December) bags are taken by the river, thereby polluting the water and further spreading the bags throughout the area (expert interview, March 2011). The natural environment, or eco-system, is an important pillar of public health (WHO 1986).

Goal

Considering that chlorpyrifos-treated bags form a problem for human health (and infant health in particular) and the environment, it would be good to diminish the use of such bags. Research has suggested that, according to the plantain producers in the indigenous territories, reasons for pesticide use are “*economic needs to obtain production quantity and quality, and pressure to use pesticides by other economic agents such as middlemen*” (p.708, Barraza et al 2011). Middlemen, or intermediaries, are traders that buy banana and plantain in the territories and sell it on the (national) market.

However, the reasons for the use of chlorpyrifos-treated bags have not been studied in detail, and little is known about their embedding in, or occurrence from, a specific social, economic, political and physical environment (or setting) – or in other words their contextuality.

According to the Ottawa Charter of Health Promotion (WHO 1986) environmental factors are important determinants of health that are sometimes overlooked in health promotion (see Chapter 3). It is relevant to understand the context of a health problem when attempting to design appropriate interventions, in order to make sure that intentions to reduce pesticide use are reached and not counteracted by the environment, and to prevent unintended (side)effects of interventions. To better understand the context this study uses a settings approach, which is discussed in more detail in Chapter 3.

Main research question

How can the continuous use of chlorpyrifos-treated bags in plantain production in the Bribri and Cabécar Indigenous Territories of Talamanca Costa Rica be explained, taking into account the perspective of the users and relevant other actors, and their embedding in a specific environment?

Sub questions

1. Why are the bags being used?
 - a. What is the perspective of different relevant actors?
 - b. How can their perceptions be explained from a settings perspective?
2. What are relevant actors’ perceptions of alternatives?
 - a. What is the perspective of different relevant actors?

¹ The river Telire is one of the main rivers in the Bribri Indigenous Territory of Talamanca – passing the villages of Sepecue, Suretka, Amubri and Katsi, among others.

- b. How can their perceptions be explained from a settings perspective?
3. What lessons can be taken from this for future interventions?

Reading guide

Chapter 2 provides a description of the research area. In Chapter 3 the principals of health promotion and the settings approach are presented as the theoretical viewpoint for this research. In Chapter 4 the research methods are explained and the ANGELIPU-framework is introduced. Chapter 5, 6, 7 and 8 contain the results. Chapter 5 starts with an overview of the literature on the use of, and alternatives for chlorpyrifos-treated bags. In Chapter 6 perceptions of relevant actors on the use of the bags are given, followed by perceptions on alternatives in Chapter 7. Chapter 8 describes lessons that can be learned from this research for future interventions. Finally, Chapter 9 gives the conclusion of, and discussion on, this research.

2. Research area

In Costa Rica plantains are mainly cultivated in the region of Talamanca, located in the south of the country. Talamanca is the region with the lowest Human Development Index in Costa Rica (PNUD-UCR 2007). The Bribri and Cabécar Indigenous Territories (see Figure 1) are a part of Talamanca and within these territories many households economically depend on the production of plantains. People within these territories have few economical resources, are (geographically) isolated and have limited access to information, health and educational facilities (Barraza, et al. 2011; Fieten, et al. 2009; Polidoro, et al. 2008; Rioux-Pelletier 2009). This research took place in the communities of Amubri, China Kicha, Gavilan, Katchabri, Katsi, Sepecue, Shiroles and Suretka (in alphabetical order).



Figure 1: study area – Bribri-Cabécar Indigenous Territory Talamanca

Historically, mainly cacao was produced in the indigenous territories. However, because of a disease in the cacao a need rose to change to another type of production (Díaz 2011). It is not known exactly how and when, but the production of plantain gained economic importance and grew to be a good alternative to the production of cacao. Gradually more cacao trees were cut down and more plantain was planted. In the late 1980's Talamanca produced a great part of the plantain that was nationally consumed. Also the transnational enterprises Del Monte, Dole, and Chiquita exported the plantain together with the bananas from their own plantations, outside the indigenous territories in the Sixaola Valley. The indigenous smallholders copied technology from the large banana plantations in the Sixaola Valley for the cultivation of plantain (Barraza et al. 2011; Díaz 2011).

With the introduction of a monocultures, also plant diseases emerged. The main disease affecting plantain production is *la Sigatoka Negra*, a disease that gives black stains to the plant's leafs and fruit. Parts of the indigenous territories have been deforested and turned into plantain monocultures. Exposure to sunlight and heat have affected the micro-organisms in the soil that normally control the

micro-organisms that cause Sigatoka (Díaz 2011). Due to deforestation Sigatoka has become a more aggressive disease and other pests and diseases have started emerging too (e.g. nematodes, weeds). Also the soil has become less fertile, because the trees that usually recycle nutrients have now been cut down (Díaz 2011). As a result it has become necessary to use fertilizers and pesticides in order to achieve acceptable yields. The use of most fertilizers and pesticides has been copied from the large banana plantations, including the use of chlorpyrifos-treated bags to protect the plantains peel from the stains caused by Sigatoka.

Inside the Bribri and Cabécar Indigenous Territories most people produce plantain, banana or cacao (Díaz 2011). In most banana and cacao plantations no chemical pesticides are used and several are organically certified by either APPTA, UCANEHÜ (both banana and cacao) or ACOMUITA (only cacao). These organic organizations, however, do not provide an organic certification for plantain (personal communication APPTA, UCANEHÜ and ACOMUITA). Most smallholders that have a plantation with only plantain use chemical pesticides. The plantations are usually small plots of land with an average size of 2.8 hectare (Polidoro et al. 2008). On one hectare a farmer can produce approximately 1000 racemes per year.

Plots of land are traditionally inherited matrilineal (Villalobos&Borge 1994). Officially only indigenous can own land inside the territory, but in practice non-indigenous also use parts of the land (observation during this study). Both men and women work in the plantations. There is a task division in which the women in general exercise the lighter tasks of weeding, but also tasks that include pesticide use such as passing chlorpyrifos-treated bags to the person who is putting the bag around the plantain bunch, and putting highly toxic nematicides at the plantain stem (Fieten et al., 2009). The men usually harvest, spray, place chlorpyrifos-treated bags and other pesticides. It is common for children to help at the plantations (Barraza et al. 2011). The plantations are family-owned and it is part of the culture to work at the plantation with the whole family (Villalobos&Borge 1994). In earlier days family groups would work at each other's plantations all together in turn, but nowadays people work more individually on their own plantations (discourse during fieldwork for this study).

Most producers harvest every two weeks, after which in many cases the plantains are sold to so-called middlemen, or intermediaries. The intermediaries in the territories were described by Madrigal Aguilar&Morales Carbonell (1995) to exist in different roles. The ones with most power are primary intermediaries. These intermediaries usually own a truck with which they transport the plantains to one of the national markets (mostly Mercado Borbón, Mercado Cená or Mercado Mayoreo). Also secondary intermediaries exist, who do not have direct access to the market themselves, but trade with other (primary) intermediaries after collecting and buying plantains from plantain producers. A third

category is the so-called transporters. The transporters own a truck and are contracted by merchants to collect and transport plantains and bananas (Madrigal Aguilar&Morales Carbonell 1995).

Within the territory many intermediaries gather in Suretka on the banks of the Telire river. Secondary intermediaries and producers come there to sell plantain to the primary intermediaries. Secondary intermediaries and some primary intermediaries also drive through the Territory to buy the plantains directly at the plantations. On collection days many piles of plantain can be seen lying by the side of the road (own observations).

3. Theoretical framework

In this chapter the settings approach to health promotion is presented as the theoretical framework (see Figure 2, p.18). This theory is chosen because it is a useful approach to better understand the context of health problems. Also, the settings approach to health promotion can be easily linked to the ecosystem health approach (Lebel 2003) which forms a basis for the ISA Program. This research has been conducted as a part of the ISA Program (as mentioned in the Preface).

Because the settings approach is based on the principles of health promotion as stated in the Ottawa Charter (WHO 1986), these are explained first in paragraph 3.1. In paragraph 3.2 the settings approach is explained, followed by a specification of the work -, home - and community setting on which the focus of this research will be.

3.1 From health promotion to a settings approach

The World Health Organization (WHO) has defined health as: “... *a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” (WHO 2006). Health is a fundamental human right (WHO 1998). However, unfortunately, health is not easily obtained by everyone and health problems exist worldwide. Through health promotion, which is “*the process of enabling people to increase control over, and to improve, their health*” (p.1, WHO 1986), health can be improved. To be able to improve health, the health promotion activity needs to take into account the fundamental requisites and resources for health, which are peace, shelter, education, nutrition, income, a stable eco-system, sustainable resources, social justice and equity (WHO 1986). Basic principles of health promotion are empowerment, participation, holism, equity, sustainability, and intersectional and multi-strategy approach. Three basic strategies to promote health identified by the Ottawa Charter are “*advocacy for health to create the essential conditions for health (..), enabling all people to achieve their full health potential, and mediating between the different interests in society in the pursuit of health*” (p.2 WHO 1986).

Besides these fundamental requisites, resources, principles and strategies, the Ottawa Charter (WHO 1986) also contributed to the field of health promotion by stating five health promotion action areas (see Box 2). One of the five *health promotion action areas* that is mentioned is to ‘*create supportive environments*’. Also ‘*building public policy*’ refers to an environmental change

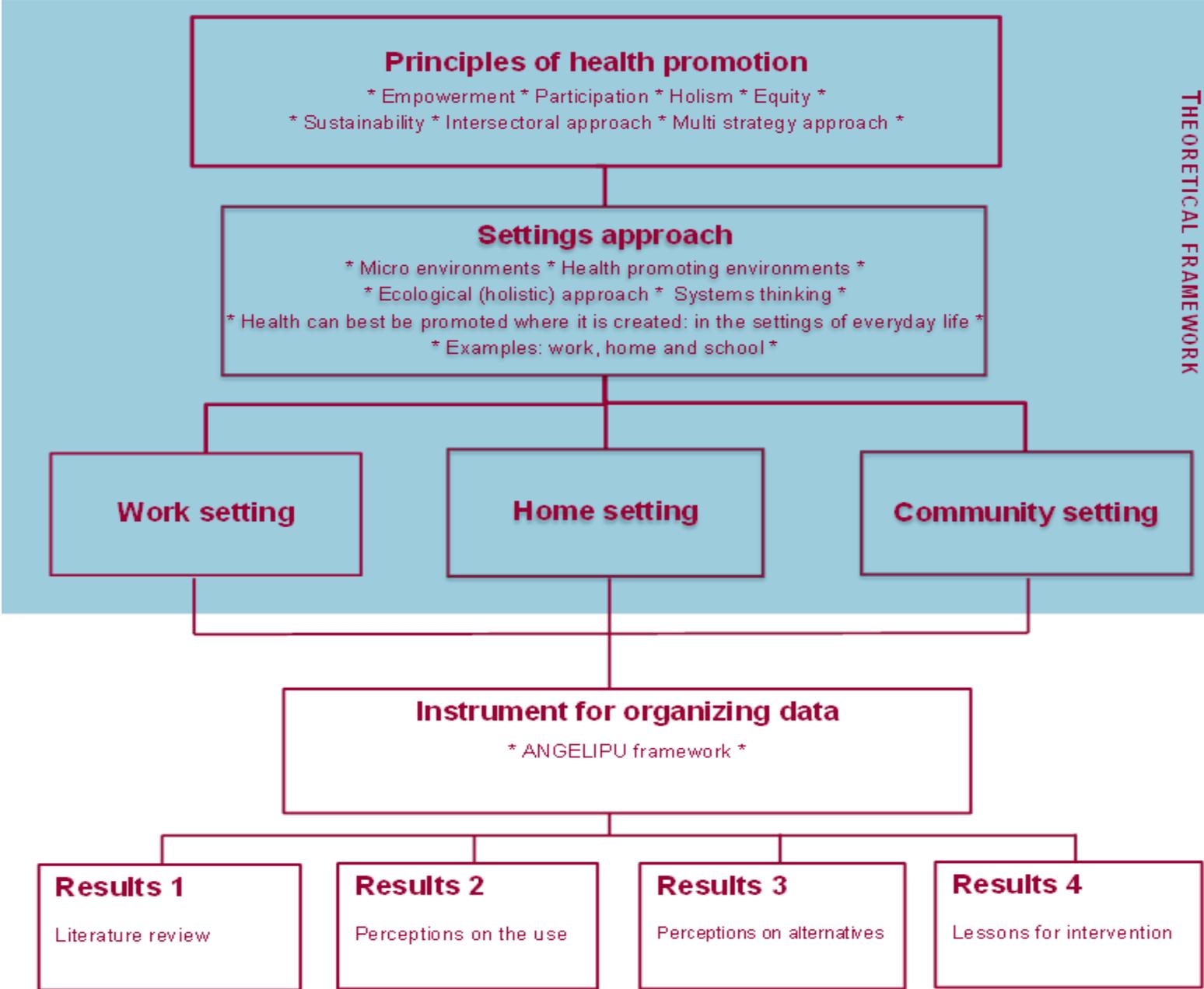
Box 2: Health Promotion Action Areas

Five health promotion action areas, as stated in the Ottawa Charter for Health Promotion (WHO 1986)

1. Build healthy public policy
2. Create supportive environments
3. Develop personal skills
4. Strengthen community action
5. Reorient health services

“*These actions are interdependent, but healthy public policy establishes the environment that makes the other four possible*” (WHO 1988, Adelaide Recommendations).

Figure 2: Theoretical framework and structure of the report



(political environment). Health and the environment are linked inextricably. Firstly, because the environment sets the boundaries for the behaviour that takes place within that same environment. And secondly, because changes in environmental variables modify behaviour (Poland et al. 2000). This inextricable connection suggests that “... *health promotion can achieve its best results by exercising whatever control or influence it can over the environment*” (p. 17, Poland et al. 2000).

A health supporting environment supports healthy behaviour. For example, when your environment contains many elements that stimulate physical exercise (e.g. stairs are easier to reach than the elevator (physical environment) or many of your colleagues ride a bike to work (social environment)), healthy behaviour (exercising) is stimulated by the environment.

Environmental factors can have a positive or negative influence on health. That is why it is not sustainable to only teach new behavior without paying attention to environmental factors. Through health promotion environments can be made more health supportive.

According to the Ottawa Charter of Health Promotion (WHO 1986) “*health is created and lived by people within the settings of their everyday life; where they learn, work, play and love. Health is created by caring for oneself and others, by being able to take decisions and have control over one’s life circumstances, and by ensuring that the society one lives in creates conditions that allow the attainment of health and its members*” (p.4). This statement is considered to be the base of the settings approach to health promotion (see below), which considers that health is created and thus can be best promoted in settings of everyday life.

3.2 Settings approach

As mentioned above, the *settings approach to health promotion* has been inspired by ideas on *supportive environments for health*, that were first mentioned in the Ottawa Charter (WHO 1986), and further developed in the Sundsvall Statement (WHO 1991).

At the basis of the ‘*settings approach to health promotion*’ is the idea that the context, or environment people live in, should be health promoting, and thus stimulating people to make healthy choices, as explained in 3.1. Another basic principle of the settings approach is that it is an ecological approach, that sees the world as a complex system in which everything is interconnected; changing something in one place or setting, means that something else will also change in reaction. This way of thinking is called (ecological) systems thinking, and assumes that “*the world is systemic and the parts interrelated, that the whole is greater than the sum of its parts, and thus that meaningful understanding comes from building up whole pictures of the system*” (p.S209, Best et al. 2003).

Systems thinking is in contrast with the idea of reductionism, which assumes that you can best study phenomena by taking them apart in separate pieces (imagine dissecting a frog in biology class) (Best et al. 2003). Systems theory does acknowledge that smaller parts of the system can be studied, but

emphasizes that the whole is more than the sum of its parts (a living frog is more than just all the pieces put together).

In planning health promotion for instance, one always has to take into account that intervening on one level might also affect areas that are not your target, because everything is interconnected. Because the system is complex, it helps to dissect it a little further in order to gain a better understanding of the environmental context. When taking a system apart it is important to still take into account the existing connections between parts of the system.

The settings approach is a way to dissect the environment in smaller pieces, investigate those pieces in more detail and study the relationships between the parts of the bigger system (Best et al. 2003, Poland et al. 2000). The settings approach is about understanding and possibly adapting the environment, or those environmental elements that significantly influence individual behaviour, or health directly.

The settings approach to health promotion is useful for better understanding the context of a health problem and thereby creating a better picture of what would be good starting points for health promotion or other intervention strategies.

A setting is a (physical) micro-environment and a social structure (Poland et al. 2000; Swinburn et al. 1999), characterized by specific physical features, norms and values that regulate people's interaction. Settings help to understand the context of a health problem by making explicit 'where' the problem takes place, who plays a role in the setting, how people in the setting think and operate, what are the assumptions, norms, roles, how power is divided, what is the political and organizational culture, and the physical and social environment (Poland et al, 2009). "*Settings come equipped with readily definable structures, routines, pathways of entrée and of change, are relatively stable over time, are less amorphous than community or society, and are more easily operationalized than a focus on specific risk groups*" (p12, Poland et al. 2000). Examples of settings are schools, homes, hospitals, prisons, workplaces and islands. Below the work, home and community setting, that are used in this research, are further explained.

3.2.1 Work setting

Studying the workplace setting is relevant for the research problem, because the plantations in which the pesticides are used are a workplace for the plantain farmers. Also relations with intermediaries (who were suggested to play a role in the use of chlorpyrifos-treated bags in earlier research (Barraza et al. 2011)) are a part of the workplace. "*The [workplace] setting refers to the immediate physical and built environment (e.g. the building, the work process) and the psychosocial environment (e.g. the organizational, economic, legal, and political environments (...)(p.171, Poland et al. 2000))*".

The workplace can be related to health through work-related injuries and illness. To promote workplace health one has to take into account physical, social and psychosocial factors. “*The [workplace] setting (...) influences workplace health promotion in two different ways. It influences the target of health promotion (the health of workers) and the practice of health promotion (what health promoters can or cannot actually do)* (p.171, Poland et al. 2000)”. The determinants that influence workplace health lie both inside and outside the workplace. An example of a determinant outside the workplace is a law on the use of toxic substances. Examples of determinants inside the workplace are the physical features of the workplace. The social, economic and policy environment can constrain decisions made at company level that influence health through the above mentioned factors (Poland et al. 2000).

Improving health through the workplace setting could for example be done through the reduction of chemical hazards at the source (in this case, reducing the use of chemical pesticides), or other exposure reduction measures like improved personal protection or modification of work equipment and practice. Improvements at the workplace include as well employers providing a health insurance for their employees.

When attempting to create healthier workplaces, it is important to balance economic strength, social equity and environmental sustainability (Poland et al. 2000). A relevant barrier, mentioned by Poland et al. (2000, p173), to take into account is that “*ultimately, however, the workplace as a setting for health promotion is inherently limited by the fact that health interests of workers will seldom prevail if they conflict with corporate profitability, particularly in the current economic context of globalization and “bottom-line” competition. However, work-related determinants of health can be addressed in other ways besides direct intervention in the workplace. Change can be initiated from the bottom-up as well as from the top-down.*”

In Chapters 6.1 and 7.1 the perceptions of relevant actors in the workplace setting on, respectively, the use of and alternatives to chlorpyrifos-treated bags will be described.

3.2.2 Home setting

Homes as health promoting settings involve the family and its social interactions, as well as the physical environment of the home and the resources within it (Poland et al. 2000). Both seem to be of importance when looking at the use of chlorpyrifos-treated bags.

Most plantain farmers in the Indigenous Territory are smallholders, who own their own plot of land and the production of plantains is in many cases a family business. The family unit and its social interactions may for instance influence the way producers handle pesticides, or whether they talk about risks and ways of handling the pesticides (Rioux-Pelletier 2009). Also all family members can

experience adverse health effects due to pesticide use (Fieten, et al. 2009; García 2003; Polidoro, et al. 2008; van Wendel de Joode, et al. *in press*).

The physical environment of the home is important for instance with regard to pesticide storage inside the home, or the use of pesticides close to the home, and thus the likely amount of contact that family members have with the chemical substances. The resources within the home, like the economic needs of the household, are likely to also play a role, as will the division of power, and thus access to the resources, within the household.

The family/home setting differs from the workplace setting because the family/home setting is a private setting. *“Part of what makes this environment a ‘home’ comes from the power of its occupants to organize it according to their needs”* (p45, Poland et al. 2000). Within the category of home settings, settings differ because they are partly defined by the rules and boundaries set by the family – these will be different for each family.

The home setting is an important learning environment in which beliefs and behaviors are developed and maintained. *“Social stimuli such as house rules, encouragement from family members, emotional support, and positive and negative reinforcement are among the most powerful determinants of health-related behavior acquisition in children”* (p51, Poland et al. 2000). Parents’ attitudes or behaviors can influence the adoption and maintenance of certain behaviors, but also young people may exert influence on their parents, because they can bring home new knowledge and skills, or change parent’s perceptions. From that perspective the children’s knowledge, attitude and behavior with respect to pesticides could be an influence on their parents’ pesticide use. Interesting in families is that if one family member makes a change, others are also stimulated to change. *“Once one family member initiates change, others might follow and in turn, influence and reinforce the change initiator”* (p 60, Poland et al. 2000).

In Chapters 6.2 and 7.2 the perceptions of relevant actors in the home setting on, respectively, the use of and alternatives to chlorpyrifos-treated bags will be described.

3.2.3 Community setting

Considering the community as a setting is slightly more complicated than the home- or workplace setting, because a community does not have boundaries that are quite as fixed. A community refers mostly to the relationships that exist between people and not so much a physical space. It can include families, friendship networks, neighborhoods and ‘political jurisdictions (e.g. the town, the city)’, interest groups and formal governmental and non-governmental organizations (p.250, Poland et al. 2000). Other than that, the definition for community seems to be quite abstract.

One thing that is clearly of importance for defining a community are the relationships between people, with their power division and possible conflicts. *“Discussion of community as a setting (...) is incomplete without an analysis of the nature of social power relations ...”* (p. 251 Poland et al. 2000).

This setting is much broader than the workplace of home/family setting, and will shed light on the bigger structures in the (social) environment that influence pesticide use. In chapters 6.3 and 7.3 the perceptions of relevant actors in the community setting on, respectively, the use of and alternatives to chlorpyrifos-treated bags will be described.

4. Methods

In this chapter the used study design (4.1), the methods and instruments of data collection and analysis (4.2), and the used sample (4.3) are described.

4.1 Study design

In this research an observational study design with qualitative methods is used to investigate perceptions on the use of and alternatives to chlorpyrifos-treated bags. As qualitative methods are used, the methods have further evolved during the research process based on the gathered data, as described below. The collected information is structured according to the theoretical framework described in Chapter 3. Due to practical issues, this theoretical approach has been adopted after the data collection was finished.

In the first phase (A) of the research relevant literature was reviewed and key informants (experts) were interviewed. The literature review and the expert interviews gave direction and points of entry for the following phase (O1). Following an observational study design, the data collection consisted of two phases of participative observation and semi-structured interviews (O1 and O2). The participative observations and semi-structured interviews were interrupted by a three-week intermezzo (I) in which the researcher temporarily left the field. Following information obtained from the first phase (O1), additional interviews were held in a second phase of data collection (O2) (Bowling and Ebrahim 2005). Figure 3 gives a schematic overview of the study design in time.

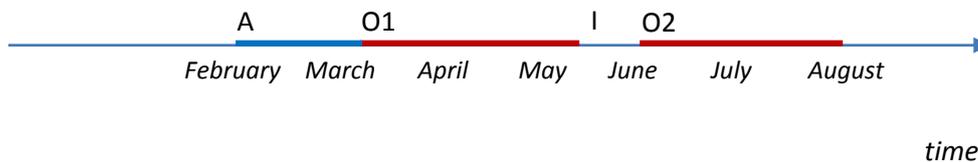


Figure 3: Study design in time – observational study design with two phases of data collection (O1 and O2) and an intermezzo (I), preceded by an initial phase of literature review and interviewing key informants (A).

4.2 Data collection and analysis

Data has been collected in the research area (see Chapter 2) in the period of March to August 2011.

4.2.1 Methods of data collection

Literature review

A list of relevant literature was made by composing relevant search terms (see Table 1) with the help of a dictionary and the reference lists of recent articles. After synonyms and Spanish and Dutch equivalents of the search terms were searched. Also relevant literature was obtained from experts (Baarda et al. 2005).

The preconditions for used literature are:

- English, Dutch and Spanish written literature from after the year 2000, with an emphasis on the last 5 years (after 2007)
- Only books and peer-reviewed articles. Academic thesis reports are used when recommended or approved by experts.

Table 1: sources and search terms literature review

| Sources | Search terms |
|--|---|
| Literature has been searched through experts, Web of Science (science citation index), literature lists of consulted articles and books, and search engines (Scopus, Google Scholar) | Chlorpyrifos, chlorpyrifos use, chlorpyrifos bags, pesticides, insecticides, pesticides use, insecticide use, pesticide handling, pesticides OR chlorpyrifos AND attitudes AND/OR perceptions AND/OR beliefs, smallholders, farmers, indigenous farmers, producers, plantain producers, plantain farmers, banana producers, banana farmers, Central America, Latin America, tropical countries, developing countries, indigenous territory, Costa Rica, Talamanca, Limón, alternatives AND pesticides, alternatives AND chlorpyrifos, alternatives modes, organic alternatives, non-conventional methods, health effects, and Spanish and Dutch equivalents |

Semi structured interviews

Semi-structured interviews form the most important data-source for this research. Semi-structured interviews can be used to investigate opinions, perceptions, attitudes, knowledge and feelings (Baarda et al. 2005). Topic lists have been developed to guide the interviews (see Appendix 1). The topics have been chosen based on expert interviews and literature research, and have been further developed during the period of data-collection. The interviews consisted of open-ended questions, organized by topic. When more appropriate for the structure of the conversation, the following order or formulation of questions was adapted during the interview. The interviews have been conducted by the researcher in the Spanish language. During the interview notes were taken that were transcribed in MS Word and translated to English or Dutch within three days after the interview.

Observations

In this research participatory and non-participatory observations are used to triangulate information from the interviews. Observations were conducted from the end of March 2011 until mid-August 2011. For this time a field diary was kept, making daily notes of plans, activities, experiences and reflections upon those experiences. Participative observations cover the information obtained from

informal conversations (for example: driving with an intermediary in a truck for a day, or talking to people on the bus), and the information gathered by being a part of the community for five months.

Non-participatory observations cover the information gathered from sight or hearing, without actively taking part in the situation observed (for example: seeing someone using a backpack spray around his house in the presence of his children, or overhearing the way people talk about intermediaries).

A small notebook was carried always by the researcher to jot down non-participant observations and to take notes of conversations. In all cases the notes were more elaborately processed within two days from the observations (Bernard 2000; Dahlgren, et al. 2004).

The advantage of these observations is that they give a better understanding of the setting and the context of the problem. Living somewhere for a larger stretch of time gives insights in ‘why things work the way they work’. With some people it was easier to talk informally than making an ‘official’ interview, because it was expected that respondents would not be at ease when the researcher would have started taking notes and asking question from a list (for instance with some of the intermediaries). The downside of participatory observation is that notes are often taken from memory after the conversation or situation, making the observations perhaps slightly coloured, because it is easier to remember things that are familiar or that you see as important. Also the researcher did influence the setting she was in, simply because of her appearance (being obviously foreign) and for example in the case of the intermediaries, being the only woman around. Because it is difficult to keep looking at a setting objectively when you yourself are part of the setting for a long time, a three-week break (Intermezzo – I) outside the field was taken half way.

The information obtained by observation is used in two ways. In the case of more elaborate informal conversations (more than 15 minutes) about the research topic (the use of or alternatives to chlorpyrifos-treated bags), the conversation is further used as an interview.

In the case of all other observations, they are used to verify information obtained from the literature and interviews. Observations are only mentioned in the results when they explicitly confirm or contradict something that was found in the interviews or literature, or when they add new information that was not obtained otherwise.

4.2.2 Tool for analysis: ANGELIPU framework

To be able to describe the settings mentioned in Chapter 3 in relation to pesticide use, a tool is needed to structure the information obtained. A useful tool to analyze settings is Swinburn et al’s (1999) *ANalysis Grid to understand Environments Linked to Obesity* (the ANGELO framework). Since 1999 this framework has been used in several studies and was confirmed to be a flexible and efficient framework (Simmons et al. 2009). Even though Swinburn et al.’s focus is on dissecting obesogenic environments, the method seems to be applicable to other problem statements too, as the roots for the

ANGELO framework also lie in the Ottawa Charter's action area of creating supportive environments, and as it is a tool to understand environments by conceptually dissecting them into smaller pieces (with one of those pieces being 'settings').

In the ANGELO framework the problem (obesity) is taken as a starting point, and with that problem in mind, promoting and inhibiting factors in the environment are analyzed to create a better understanding of the context, and show possibilities for intervention.

One can take into account different sizes and types of environments when speaking of *health supportive environments*. In the ANGELO framework settings are described as micro-environments (see below in the ANGELIPU framework, Table 2). The distinction of different types and sizes (or levels) of health supportive environments is also mentioned in the Sundvall Statement (WHO 1991), a statement that is at the basis of the settings approach, as described in 3.2.

The different types of environment are not separated in reality; they are connected and constantly influencing each other. However by making conceptual boundaries, it becomes easier to understand the system as a whole. It has to be taken into account of course that these boundaries are observer-dependent (Poland et al. 2000). By filling in the framework, an overview of elements related to (the mediators of) the problem is created.

Analyses Grid to understand Environments Linked to Pesticide Use (ANGELIPU)

The Analyses Grid to understand Environments Linked to Pesticide Use (ANGELIPU) (see Table 2) is based on the ANGELO framework (Swinburn et al. 1999) as described above.

Like in the ANGELO framework, horizontally environments are divided into different sizes: micro-environments or settings, and macro-environments or sectors. These settings and sectors have their own subcategories of different types of settings (e.g. work, home or community) and sectors (e.g. world food market). The focus of this research is on settings.

Vertically different types of environments are named: physical, economic, political and socio-cultural environment. Mediators for the overall problem can be put as subcategories for the environments. For example, in the ANGELO framework mediators for obesity are (bad) nutrition and (lack of) physical activity. In the case of (health problems related to) chlorpyrifos-treated bags the problem is mediated by the use of the bags and by (a lack of) alternative measures of production.

The framework that is created by this division in environmental types and sizes provides a structure through which the problems related to chlorpyrifos-treated bags can be better understood from an environmental perspective. Below the different quadrants of the grid are explained.

Table 2: Analyses Grid for understanding Environments Linked to Pesticide Use
with the focus-area of this research marked blue

| Size mediators categories | | Type | Physical | | Economic | | Political | | Sociocultural | |
|---------------------------------|------------------------------------|------|----------|--------------|----------|--------------|-----------|--------------|---------------|--------------|
| | | | Use | Alternatives | Use | Alternatives | Use | Alternatives | Use | Alternatives |
| Settings (micro) | Home (family) | | | | | | | | | |
| | Work (plantation) | | | | | | | | | |
| | Community | | | | | | | | | |
| Sectors (macro) | (Inter)Natio nal food market | | | | | | | | | |
| | Pesticide production | | | | | | | | | |
| | National government | | | | | | | | | |

In short, through settings small pieces of society are studied (micro-environments), while sectors refer to the greater structures within society (macro-environments). The physical environment refers to ‘what is available’, the economic environment to ‘what are the costs’, the political environment to ‘what are the rules’, and the socio-cultural environment to what are the attitudes, beliefs and values’ (Swinburn 1999). Below, in Table 3 a more elaborate explanation of the different environments is given.

The focus of this research is on settings (marked light blue in Table 2), and specifically on work-settings (dark blue in Table 2), because that is where chlorpyrifos-treated bags are being used. The home- and community-setting and discussed more briefly, to create an understanding of the complexity of the context in which the bags are being used. Sectors are mentioned in the framework because they can influence settings, but are not a part of this study.

Table 3: explanation of the different environments of the ANGELIPU framework

| Environment | Description | Examples |
|---------------------------------|---|--|
| The setting (micro environment) | <i>‘where groups of people gather for specific purposes’</i> Settings are <i>“usually geographically distinct, (...) relatively small, and are potentially influenced by individuals”</i> (p. 565, Swinburn et al. 1999). | e.g. the workplace setting, the home setting, the community setting (also see Chapter 2.2) |
| The sectors (macro environment) | Greater structures within society that influence the settings. Sectors | e.g. the (national) food market (which products are demanded/who |

| | | |
|-------------------------------|--|---|
| | <i>'are common to the wider population, often operating at regional, national and international levels, and tend to be geographically diffuse'</i> (p.565, Swinburn et al 1999). | will buy it?), pesticide industry (which pesticides are offered/ what is 'good' agriculture?) and legislation about production (what ways of production are allowed?). |
| The physical environment | refers to 'what is available', meaning the visible world around us, but also less tangible things such as the availability of education, or available expertise and information | In relation to chlorpyrifos-treated bags the physical environment can be the availability of the bags (e.g. where to buy them), or for example information on alternative ways of production. |
| The economic environment | refers to 'what are the costs'. | These costs can be the literal costs of buying the bags, but also less direct the costs for health or the environment because of the use of the bags. |
| The political environment | refers to 'what are the rules'. These rules can be both formal and informal. | An example could be the formal rules about pesticide use imposed by the government (like laws or policy), but also informal rules in the home environment about taking the children into the plantations. |
| The sociocultural environment | refers to attitudes, beliefs and values of the group or of society. | For example beliefs of the Bribri-culture about nature could perhaps be related to the way people deal with pesticides in the Bribri-Cabécar Indigenous Territory. |

4.2.3 Data analysis

The transcripts of the interviews and observations have been coded with 'open coding', meaning that the codes are based on main topics that came forward during the interviews. These codes have afterwards been categorized using the ANGELIPU framework, splitting them on theme (use or alternatives) and organizing them according to the four environments, physical, economic, political and socio-cultural.

4.3 Sample

To obtain a good picture of the context of the problem, and to triangulate obtained information, a broad group of respondents has been included. Respondents included in the sample are plantain producers (because they are in direct contact with the bags), hired workers (revealed to play a role by interviews with producers), intermediaries (suggested by earlier research to play a role in the use of

the bags), governmental- and non-governmental organizations (suggested by experts). Below the different groups of respondents are described in more detail.

4.3.1 Producers

The sample of producers has been collected as a combination of a convenience and a snowball sample and consists of 31 persons. It was intended to encounter producers using existing contact lists of IRET, the women’s organisation ACOMUITA and a producers’ organisations (AAXPUS), however after several tries none of these lists were obtained in time. Therefore producers were encountered using some existing contacts and obtaining new contacts through these producers (snowball). Also producers were encountered ‘on the street’.

It was made sure that the sample consisted of producers from several communities, containing both men and women, both conventional and non-conventional producers. Both men and women were included because it was suspected that their perceptions might differ due to different family and work roles. Conventional and non-conventional producers were included to investigate the reasoning or perceptions behind the use or non-use of pesticides. The collection of respondents was stopped when data saturation was reached, meaning that subsequent interviews did not lead to new information.

Eight female and thirteen male producers were interviewed. Also five women and five men were part of informal conversations (participative observation), completing the sample to 31 producers, of whom 13 are female and 18 are male. Two respondents are both producer and intermediary. These respondents have been counted as intermediaries and are therefore not a part of the sample of producers. This choice has been made because the researcher believes that their perceptions are not comparable with producers who are not involved in trading. Table 4 shows the communities and use of bags of the 21 respondents of the semi-structured interviews.

Table 4: plantain producers, respondents to semi-structured interviews split by use of chlorpyrifos-treated bags, gender and community.

| Use of bags | Gender | | Total | Community | | | | |
|--|----------|-----------|-----------|-----------|-------------|----------|----------|----------|
| | F | M | | Amubri | China Kicha | Sepecue | Shiroles | Suretka |
| Uses | 5 | 6 | 11 | 1 | 2 | 1 | 5 | 2 |
| Has never used bags | 0 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| Used before, but now doesn't use | 2 | 3 | 5 | 1 | 1 | 0 | 1 | 2 |
| Normally doesn't use, but now does use | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 0 |
| <i>Total</i> | <i>8</i> | <i>13</i> | <i>21</i> | <i>6</i> | <i>3</i> | <i>1</i> | <i>7</i> | <i>4</i> |

4.3.2 Intermediaries

Eleven intermediaries were included by a combination of convenience sampling and snowball sampling. Intermediaries have been encountered ‘on the street’ during their work (mainly on Mondays (sales day) on the banks of the river Telire in Suretka), through contacts of producers, and by hearsay. The sample of intermediaries consists of only men, as no women were observed practising the job of intermediary (middleman).

The major part of the sample of intermediaries was collected before any other interviews were conducted, because the expectation was that it could be difficult to reach the intermediaries.

Six out of the eleven intermediaries were interviewed (semi-structured interview). The other five intermediaries that are included in the sample were part of informal conversations (participative observation). Table 5 shows the different types of intermediaries in the sample, divided by community.

It stands out that most of the intermediaries in the sample are from within the territory. There is a slight possibility that there is a bias in the sample. However, the intermediaries were approached mostly by the river in Suretka, where most traders gather on Mondays. The researcher went to all the trucks to ask for intermediaries, and asked interviewed intermediaries for new contacts. It can therefore be assumed that the sample of intermediaries gives a reasonable representation of the intermediaries active in the territory.

Table 5 – Intermediaries, all males, who responded to semi-structured interviews or were subject of participative observations, split by community and role. Roles and communities are described in Chapter 2, Research Area.

| Community | Males | Type of intermediary | Males |
|----------------------------|-----------|------------------------|-------|
| From inside the territory* | 8 | Transporter | 2 |
| | | Producer/intermediary | 2 |
| | | Primary intermediary | 1 |
| | | Secondary intermediary | 3 |
| From outside the territory | 1 | Primary intermediary | 1 |
| Unknown | 2 | Secondary intermediary | 2 |
| <i>Total</i> | <i>11</i> | | |

* from China Kicha, Sepecue, Shiroles and Suretka

4.3.3 Governmental organizations

The representatives of three governmental organizations have been interviewed (see Table 6).

Table 6: representatives from governmental organizations that responded to semi-structure interviews

| Name of organization | Location | Representative | Function of representative |
|---|----------|---------------------|----------------------------|
| Ministry of Agriculture and Income (MAG – regional office Talamanca) | Suretka | Guillermo Sanchez | Director |
| Ministry of Health (Ministerio de la Salud – regional office Talamanca) | Bribri | Pricila García | Director |
| Caja Costarricense de Seguridad Social (regional office Talamanca) | Bribri | Wilman Rojas Molina | Director |

4.3.4 Non-governmental organizations

The representatives of five non-governmental organizations that work inside the indigenous territory, have been interviewed (see Table 7).

Table 7: representatives of non-governmental organizations that responded to semi-structured interviews

| Name of organization | Location | Representative | Function of representative |
|--|----------|--------------------------------------|----------------------------|
| Asociacion de Agro-Exportadores Unidos de Suretka (AAXPUS – producers' organization and collecting used bags for recycling. Not operative at the time of research) | Suretka | Maritza Hurtado Morales | Secretary |
| ACOMUITA (women's association – especially for women producing organic cacao) | Shiroles | Kattia Almengor Almengor | Primer vocal |
| UCANEHÜ (organization for producers of organic banana) | Suretka | Demetrio Layan and Aristides Morales | President and treasurer |
| COPETSIÖLA (organization for plantain producers to make plantain chips out of organic plantain) | Amubri | Mildred Blanco Salazar | Secretary |
| APPTA (organization for organic banana and cacao producers) | Sand Box | Juanita Baltodano | Director |

5. Results 1: The use and alternatives according to literature

In this chapter an overview is provided of what has been described in literature about the use of chlorpyrifos-treated bags in the Bribri and Cabécar Indigenous Territories. Also motives for the use of pesticides by smallholders, and related concerns have been investigated in literature. And last, perceptions on alternatives found in literature are mentioned.

Most literature encountered described epidemiologic, quantitative research on for example the effects of pesticides on health and the environment, on sorts of pesticides used or modes of use. Very few studies describe the situation in which the pesticides are used, or the reasons behind the use.

5.1 The use of chlorpyrifos-treated bags in the territory

Chlorpyrifos-treated bags are being used to protect the plantain from insects that stain the peel. Almost all producers with a plantain monoculture use the bags (Polidoro et al. 2008). Producers place the bags weekly (Van Wendel de Joode et al., *in press*). Barraza et al. (2011) report that boys as well as girls from the age of fifteen (in some cases even age ten) place the bags. Some children between the age of seven and ten have been reported to pass the chlorpyrifos-treated bags to the person who is placing them around the bunch. *“If farmers can afford it, they prefer to hire unskilled laborers for this service, who are usually young men in the community that do not own land”* (p.102, Polidoro et al. 2008).

Producers have copied the use of pesticides from the banana plantations outside the territory, but use them in conditions of extreme poverty (Barraza et al. 2011). Safety precautions in the use of pesticides are hardly taken, and producers in the territory have only vague ideas about the (health) risks of using pesticides (Barraza et al. 2011). According to Polidoro et al. (2008) legislation that regulates pesticide use is not present in the territory.

The ‘rules of the game’ that are established by certification bodies, organic organizations and intermediaries (plantain buyers) have an important influence on the way land is used (and whether or not pesticides are being used) in the territory (Whelan 2005). There is a widespread perception among producers of buyers (both intermediaries and companies) abusing their powerful position and fixing prices irrespective of the market price (Whelan 2005; Barraza et al. 2011).

Economic considerations, such as economic needs (production quantity and quality) and pressure (by intermediaries) are mentioned by producers as the underlying reason to use the bags. Plantain producers in the territory consider that they need to use pesticides, because *“middlemen buying the plantain harvest paid just a third of the market value if there were spots on the plantain skin”* (p.710, Barraza et al. 2011). *“In addition, the middlemen push producers to use chlorpyrifos treated bags so that they can sell them the bags. Farmers who cannot show the middlemen the used blue chlorpyrifos-treated bags receive a lower price* (p.714, Barraza et al. 2011). Producers are dependent of the intermediaries, because they are the only ones that have access to the next level of the market chain (Barraza et al. 2011; Polidoro et al. 2008; Madrigal-Aguilar&Morales-Carbonell 1995).

After use the plastic bags are being burned, buried, or littered anywhere (Barraza et al. 2011; Polidoro et al. 2008). In the perception of the indigenous the river is very important, and they worry about the river being polluted (Whelan 2005; Barraza et al. 2011). Health risks caused by pesticides seem to have little concern (Barraza et al. 2011; Polidoro et al. 2008). According to Barraza et al. 2011 this lack of concern for health aspects can be related to the fact that producers have no other option but to use the bags (because of the intermediaries' power). Mothers are especially concerned about the health of their children being affected by the use of pesticides (Barraza et al. 2011).

In communities such as Amubri and Katchabri there is more attention for the 'good use' of the soil – less chemicals are being used (Whelan 2005).

5.2 Motives for pesticide use in comparable areas

Like in plantain production in the Bribri-Cabécar Indigenous Territory, smallholders in other tropical or developing areas (Tanzania, Ethiopia, Amazon in Brazil, West Bank Palestine) have similar perceptions about it being impossible to produce without the use of pesticides (Stadlinger et al. 2011; Karunamoorthi et al. 2011; Zyoud et al. 2010; Pedlowski et al. 2012). Although the crops and location in these studies differ, the situation of farming in conditions of poverty and depending on crop production for one's livelihood, is comparable.

Going back to old practices once pesticides have been introduced is mentioned to be very difficult (Stadlinger et al. 2011). Producers can become 'locked' in the use of pesticides (Whelan 2005; Wilson&Tisell 2001). Because of agrochemical use and the costs that are connected to switching the way of production, it becomes impossible for farmers to change back to an organic form of production.

Other reasons for the continuing use of pesticides by producers can be, among others, ignorance about the sustainability of pesticides, the bias created by pesticide promotion by producers of chemicals, the barrier of investment costs, the slow damaging effect that pesticides have on the soil quality (not easy to notice in time), and the underestimation of health effects (Wilson&Tisdell 2001).

5.3 Perceptions on alternatives

Although producers recognize negative effects of pesticides, they do not have many other options to generate a cash income (Whelan 2005). This makes thinking about alternatives ways of production difficult. Plantain producers "*emphasized the need for more information for parents about the potential negative effects of pesticides in human health, especially children*" (p.713, Barraza et al. 2011). This information is not being provided by governmental agencies. Also producers would like to receive information about non-chemical alternatives (Barraza et al. 2011).

Growing organic banana could be a promising strategy, because it can provide a stable income and it stimulates biodiversity as it can be grown in multiple varieties and in agroforestry areas (Whelan 2005).

When looking for alternatives for plantain production in particular it is important to obtain plantain of good quality and to keep in mind the economic needs of plantain producers. *“As no market currently exists for organic plantain either in Costa Rica or internationally, alternatives to pesticides must provide similar or better fruit yield and quality standards, as well as equal or increased financial benefits as currently obtained from fruit grown with pesticides”* (p104, Polidoro et al. 2008).

Polidoro et al. (2008) name the possibility of using a different type of bag (“a white bag made of plastic or cloth”) in which no pesticides are used.

Wilson&Tisdell (2001) describe that switching to alternative ways of production is most promising when all producers act at the same time. The yields will initially be lower, so the prices will go up, making it easier for producers to make a new start. When producers switch one by one the economic barrier for the one switching producer is likely to be too big.

In the Adelaide statement (WHO 2010) it is stated that sustainability can best be promoted through policies that influence population consumption patterns. Also Whelan (2005) emphasizes that consumers have an important influence on what is being produced and how. New policies and regulations can however be difficult to implement in developing countries. *“Development of simpler and safer pest control methods has been stressed for developing countries where stricter regulations are difficult to implement and education alone does not improve pesticide use safety”* (Stadlinger et al. 2011).

5.4 Conclusion

Economic considerations seem to be the main motive for the continuing use of chlorpyrifos-treated bags. The economic situation can lock producers in the use of the bags, because they cannot find opportunities to change the use. Producers in the territory are dependent of intermediaries and mention the rules of the intermediaries as a reason to use the bags.

Pollution forms a main concerns related to the use of the bags. Health risks seem to receive less concern. Producers do not see other options for production. Alternatives would only succeed when the economic needs of producers and the quality standards of plantain are taken into account.

6. Results 2: The use of the bags

In this chapter different perceptions on the use of chlorpyrifos-treated bags are covered. In 6.1 perceptions of relevant actors in the work setting are described. Paragraph 6.2 covers the home setting, and 6.3 the community setting. The main focus is on the work setting.

In paragraph 6.4 the main themes that come forward in the perceptions are structured according to the ANGELIPU-framework, and underlying mechanisms are described. Information comes from semi-structured interviews and participative observation.

6.1 The work setting

6.1.1 Relevant actors' perceptions on the use

The work setting in this case consists of the plots of land where plantain is grown. These plots are usually family owned and have an average size of 2.8 acres (Polidoro et al. 2008). Producers work the fields by themselves or with the help of family members, or hired workers (so-called 'peones').

A social setting that is important to the workplace is the trade-interaction between producers and intermediaries. Relevant actors in the work setting that have been included are producers (6.1.1.1), hired workers (6.1.1.2) and intermediaries (6.1.1.3).

6.1.1.1 Producers' perceptions on the use

No contact, no problem

It was found that most producers do not place the bags themselves, but hire someone to do that. *"Everyone knows the bags have health effects, but nothing is changed because the boss of the finca is not worried. Others work for him, so he does not get exposed. The others don't have a choice; they have to do something to earn money and this is their only option"* (female producer).

This response led to more questions about who place the bags, because before it was assumed that the producers mostly place the bags themselves. Out of the eight producers who normally use bags and that were interviewed after adding a question to the interview about who places the bags, all eight (100%) indicated to hire someone to place them. *"I never put up the bags myself, I hire someone to place the bags"* (male producer). After, it was also confirmed by literature (Polidoro et al. 2008) that producers who can afford it hire unskilled laborers to apply pesticides.

The reasons to not place the bags themselves seem to differ slightly between men and women. For men the reason is that they do not like to put up the bags themselves because it is too much work, because they need someone younger and lighter to climb the trees, or because they do not like to be affected by the chemical. For women the reasons to not place the bags seem to be gender-related; because it is something women just do not do, or because it is heavy work to climb the trees.

The finding that many producers do not place the bags themselves is an interesting one, because it could alter their perception on health risks (they do not have direct contact with the bags) and their perception on problems related to the use of the bags.

Income-related reasons to (not) use bags

For most producers the main reason to use the bags, is that they receive a higher price for bagged plantain (*embolsado*). However, some producers indicate that using the bags is expensive and that therefore the reason they do *not* use the bags is also income related.

All of the respondents currently using the bags (n=11) named the price they receive for the plantains as the reason to do so. “*For the bagged plantain they [the intermediaries] pay you about 1000 colones [2 dollars] more...*” (male producer).

However, not every respondent agrees. Other producers (n=3) indicate that the reason they do *not* use bags is also related to income. According to them the bags are expensive, and with the low prices the intermediaries pay for the plantains, it is not worth it to invest in chemical pesticides. Although bagged plantain is worth more on the day of sale, with the investments that have to be made in buying pesticides and hiring people to apply them, in the end very little profit is made.

“*The bags are mainly interesting when you have a big plantation, because then it makes a big difference to earn a few hundred more for each bunch. If you have a small harvest it’s not worth the trouble. It also costs a lot of time to apply everything and you have to invest in the chemicals... it doesn’t pay off*” (female producer).

Using bags is part of the price requisites

The reason why a better price is paid for bagged plantain (*embolsado*) is that the fruit has to comply to several (esthetic) criteria at the moment of sale to receive a high price (see Box 3). Even though the taste of *embolsado* is said to be less good, the appearance defines the price.

According to several respondents (n=7) the bags make the plantain cleaner, more beautiful and/or of better quality. These features explain (part of) the price difference between *embolsado* (bagged) and *corriente* (common). “*They only want beautiful plantain at the market*” (male producer) and “*The presentation of the plantain is most important; if it looks good, they pay a high price*” (female producer). More specifically the bags are used so that insects do not damage the peel, and the peel does not get stained.

However others (n=4) say that the quality of bagged plantain is actually less good than of *corriente*, but that intermediaries pay more for it because it looks nicer. “*Excuse me for generalizing, but people*

from the city that are smart, are really more stupid, because they want a beautiful, clean plantain, but that doesn't have taste?". That bagged plantains do not have taste appeared to be the general consensus among people living in the territory, based on five months of participative observations.

Box 3: Requisites for plantain price

There are two price categories, '*embolsado*' and '*corriente*', or conventional and non-conventional plantain. *Embolsado* (with using chemicals) is mostly bought per raceme. *Corriente* (without chemicals) is bought by raceme, crate or weight. On average the price of a raceme of non-conventional plantain is half of the price of a raceme of conventional plantain. The price is based on several requisites:

- The number of fingers (30 or more per raceme)
- The size of the fingers
- The thickness of the fingers
- The colour of the peel
- Unstained peel

Most intermediaries in the territory say that the price differs depending on whether or not the bags are used, and that you can see the difference between '*embolsado*' and '*corriente*' best in the colour of the skin. From this information the colour of the skin seems to be most important requisite for price. On the national market, however, many intermediaries say that the colour indeed is very important, but in the eyes of some the size and thickness of the fingers is more important (personal communication M. Trejos).

Both traders and producers say that the non-conventional plantain (*corriente*) tastes much better, and that in fact that quality of the fruit is better. However for the market the appearance is most important – plantain has to be big, thick, clear and free of stains.

When one of these requisites is not met, the plantain is bought from the producer as *corriente* (so for half the price). When the raceme does not have enough fingers, the racemes are bought two or three for the price of one.

Chlorpyrifos-treated bags are not a chemical

Although all producers agree that the blue bags contain chemicals, using the bags is not seen as using a chemical. When speaking of 'using chemicals' producers usually refer to other forms of applying pesticides, like using a backpack-spray. 'Using chemicals' is perceived to be worse for one's health than using the bags. One producer even says that she produces organically, even though she uses the chlorpyrifos-treated bags.

Health problems related to the bags don't have priority

Although all respondents realize that there is a risk attached to working with chemicals, all seem to downplay the risk of working with the bags. They mention that they are always careful, or that they

have never experienced effects themselves. Also the effects of the bags are perceived to be very slow and invisible, and therefore do not form a very urgent problem.

“Everyone knows about the health effects but money is more important” (male producer).

Less than half of the respondents (n=5) spontaneously mentions that the use of bags can lead to health problems. The other respondents do not mention health problems in relation to the bags without being asked specifically. When questioned in more detail there does not seem to be a big difference between these two groups in the way they perceive health problems related to the bags. In general all producer respondents know that the use of the bags can affect one’s health, or can at least imagine this to be true. Also all respondents know that the bags contain a chemical – especially because the bags have a very strong smell.

The only difference between the group that spontaneously mentions health related problems and the group that does not, is that the first group has a personal (or family) example of dealing with health problems related to the bags. *“My brother’s skin has white stains, his arms are almost completely white... because of the bags, because he worked with them in the sun”* (male producer). There seems to be no difference in this perception between conventional and non-conventional producers, or men and women.

Several respondents (n=5) talk of strong blood or weak blood in relation to health effects. *“The chemicals do not affect me because I have strong blood”* (male producer). *“Some people are weaker than others...”* (female producer). And, *“[the chemicals] slowly make your blood weaker”* (male producer).

Looking at blood as being strong or weak could alter health perceptions. From the first two quotes it appears that these respondents ascribe the effect of pesticides to the person that is affected by it, and not to the pesticide itself; when you are lucky enough to have strong blood, you will not be affected. The first quote also shows that when people perceive to have strong blood, they think that they will not be affected by the chemicals. Although exposure might not lead to an immediate reaction for these people, there can still be long term effects. When people perceive that they will not be affected because they have strong blood, they may be, for instance, less likely to protect themselves against exposure.

The downside of using the bags: environmental problems

Nineteen of the interviewed producers (61%) say that the biggest problem concerning the chlorpyrifos-treated bags is the environmental pollution they cause, and especially the pollution of the river. They worry about the bags polluting the water and the soil. *“Pollution is a big problem. La tierra es una sola pelota – the earth is only one ball/ planet”* (male producer).

In general, respondents that produce organically are more worried about the environmental consequences of pesticide use than respondents that do not produce organically. Respondents that produce organically especially mention that the soil will become infertile when pesticides are used. *“Chemicals sterilize the earth – they make the soil unfertile”* (male producer).

In the communities where most people produce conventionally, most respondents do not see problems with the use of the bags as long as they are being collected. *“Problems with the bags?.. no not really.. they are being collected.. Well, yes, there are other people that throw them on the street – that is bad for the environment and the soil”* (female producer).

Dependency of intermediaries: making the price

Intermediaries are seen by the producer respondents to be responsible for the low prices and therefore the use of pesticides. Most producers strongly feel that the intermediaries keep them poor by offering low prices, and in that way force them to use the bags to at least earn some money. Only one producer contradicts these perceptions.

Most respondents (n=20) believe that intermediaries make price agreements to keep the plantain price in the territory artificially low. Four respondents mention that they are very certain of this because they know from family that the price on the markets in San José (the capital) is much more stable and has not lowered in the last few years. *“The intermediaries say that the price depends on the market, but I don’t believe it. I have family in San José that says that the price of the plantain is always the same there, it never goes down.”* (female producer).

According to producers, the intermediaries have the power to make the price because they are the only people with access to transport. *“The primary problem are the intermediaries. They pay little here, while there on the market they are paid well – they hurt the producers here. We don’t have transportation, no possibility to bring our products to the market.”* (female producer).

Only one producer respondent explicitly disagrees on this: *“The intermediaries have a lot of competition... I don’t believe they have agreements about prices”*. He bases his perception on the fact that he usually sells to different intermediaries every other week, and that in between the intermediaries he can usually find slight price differences. More than half of the producers (n=17) that have been interviewed always sell their produce to the same intermediary, either because they feel it gives them more security about someone buying their harvest, or because they do not have another option and only one intermediary comes to their area.

Dependency of intermediaries: market monopoly

Intermediaries appear to have a monopoly on plantain trade inside the territory. The producers' perspectives on why they use the bags (price difference, buyers demand, instability of price) hint to the idea that the producers (perhaps justly) feel very dependent of the whims of the intermediaries.

Four respondents literally refer to the fact that they feel dependent of the intermediaries, and that they have no other option. *"We are depending on the intermediaries... they bring all the stuff. They want that we harvest good plantain.. They do not only have the bags, but everything that is needed to grow the plantain"* (male producer).

Looking at the geographical location and economic situation of the producers, the perspective of the producers that they are dependent of the intermediaries to sell their product, seems to be a realistic one.

During this research only two local producers' initiatives to market their own plantain have been encountered, of which one was out of business because their truck had broken down and they did not have money to pay for the repairs. Further, organic organizations that buy produce inside the territories, only buy organic banana and cacao.

It appears that 'the intermediaries' have a monopoly on the trade of plantain. One should however be careful in making quick conclusions about the homogeneity of the group and their apparent power over the price of plantain (also see paragraph 6.1.1.3 for the intermediaries' perspectives).

Dependency of monoculture crops

The fact that many people within the territory depend on an income that comes from the same monoculture crops is only mentioned by a few respondents (n=3), but seems to be an important underlying reason for problems with low prices and the economic dependency of plantain. People, however, do not have many other options for employment inside the territories besides working with plantain.

"It is a big problem here in Shiroles, because the entire economy is based on plantain... the money I earn with that, from that I have to buy food for my children. In other communities people are still more able to support themselves, they produce rice and grain, so they don't have to buy that. But here people are completely dependent of the plantain" (female producer).

"Here there aren't many possibilities to get another job, so you have to make use of the possibilities you have as much as possible... That's why I use the bags, to profit as much as possible." (male producer).

Using chemicals is not sustainable and goes against Bribri and Cabécar traditions

The point of sustainability is only made by producers that do not use chemicals (n=3). Half of the organic producers says that using chemicals is not sustainable and that it will give problems with the fertility of the soil when people use chemical. The other half of the organic producers does not mention this.

“When you use a lot of chemical, the soil won’t do it by itself” (male producer). *“When you use a chemical you have 3 to 5 years without diseases, but afterwards they return; you have to start using more and more to be able to produce. There are people that can produce 15 years with chemicals, but afterwards the plagues become resistant. Organic production is much better on the long term, because you can keep producing forever”* (male producer).

Organic producers also explain that organic production fits the Bribri and Cabécar traditions, in which nature is placed above men and should thus be respected. They do not use chemicals because they have never done so, and because it is against their traditional way of agriculture.

Conclusion producers’ perceptions

The fact that most respondents do not place the bags themselves but hire workers to do so, is an important point that can be related to down-playing health risks and the continuous use of the bags despite possible negative health effects. In general, health problems related to the bags are acknowledged to exist, but the risk of being affected seems to be down-played. Environmental problems cause more concern among the respondents.

The reason the bags are being used is because *embolsado* is worth more money. However, not all respondents agree on the fact that using pesticides makes more money in the long run.

According to the producers the price is related to certain esthetic requisites and the monopoly position of intermediaries. Whether intermediaries really have so much power remains to be seen. Producers however feel that they have no way out of this system, because of economic dependency and lack of other opportunities. This corresponds with literature on producers being ‘locked’ in the use of pesticides.

6.1.1.2 Hired workers’ (peones) perceptions on the use

Because producers indicate to hire people to place the bags, the perceptions of these workers are described below. It appeared to be difficult to encounter these workers (partially due to time constraints), so only two have been included. Their perceptions are believed to give an indication of how hired workers might see the use of the bags.

There is no other option

For the hired workers, putting up bags is a part of their job. Both indicate that there are no other job options for them. E2: *“I have to work to provide a living.. I don’t have another option”*. They put up bags every week and get paid per bag, or by contract.

The bags are unhealthy, but there’s nothing we can do

Both hired workers say that the bags affect their health. They get dizzy or have headaches because of the smell, and the chemical irritates their skin and eyes. They do not wear protective clothing, because it is impossible to climb trees in the heat wearing long sleeves, trousers and a mask. According to one worker the producer is not worried about his health – it is his own responsibility to wear a mask.

E1: *“There are some who know, but everyone thinks ‘o, that won’t happen to me’. Yeah... maybe I should look for another job, but then... here you are born into this work... there’s not much you can do except for working on a finca (farm)... and we’re sort of forced to use chemicals”*.

Conclusion hired workers’ perceptions

The hired workers are at the bottom of the chain so to say – they do not have a choice in using the bags or not, it is part of their job to do so. They feel the bags affect their health, but there are no other job options. They are dependent of the producers.

6.1.1.3 Intermediaries’ perceptions on the use

Quality as a reason to use the bags

The reason the bags are used is because they give the quality the national market demands.

All intermediary respondents give quality-related reasons for the use of chlorpyrifos-treated bags. With the bags the plantain is lighter, greener and does not have stains. According to the intermediaries this quality (also see the requisites in Box 3, p.38) is demanded by the national or export market to which they sell the plantain. *“The price is higher because the quality is better, more beautiful, lighter. Corriente tastes better, but at the markets they want beautiful plantain”* (primary intermediary).

Like the producers (see paragraph 6.1.1.1) intermediaries acknowledge that non-conventional plantain tastes better, but that conventional plantain is valued higher because of its appearance.

The price depends on the quality, not on the bags

The intermediaries say that the price of the plantain depends on the quality of the plantain and not necessarily on the use of chlorpyrifos-treated bags. This would contradict the suggestion of Barraza et al. (2011) that producers have to show the used bags to the intermediary (see Chapter 6).

The colour and the size are important indicators for quality (also see requisites in Box 3, p.38). Some respondents at first say that the price depends on the use of the bags, but when asked in more detail all the intermediaries appear to think the same on this point: hypothetically a high price can be paid for non-conventional plantain, if the plantain meets all the quality requisites. However, none of the

intermediaries believe that it is possible to produce a plantain of sufficient quality without using chlorpyrifos-treated bags. So although producers do not have to explicitly show the used bags, they have to show that they use the bags through the quality of the fruit, which still forces them to use the bags.

The plantain price is controlled by the national market

Although most producers are convinced that the intermediaries keep the price of the plantain artificially low, the intermediaries say that their price depends on the national markets. All intermediaries explain that they base their prices on what they can earn on the national market. Intermediaries say that the prices in the territories rise and fall according to what the national market does, so the market is responsible for the price fluctuations.

One intermediary explains how he phones with people he knows in the market in San José to know what the price is doing. They call him when the price lowers, so that he knows that he has to buy for a lower price in the territory as well. *“What controls the price in reality is the national market. They [the market Cená and Mayoreo] are the ones that decide the prices. (...) The intermediaries don’t have a lot of power (...) The market-owners have all the power, because all the plantain comes there..”.*

Contacts are needed to enter the market

In response to the producers that say that the intermediaries have a monopoly on transport and therefore have all the power, the intermediaries say that everyone can buy a truck. The only barrier is that one needs contacts to enter the market in San José. Without existing contacts, one wouldn’t be able to sell. *“...it’s very difficult to just enter there without contacts”.*

There is a lot of competition between intermediaries

All but one producer have the perception that intermediaries make price agreements and work together. When asked about this, all intermediaries speak strongly against this idea. *“The intermediaries don’t have agreements – when I don’t get my fright full, and you have a producer that wants to sell to you, I will offer just a bit more so she will sell to me... (...) there is plenty of competition”.*

The work is hard and the profit is low

In the perception of the intermediaries the fact that their work is hard justifies that they earn more money than the producers.

The intermediaries perceive their work as tough, because they make very long working days and according to them their profit is not that big, especially when it’s placed in relation to the hard work. The business is insecure and they always have to fight about prices. *“The producer says I’m a thief,*

because I'm mistreating him. And when I get to San José with my plantain, the market keeper believes that they give me the plantain for free here... I'm always fighting with both" ..

One intermediary explains that there is about 1000 colones (2 dollars) price difference per bunch of bagged plantain between his buying and selling price. For each bunch he pays a commission to another (secondary) intermediary, he has to pay gasoline, the maintenance costs of his truck, the pay of his helpers and in some cases a fee to have a place on the national market. The profit he has per bunch is around 200 to 300 colones (40-60 dollar cents). Another intermediary names similar profits, in between 100 and 300 colones (20-60 dollar cents) per bunch. Assuming truckloads of 1000 bunches (middle-sized truck – this was the load size of the truck belonging to the intermediary who named profits between 200 and 300 colones per bunch) that comes to a gross income between 200 and 600 dollars per ride. One ride to the territory takes at least 36 hours of work, according to this one intermediary.

Problems related to chlorpyrifos-treated bags are the producers' fault

In general the intermediaries do not really see any problems with the bags. The problems that do exist are the producers' fault.

The intermediaries who themselves come from the territories mention environmental problems. Like the producers, intermediaries especially see the pollution of the river as a big problem. That the river is very important for the indigenous also came forward in literature (see Chapter 6). From the way the intermediaries speak about pollution caused by the bags, they seem to blame the producers for the pollution. *"They [the producers] don't recycle them in the right way"*. And, *"They are not being recycled – people throw them away on the ground, no-one picks them up"*.

Two intermediaries mention that there are health effects related to the use of the bags. One of these intermediaries has participated in a project about health effects caused by pesticide exposure (ISA Program, IRET) before. And the other produces his own plantain besides being an intermediary. Although they mention that there can be health effects for the producers, they seem to find environmental problems caused by the bags more important.

Conclusion of intermediaries' perceptions

From the intermediaries' perspective the use of the bags seems to depend on the national market, because of the quality that is demanded. Further, they do not agree with what the producers say about the intermediaries having price agreements and creating dependency. Intermediaries say that there is plenty of competition amongst them. It is interesting that not transport, but contacts on the national market, seem to be the reason for the monopoly position of the intermediaries in the territory.

Like the producers, intermediaries too see environmental problems as the main problem caused by chlorpyrifos-treated bags. According to most intermediaries producers are to blame for this.

6.1.2 Conclusion work setting

The people that effectively are in contact with the bags, the hired workers, have to place the bags because it is part of their job and there are no other options for work.

Further, economic considerations appear to be a driving force for the use of the bags. This can be related to existing quality demands (for which the bags are needed) on the national market. The finding that economic considerations play an important role, corresponds with findings from literature (see Chapter 6).

The intermediaries' monopoly on trade in plantain appears to be mainly dependent of contacts in the national market, and not only of the monopoly on transport that intermediaries have.

Although producers perceive that intermediaries have the main power over the price and quality demands, it seems that intermediaries are also dependent of the national market, and might therefore be more limited in their power than the producers suspect. Further research is needed to draw conclusions on this point.

6.2 The home setting

To place the perceptions of the work setting in a broader context below additional perceptions from actors in the home setting are described. The home setting here refers to the home of the producers.

Relevant actors in this setting are the producers (who's perceptions have also been described in 6.1) and their families. These families usually consist of a mother, father and several children. Also, it is not uncommon for other family member (like uncles, aunts, grandparents) to share the same household, or for couples to be separated and the children staying with the mother. About half of the respondents still lived in the same village as where they grew up, and had family living close (within walking distance).

Most plantations in the territory are family owned. Family ideas can therefore influence working practices. The workplace also clearly influences the home setting, by the cash flow that enters the home from the work setting, and through contamination of the home setting by pesticides.

The work setting is usually close to the home setting. For respondents the distance to their plot varied from a 5 to 30 minutes' walk.

To avoid repetition only remarkable perceptions that add to the information from the work setting are described.

6.2.1 Main themes in perceptions about the use of chlorpyrifos-treated bags

The household economy depends upon plantain production

This perception has already been described extensively in the previous paragraph, but the perception from the home-setting makes more clear why producers cannot afford to take the financial risk to not use the bags. *“Everyone here lives of plantain. Imagine that you have an entire field that you cannot sell... that would really be a disaster”* (female producer). Income is one of the fundamental requisites and resources for health, as are nutrition and shelter (WHO 1986). Assuming that family leaders want to maximize the wellbeing of the family and each member individually, and knowing that – at least from the perspective of pesticide-using producers – using pesticides generates a higher income, this will be an important factor that promotes pesticide use from a home setting perspective.

Storing bags inside the house

Several female producers indicate to store the bags in their house, because they are afraid that the bags will be stolen otherwise. *“I store the bags inside the house... I know it’s not good, but if I leave them in the shed they will get stolen”* (female producer). The storage of the bags inside the home has a potential negative effect on health, because air and dust get contaminated and there is a risk for children to play with the bags (Van Wendel de Joode et al. *In press*).

Taking decisions within the household

Decisions about the use of the bags can be influenced by other family members, for example because they give advice. *“Before I used a lot of chemicals, but now I use a machete. Why did you change? Because my mother always told me that chemicals make you ill and that you shouldn’t use them. I think she is right, so I try to use them less”* (female producer).

Another influence on the formation of beliefs and attitudes are experiences of other family members. *“My husband cannot place the bags because he is affected by the chemicals, because he has been poisoned once”* (female producer).

Power relations within the home setting have not been studied in much detail in this research, but some things were mentioned regarding power relations or control over decisions.

“I don’t know anything about plantain, my husband does it all, but that’s different for other women – my sisters in law for example manage their own finca. But when there are results that alternatives work just as well or even better and I tell it to my husband, then he will listen. And if those results really exist then he will want to change too” (female producer).

6.2.2 Conclusion home setting

The household is strongly affected by the money that is generated in the workplace, making the reason to use the bags to generate extra income even stronger. From a the home setting perspective people cannot afford to take the risk to lose (part of) their income and they are therefore forced to continue using the bags. Because of this dependency and the strong relation between work and home, it is important to take the home setting into account when addressing the problem of chlorpyrifos-treated bags.

Family experiences seem to influence perceptions about the health risks of using the bags. Also, family members influence each other when taking decisions about the workplace, so all family members could be involved when working on diminishing the use of chlorpyrifos-treated bags.

6.3 The community setting

In this paragraph perceptions of actors in the community setting are added to the context already described above. The producers, hired workers and part of the intermediaries that have been described in paragraph 6.1 are also part of the community, as are the families described in 6.2. Besides the actors already covered, important community-actors are governmental and non-governmental organizations working in the indigenous territories.

Semi-structured interviews have been conducted with representatives of the regional Ministry of Health, the regional Ministry of Agriculture (MAG), primary health care services (CCSS), organic producers' organization APPTA, organic producers' organization UCANEHÜ, women's organization ACOMUITA, producers' cooperation COOPETSIÖLA and producers' organization AAXPUS. Again, only main themes that add to the information already presented, are described.

6.3.1 Main themes in perception about the use of chlorpyrifos-treated bags

The task responsibility is unclear

Like at the level of the producers and intermediaries, also at this level there seems to be a lot of finger pointing at others who are responsible, and no-one stepping forward to take the responsibility. There seem to be conflicts of interest and it appears that there is no clear consent on who has the task to work with on the environmental problems and health risks caused by the chlorpyrifos-treated bags.

The director of CCSS explains the following: *“Part of the problem is also the existing conflict of interests – the national government for instance has an economic interest in the trade of pesticide, while they should also be worried about the health of their population and natural environment. MAG should be protecting the environment, but at the same time they still promote the use of agro-chemicals for a higher production and income. The big banana plantations may have environmental and health effects, but at the same time they create many jobs. On top of that this subject is not a popular subject – people rather see a government that builds bridges and schools. Touching a topic like this can make you lose votes, which makes it politically complicated. Politicians are not likely to*

start acting on this topic until the public starts asking that they act. The people here are not yet interested in organic products; we are about 100 years behind Europe in that way” (director CCSS).

The role of intermediaries

The same discourse that goes on at the level of producers and intermediaries, also takes place at a higher level of governmental and non-governmental organizations.

Representatives of producers’ organization confirm the perceptions of producers that intermediaries set a low price, and that there is no way of avoiding intermediaries because the market is closed off through sales agreements that traders have. The representative of the MAG confirms what intermediaries say about the market asking for high quality, and the market deciding the price.

Perhaps there is truth in both viewpoints. Further research on market strategies would be needed to get more clarity on the role and power of intermediaries.

Environmental problems

All representatives, except for the director of CCSS, confirm that environmental problems related to the bags are very big and seem to find health risks less urgent.

The director of CCSS is the only representative who explicitly worries about health effects caused by the bags: *“the price we pay for the use of this product is very high, speaking in environmental contamination and human health. Using something that has an effect on the development of children is a high price to pay for something aesthetic” (director CCSS).*

The representative of the Ministry of Health also says that the health of the person is affected, but that she does not know exactly how. The Ministry of Health was working on an improved collection and recycling system at the time of research. In her actions and the topics that were discussed the Ministry of Health seems to be mainly worried about the environmental effects of the bags.

The Talamanca representative of the Ministry of Agriculture and Income says that the first and mayor problem is the health of young and old, and second the contamination of the rivers. This appears to be a socially desirable answer, because in the rest of the interview he only speaks of environmental contamination.

6.3.2 Conclusion community setting

What stands out at the community level is that no-one really takes on the responsibility for the existing problems, and that people mainly point at others as the responsible ones. It is unclear who has what task regarding the problems caused by the bags. This could be because of competing interests.

At the community level a similar discourse is going on as at the level of individual producers and intermediaries, about who is deciding on the prices and about environmental problems that are caused by the bags.

6.4 Perceptions placed in the four environments

In this paragraph all the above described perceptions are structured according to the ANGELIPU-framework. This structuring leads to see how the perceptions are related to each other and to different environmental types.

Table 8 shows the main conclusions from the perceptions described above, and possible relations between them, structured in the ANGELIPU framework. The circled concepts seem to be central in the use of chlorpyrifos-treated bags, and are further explained below.

Table 8: main themes of perceptions on the use organized in the ANGELIPU framework

| Size mediators categories | | Type | Physical | Economic | Political | Socio-cultural | | | | | | | | | | | | | | | |
|---------------------------------|-----------------------------|------------------------|------------------|--------------|---|--------------------------------|---|------------------------------|--|--|---|--|--|---|--|--------------------------|-----------------------------------|---|---|-----------------|-----------------------------------|
| | | Use | Use | Use | Use | | | | | | | | | | | | | | | | |
| Settings (micro) | Work, Home, Community | Geographical isolation | Tropical climate | Monocultures | Environmental problems are communities' biggest cause for concern | There are no other job options | Economic dependency (of intermediaries) | Prices are low and fluctuate | Producers: intermediaries make the price | Intermediaries: the market makes the price | More money is paid when the bags are used | No health and safety regulations are applied | Market politics – connections are needed to enter the market | 'Political games' and conflicts of interest | Quality criteria exist to receive a high price | There is no other option | Health risks are being downplayed | Chlorpyrifos-treated bags are not really seen as a chemical | No-one feels responsible for the problems / task responsibility | Quality beliefs | Bribri-culture and sustainability |

6.4.1 The physical environment

In the physical environment there are several underlying reasons that contribute to the use of the bags that are difficult to change, such as the geographical isolation, the tropical climate and the fact that crops are planted in monocultures.

One of the outcomes of the use of the bags, environmental pollution, also lies in the physical environment. In both perceptions from the work setting and perceptions from the community setting, environmental problems are seen as the most pressing problem caused by the bags. This is the

problem that respondents are most eager to find a solution for. It is important to take this into account in the next chapter about perceptions on alternatives.

6.4.2 Economic environment

The most obvious reasons for the use of the bags lie in the economic environment. Producers are economically dependent of plantain production (and thereby the price that intermediaries give them for their product). More money is earned when the bags are used, so producers are forced to use the bags if they want to survive economically. The fact that there are no other job options is an important underlying reason for the economic dependency.

These factors in the economic environment are the most important driving force for the use of the bags. As long as people have a low overall income and the use of the bags form a possibility to generate extra income, it will be almost impossible to motivate people to decrease the use of the bags. People cannot afford to take the risk to lose their household income. These economic considerations are central in the use of the bags and therefore essential to take into account when thinking of alternatives in the next chapter.

6.4.3 Political environment

In the political environment the ‘political games’ that are played and the before mentioned conflicts of interest on higher governmental levels play a role in what action is undertaken to solve the problems. The ‘political games’ make that no-one has a task responsibility (socio-cultural environment) in this problem and that, for instance, health and safety regulation are not applied in the work place.

Governmental bodies can be important facilitators for change by, for example, making policies that regulate the use of the bags. When nothing happens at this higher level, it can be difficult to generate change on a larger scale (WHO 1988).

6.4.4 Socio-cultural environment

In the socio-cultural environment it stands out that health risks of the use of the bags are being downplayed, and that no-one really feels responsible for the problem. In fact, the problem that is defined to be the problem in this research (potential negative health effects) is not perceived to be a real problem by most respondents. For them the most pressuring problem concerning the bags is the environmental pollution, as described above. The fact that there is no other option for them at this moment (mainly because of economic concerns) can play a role in what is perceived to be the problem.

6.5 Conclusion

Economic considerations are the main driving force for the use of chlorpyrifos-treated bags. The fact that potential health risks are not perceived to be the most pressuring problem by most parties, plays an important role in the continuing use. Environmental problems, which are concerned to be a big problem, could be solved without diminishing the use of the bags.

Lack of community action and lack of task responsibility on this level, contribute to the system being stuck in the way it is, and make it difficult or impossible for producers and hired workers to change the use of the bags.

7. Results 3: Alternatives to chlorpyrifos-treated bags

The previous chapter has explained why the bags are being used. In this chapter different perceptions on alternatives to chlorpyrifos-treated bags are described.

In paragraph 7.1 perceptions of relevant actors in the work setting are described. In 7.2 and 7.3 these perceptions are elaborated with a summary of perceptions from respectively the home- and community setting. In 7.4 the main themes in the perceptions are structured according to the ANGELIPU framework. Information comes from semi-structured interviews and participative observation.

7.1 The work setting

The workplace setting and its relevant actors have been described in Chapter 6.1. For a work setting perspective on alternatives to chlorpyrifos-treated bags, relevant actors are producers (n=31), and in particular producers that cooperate in a project in de ISA-program to test alternatives² (n=2), and intermediaries (n=11). Hired workers have not been included as a relevant actor, because it appeared in Chapter 6 that they do not have any power to change.

7.1.1 Relevant actors' perceptions on alternatives

7.1.1.1 Producers' perceptions

For most producers it was difficult to imagine alternative ways of production, when they did not have any experience with alternative forms of production. When later in the research process a table with examples of alternative methods (see Appendix 2) was used, producers expressed a more elaborate opinion.

Impossible to meet the requisites without using the bags

According to most producers it is not possible to meet all the requisites for export quality plantains without using the chlorpyrifos-treated bags. A few producers (n=3) believe it is possible to grow good plantain without using the bags, but that one will always see the difference between conventional and non-conventional produce. Only two producers that already work with alternative methods believe that it is possible to grow plantain of sufficient quality without using chemicals.

For alternatives to make a chance, the requisites have to be met

In Chapter 6 it has been shown that one of the most important reasons to use the bags is to generate more income. The price of plantain is based on requisites that have been mentioned in Chapter 6. According to the producers a successful alternative should lead to produce that meets this quality criteria. Also it should not cost more time, or be more expensive than conventional methods. And finally, it has to be sure that they can sell their produce for a good price.

² A project with local producers to test alternatives. Producers use conventional methods on half of their land and try different types of alternatives on the other half of their land. For the alternatives see Appendix 2.

“Embolsado always has a lighter colour. If you really want an alternative, then beside the stains you also have to look at a method that keeps the plantain light” (female producer).

Need to earn at least the same amount of money

As the income of plantain producers depends on the sale of plantain, with alternatives they have to be able to earn at least the same amount of money. If more money could be earned with alternatives, this would be an important motivation to switch.

“Producers need to be sure someone will buy their product before they want to switch to an alternative” (female producer). *“Economic reasons are important... you have to show them that alternatives are cheaper”* (male producer). *“Maybe the biggest part of the producers would want to change, but there are also people that do not trust it, they’re afraid that it goes wrong, they don’t want to take the risk”* (female producer).

Other considerations such as protecting family health and environmental sustainability are also mentioned to be a positive factor of alternatives, but they would not be the main motivator.

The intermediaries will not buy it

What applies to all the producers is that they have a low trust in the intermediaries. They think that intermediaries will never pay a good price for *corriente*, even when it looks good.

“Intermediaries will never pay more for corriente – they have a market strategy in which they always want to keep control. With the bags they have a form of control. All the chemicals enter here through the intermediaries” (male producer).

Organic will take more time

Alternative methods are automatically associated with organic production by most respondents. Producers believe that producing organically takes up more time. This would form a barrier to take up alternative ways of producing.

The extra time investment is explained in two different ways. Most importantly the fruits grow slower when no chemicals are used, so it takes longer before the fruit can be harvested and sold. And secondly several producers feel it takes up more working time to weed by hand for instance.

You can get good plantain, sure, with shadow you do not necessarily need to use the bags, but then it doesn’t grow as fast (male producer).

“You know what it is with these cultural practices, we threw them out because the chemical is much more potent and faster, you know that too... Cultural practices cost much more time. It’s about efficiency and time” (female producer).

Types of alternatives

Several types of alternatives are considered by producers.

Bags without chemicals

Seven producers (of whom six are female producers) say that the best alternative would be to use a bag without a chemical (see Box 4). *“A good alternative would be organic bags... because the bag is really only to keep away the insects, so you don't really need the chemical... that would be the best solution – change the bags for bags that don't have a chemical”* (female producer). Two male producers say that they have seen the use of such bags: *“...there were bunches with the same quality coming out. But, it only works in large plantations where there is enough shadow and leaves, because the bags are transparent and otherwise the plantains will still burn by the sun and become too dark”* (male producer).

Box 4: 'Organic' bags

Yanber, a Costa Rican company that produces and sells the chlorpyrifos-treated bags, also produces a blue plastic bag that is not treated with anything. Another alternative type of bag that Yanber produces is a bag treated with an organic repellent based on chili, garlic and other plants. I have not heard from anyone who had experience with this type of bag. The last alternative bag that Yanber produces is a bag treated with a different chemical, Befendrina. However, as this would replace one chemical with another, this does not seem to be an acceptable alternative in terms of pesticide reduction. The prices for the bags from Yanber are listed below.

Polidoro et al. (2008) speak of a white bag made out of plastic or cloth. In workshops organized by the ISA-project participants mentioned a reusable bag, that could be used up to 8 times (workshop reports ISA). During interviews and observation in the field, I have not encountered this type of bag, nor the bag Polidoro et al. (2008) speak of.

| Type of bag | Price/1000 bags |
|-----------------------------------|-----------------|
| Bag treated with chlorpyrifos | \$112 |
| Bag treated with befendrina | \$120 |
| Untreated 'natural' bag | \$105 |
| Bag treated with organic products | \$115 |

Organic market

Several producers (n=4) mention that there should be a higher price for organic plantain. Now there is no market for organic plantain and that is, according to them, the reason why non-conventional plantain is sold at such a low price. *“The organic organizations are only for banana. The export market only exports embolsado. So actually, there is no market for organic plantain”* (female producer).

Finding a market for organic produce could therefore be an alternative to using chlorpyrifos-treated bags, because the price (income security) is the main reason why producers use the bags. *“The solution is very simple: raise the price of the organic product. Pay for them what they are worth. Then no-one*

will use chemical. The government and the United States should support organic production” (male producer).

Producers’ organization

Two male producers mention that it would be an alternative to access the market with a group of producers. Among other producers however, there seems to be little confidence that this would work. They name attempts of organizations in the past that have gone wrong, and some believe that intermediaries would sabotage them if they would try to organize themselves.

Solutions for environmental problems

As many producers perceive environmental pollution to be the biggest problem, solutions for environmental problems are also part of their perspective on alternative ways of production. Producers say that a better collection and recycling system for the bags is needed. It differs per region whether bags are currently being collected and if people see this as a problem.

In some regions used bags are being collected by an environmental organization, Corredor Biológico. Also, the Ministry of Health is working on possibilities to improve the collection and recycling of chlorpyrifos-treated bags. Of the 5.9 tons of chlorpyrifos-treated bags that are being used, only 1.7 tons are being collected for recycling (Carranza-Ramírez 2012).

Knowledge

Five male producers believe that the way to convince other producers to stop using chlorpyrifos-treated bags is to transfer knowledge. *“You have to explain the problems... what are the problems and for who and why. And explain very well what the alternatives are”*. Although knowledge is important, within behavioural science it is long known that health education only does not lead to behavioural change.

Conclusion producers’ perceptions

Mainly economic uncertainty seems to make the producers critical about alternatives. They have to be sure about an income before they dare to change their way of production. If a harvest would be lost or could not be sold, this would mean a disaster for most producers.

Most producers perceive that using the bags is the only way to comply to the quality criteria and receive a good price.

An alternative on which most producers are very positive is the option of using bags that do not contain chemicals. When combined with a good collection and recycling system this would be a good

option for them. With this alternative it is easiest for them to imagine that it could work like the chlorpyrifos-treated bags.

Apart from the above mentioned uncertainty, producers that have worked with alternative methods are positive about the chances of creating a product that is of good quality. They question however, if the product would sell for a similar price as bagged plantain, because the difference in colour can always be seen. Other barriers are that organic production is perceived as being more time demanding and it takes a longer time for the plants to grow. Also, at the time of research, there were no possibilities to market organic plantain.

7.1.1.2 Intermediaries' perceptions

Buying 'alternative produce'

Especially the fact that “*the colour is completely different*”, seems to be a reason why intermediaries think it is not possible to receive a high price when using alternative production methods.

Half of the intermediaries agree that when the quality of the plantain is good enough (when the colour is clear and the fingers are big enough) one can sell it for the same price as *embolsado*. “*If it is clear/light, it will be paid as bagged*”.

Although in theory half of the intermediaries would buy plantain that is not bagged but looks good, as if it were *embolsado*, none of the intermediaries think it would be possible to reach this quality without using chemicals. The producers' perception that intermediaries will not buy their produce for a good price if they do not use the bags, seems to be correct.

Recycling is the best 'alternative'

Because pollution is seen as the biggest problem caused by the bags, intermediaries mention collection and recycling of the bags as part of the alternative ways of production too. “*It would be possible for us to collect the bags and the fruit at the same time, because the bags are taken off on the side of the road*”.

Two intermediaries mention that the government should help, but they don't have a lot of trust that they will. “*The governments (ADITIBRI and ADITICA) don't worry about this sort of thing. We need a recycling system. Not just for the bags but for all the waste. But they don't care, they only drink chicha [a traditional alcoholic corn brew]*”.

Conclusion intermediaries' perceptions

Since according to the intermediaries the only problem is the environmental pollution, the only alternative worthwhile from their perspective is setting up a good recycling system.

In theory they buy plantain for a good price because of its quality criteria – when the quality is good, the price is higher. However, none of the intermediaries believe that it is possible to obtain this quality without using the bags.

7.1.2 Conclusion work setting

The existing relationship between producers and intermediaries is an important factor in the adoption of alternatives. Producers do not trust intermediaries that they would buy plantain that is produced with non-conventional methods. The intermediaries' perceptions show that the producers are probably right on this point. Losing income would be a disaster for the producers, so without the certainty of a buyer, they are not willing to change their mode of production.

Bags without chemicals seem to be a promising option. They look like the chlorpyrifos-treated bags, and in combination with shadow and micro-organisms a similar quality can be reached (personal communication M. Díaz). Producers have most trust in this option, and intermediaries might not notice the difference.

Also both are positive about improving the recycling system. When the recycling system works well, bags without chemical could form an acceptable alternative.

7.2 The home setting

No perceptions in the home setting were found to add significantly to what has already been described about perceptions on alternatives.

7.3 The community setting

There was not much homogeneity in the perceptions of the different organizations on alternatives. As environmental problems are considered to be the most important problem by most respondents in the community setting, most alternatives or solutions were in lines of setting up a collection and recycling system. Other alternatives that arose were:

Prohibit the use of bags

One of the producers' organizations proposes that the use of the bags should be prohibited. As this would form an economic burden for the producers, according to this organization the price of *corriente* should be raised.

'Organic' bags in combination with recycling

Several respondents name the use of non-treated bags as a possibility, in combination with setting up a good recycling system.

The producers of chemicals are responsible for cleaning up

The representative of the Ministry of Health proposes that the companies that produce and sell the bags are also responsible for collecting and recycling them. According to the respondent a law exists that can oblige chemical producers to do so, only this law is not being acted on. The Ministry of Health could enforce this law, but according to the representative of the Ministry of Health the municipality is responsible for regulating the law.

7.4 Perceptions placed in the four environments

In this paragraph all the above described perceptions are structured according to the ANGELIPU-framework. This structuring leads to see how the perceptions are related to each other and to different environmental types.

Table 9 shows the main conclusions from the perceptions described above, and possible relations between them, structured in the ANGELIPU framework. The circled concepts seem to be central in finding alternatives to chlorpyrifos-treated bags, and are further explained below.

Table 9: main themes of perceptions on alternatives organized in the ANGELIPU framework

| Size mediators categories | | Type | Physical | Economic | Political | Socio-cultural |
|---------------------------------|-----------------------------|--------------|------------------------------------|---|--|---|
| | | Alternatives | Alternatives | Alternatives | Alternatives | |
| Settings (micro) | Work, Home, Community | | Using 'organic' bags | Economic dependency | Lack of governmental support | It is impossible to get the same quality without the bags |
| | | | Collection and recycling system | Uncertainty about income when changing production style | Requisites have to be met for a good price | Intermediaries will not buy the plantain for a good price |
| | | | Organic production costs more time | Law to oblige chemical producers to recycle the bags | Prohibit to use the bags | Alternatives are hard to imagine for respondents |
| | | | | | | Environmental problems are most important |

7.4.1 Physical environment

The use of 'organic' bags and the setting up of a collection and recycling system are placed in the physical environment because both have to be available to be able to use them as an alternative (and the physical environment refers to 'what is available').

From the perspective of both the work and the community setting using organic bags in combination with a good collection and recycling system, would be the most viable solution. The reason why this is the solution that is most supported can be found mainly in the socio-cultural environment: other alternatives are harder to imagine, and environmental problems are perceived to be the most important problem. Further, it is perceived to be impossible to produce plantain that meets the quality criteria without using bags. Therefore the use of an alternative type of bag can be a 'safe' alternative for people.

7.4.2 Economic environment

Because economic considerations form the main motive to use the bags, it makes sense that they also play an important role when discussing alternatives. Because producers are economically dependent of plantain, the insecurity about income that arises when changing production style, will be likely to form the biggest barrier when discussing alternatives.

The income insecurity comes from the perception it is not possible to produce plantain that meets the requisites without using the bags.

7.4.3 Political environment

In the political environment the rules about price requisites come forward again. Also with alternative methods of production, these requisites have to be met to generate enough income.

Also it was mentioned that there is a lack of governmental support for setting up a recycling system. If there is indeed a lack of governmental support it can be difficult to realize solutions such as setting up a recycling system (Carranza-Ramírez 2012), or enforcing laws on the collection of the bags, or prohibit using the bags.

7.4.4 Socio-cultural environment

There are two very important factors at play in the socio-cultural environment: it is perceived to be impossible to obtain a good quality plantain without the bags, and environmental problems are seen to be the most urgent problem.

Both producers and intermediaries perceive that it is impossible to meet all the quality criteria without using the bags. Especially obtaining the same clear colour is thought to be impossible. For the producers therefore alternative methods would mean that they cannot sell their product for a high price. As economic considerations are a central concern, this would mean that alternative methods are not an option for these producers.

The perception that environmental problems are the most urgent problem for most respondents has also been discussed in the previous chapter. In relation to alternatives this perception means that most support can be expected for solutions that tackle environmental problems, such as a collection and recycling system.

7.5 Conclusion

Since economic considerations are central to the problem (the use) they also play a central role in the discussion on alternatives. The main barrier that will have to be faced when trying to diminish the use of chlorpyrifos-treated bags, is that both producers and intermediaries believe that it is impossible to meet the quality criteria without using the bags. If the requisites cannot be met, the economic risk is likely to be too big for the producers. A successful alternative should guarantee a similar level of income as the producers have now. Using a different type of bag (without chemicals) has a chance of success because it is very similar to the current production style.

A second important issue that has also already been discussed in the previous chapter, is that the perceived problem is the environmental pollution caused by the bags, and not the use of the bags itself. From the perspective that the environmental pollution is the only urgent issue, setting up a good collection and recycling system would be a good alternative.

8. Results 4: Lessons for intervention

In this chapter lessons for intervention are described that can be taken from the perceptions of relevant actors and the mechanisms that appeared from the different environments.

Perhaps the most important lesson is that the problem that ‘we as outsiders’ consider to be the problem (the use of chlorpyrifos-treated bags), does not necessarily have to be a problem according to the users and other relevant actors. When wanting to change something it is important to take the community’s problem perception into account (in this case environmental problems).

From both perceptions about the use of the bags and perceptions about alternatives to the bags, it appears that the economic environment of the producers is central in this issue. In Box 5 the most important findings of Chapter 5, 6 and 7 are placed.

Box 5: main findings of Chapter 5, 6 and 7

- The bags are placed by hired workers
- The bags are used because of consumer demand/ a better price is paid
- Producers and hired workers have or see no other options
- It is perceived to be impossible to produce plantain of a good enough quality without using the bags
- The geographical location creates a dependency of the intermediaries
- Health risks are being downplayed
- Both producers and intermediaries mainly see environmental problems
- Poverty and income insecurity form the biggest barrier for change
- The alternatives in which producers have most trust is the ‘organic’ bag and setting up a good collection and recycling system

Looking at factors that influence the use of the bags with the principles of health promotion in mind, it stands out that there is a lack of empowerment among the producers (they feel dependent and without much possibility to change), a lack of equity (people living in the territories have less opportunities and a lower human development rate than the rest of the country) and a lack of sustainability (using pesticides is not a sustainable solution to generate income – health and the environment are affected).

Empowerment, equity and sustainability are important requisites to take into account when promoting health (WHO 1986). Addressing these basic requisites for health is important when thinking about interventions to diminish the use of chlorpyrifos-treated bags in the Bribri and Cabécar Indigenous Territories.

8.1 Points to take into account

Future interventions should take into account the following points.

Most trust in 'organic' bag

Of the alternatives discussed (see Appendix 2) producers who were not yet familiar with alternative forms of production seem to put most trust in the 'organic' or untreated bags. In their perception there has to be something around the plantain to keep insects away and to keep the plantain clean. This type of bag could be a good transition for producers to work with less chemicals. Also by using the untreated bags, that look exactly like the treated bags, the fear of being disadvantaged by intermediaries is not as big.

Giving the good example

Because the risk to change is very big for producers, part of a successful alternative is showing them that the alternative method works at least equally well. When some producers can set the example (like is the intention in the ISA-project on alternatives) and show that they are doing a good job without chemicals, others are more likely to follow. Producers who test alternatives in the project can set an example for other community members. Also, by organizing farmer field schools (workshops in the field in which producers can exchange experiences and learn from each other) can empower producers to start working with alternative methods.

Assuring market options

One of the big worries of producers is that there will not be a market for their products when they produce in an alternative way. A good alternative for them should contain the assurance that there will be a buyer for their product.

Organizations that already have access to organic markets, such as APPTA or UCANEHÜ, could be important actors when identifying possible markets, in collaboration universities or governmental agencies. Another option is to process the plantain into other higher-value products, such as plantain chips. Part of the plantain is converted to chips in San José, but if this could be done by the smallholders themselves they could have larger benefits. COOPETSIÖLA, a producers' cooperative in Amubri, for example, processes chips on small scale. This might be repeated on a larger scale (interview COOPETSIÖLA).

Another option would be diversification of production by growing cacao, plantain and trees for wood production in the same farm (CATIE has proven that this model is very functional) (personal communication M. Díaz).

Organic certification for plantain production

In the territories no organic certification for plantain exists. In banana production, organizations that buy organic banana pay a good price. An opportunity to stop using the bags and other chemical pesticides could be by attracting a company that is interested in buying organic plantain, and by creating certification for organic plantain. This option only has a chance when there is a consumer demand for organic plantain. A barrier can be that an organic farm cannot have neighbouring plots on which chemicals are used. To tackle this problem producers should switch with big groups at the same time (Wilson&Tisdell, 2001).

Working on changing consumers' demand

In the long run something should change at the other side of the chain: the consumers' demand. As long as the consumer asks for clean, clear and cheap plantain, there will be people producing it. When the demand for organic produce grows, the price of the product will also rise. Of course it is not easy to change something at such a level, but it shows that when thinking of ways to improve the working environment inside the territory in the end something has to change on a larger scale too.

Showing the financial picture

From the tests that are run by the ISA Program it appears that there is not a big difference in income when people use alternatives opposed to conventional methods (personal communication M. Díaz). Because most producers perceive that they can earn more money when they use the bags, and this is the most important reason for them to use the bags, it is important to make a financial overview of both conventional and non-conventional methods. This overview should give a clear picture of what are the investments and profits for different methods. Time should also be calculated in the costs, because several producers indicated to see extra time investment as a barrier for organic production. Economic 'lock in', as described in literature (see Chapter 6) should also be taken into account. It is possible that producers cannot afford the investment costs. A possible solution for this problem is to set up a system of micro-credits.

The government could possibly contribute to such a system. However, past experiences of trying to involve the government have shown that this can be very difficult (personal communication B van Wendel de Joode).

Enhancing cultural beliefs – being proud of Bribri and Cabécar traditions

According to Bribri and Cabécar traditions nature should be respected, and therefore the use of chemicals is not in line with these traditions. Emphasizing these traditional beliefs in combination with information about the environmental and health effects of the bags, could perhaps prevent the use of the bags in the communities where up till now hardly any chemicals are used. On the other hand

this may not be a very sustainable solution when underlying issues such as economic dependency are not being tackled.

8.2 Conclusion

The most important lesson is to take into account the perceptions of the relevant actors on what the problems are, before addressing the problem. The most important point to keep in mind when working towards alternative ways is that solutions should always be empowering, sustainable and promoting equity. In intervention strategies it is important to keep in mind that economic considerations are central to the problem and therefore to the solution (assuring market options, showing the financial picture) and that one has to take into account the relevant actors' perceptions (most trust in the 'organic' bags, environmental problems are considered more urgent).

9. Conclusion and discussion

In paragraph 9.1 the research questions are answered. Paragraph 9.2 and 9.3 provide a discussion on the methods and the theoretical framework, respectively. After, in 9.4 is it explored what contribution this research has to solving the problem. Recommendations for further research are made in 9.5.

9.1 Answering the research questions

Sub questions

(1) Why are the bags being used?

(1a) What is the perspective of different relevant actors?

Producers use the bags because of economic considerations – they receive more money per bunch when they use the bags. As their household depends on this income, they cannot take the risk to stop using the bags. Also, they might not experience negative health effects, because they hire other workers to place the bags.

The hired workers place the bags because it is part of their job and they have no other job options.

The intermediaries perceive that the bags are needed because the national market demands the quality that is reached when the bags are used.

(1b) How can their perceptions be explained from a settings perspective?

The economic environment contains the most obvious reasons for the use of the bags (economic dependency). This dependency weighs even stronger because of the direct connection of workplace decisions and household income. Not using the bags mean having less money to support the family.

Underlying factors can be found in the socio-cultural environment (not having other options, downplaying health risks, no-one feeling responsible for the problem) and the political environment (political conflicts of interest, no health and safety regulation being applied).

(2) What are relevant actors' perceptions of alternatives?

(2a) What is the perspective of different relevant actors?

Mainly economic uncertainty makes producers critical of alternatives. By both producers and intermediaries, using chlorpyrifos-treated bags is perceived to be the only way to obtain the quality demanded by the national market.

The alternative that producers would trust most is a type of bag that does not contain chemical, and setting up a good collection and recycling system.

(2b) How can their perceptions be explained from a settings perspective?

Again, the economic environment plays an important role in the perceptions, because changing the production style leads to uncertainty about income. Producers cannot afford to take this risk.

The most important underlying factors can be found in the socio-cultural environment. First, the believe that it is impossible to produce good plantain without using chlorpyrifos-treated bags,

obviously makes producers and intermediaries critical of alternative methods. Second, as environmental problems are concerned to be a more urgent problem, solutions (or alternatives) are sought more along the lines of preventing pollution (recycling).

(3) What lessons can be taken from this for future interventions?

When wanting to address a problem, it is important to take into account what relevant actors see as the main problem.

In finding alternatives, economic considerations are most important to take into account. Also one will have to deal with beliefs about plantain quality and worries about income insecurity.

Main research question

How can the continuous use of chlorpyrifos-treated bags in plantain production in the Bribri and Cabécar Indigenous Territories of Talamanca Costa Rica be explained, taking into account the perspective of the users and relevant other actors, and their embedding in a specific environment?

The continuous use of chlorpyrifos-treated bags in plantain production in the Bribri and Cabécar Indigenous Territories can be explained through economic factors (poverty, dependency), that are kept in place by factors within the physical (e.g. geographical location), political (e.g. conflicting interests at the political level, power of intermediaries, requisites set by the national market) and socio-cultural environment (e.g. not having/seeing other option, being disempowered, not perceiving the use of the bags as a problem).

Economic factors are the main motivation for producers to use chlorpyrifos-treated bags, as they receive more money at the moment of sale for bunches on which the bags has been used. Behind this price difference lie several quality criteria that are applied by the intermediaries. According to the intermediaries the quality criteria and the price depend upon the national market. This implies that the bags are being used because there is a consumer demand for plantain with high quality criteria.

Producers seem to be caught in this system of using the bags because they do not have the economic means to change their mode of production, and cannot take the risk to lose their household income if they would want to change their mode of production.

Health issues related to the use of chlorpyrifos-treated bags seem to be downgraded by both producers and intermediaries. This can partly be explained by neither of them having much direct contact with the bags (mostly workers are hired to put up the bags). Also, for both producers and hired workers downplaying health issues can be explained by the fact that they do not have much choice but to use the bags, and that there are more pressuring needs (income, food) that ask their attention. In addition to

this, producers see little alternative, because they perceive that the demanded quality criteria can only be reached by using chlorpyrifos-treated bags.

An important remark that has to be made regarding diminishing the use of chlorpyrifos-treated bags, is that the local actors do not identify the same problems as do researchers working in the field. Where researchers have two main worries, namely health effects and environmental effects, the only problem with chlorpyrifos-treated bags really recognized by both producers and intermediaries, is the environmental pollution they cause. The solution to this problem, according to both producers and intermediaries, is better collection and recycling of the bags. From their problem perspective diminishing the use of the bags is not an issue, if the bags can be collected and recycled.

The use of chlorpyrifos-treated bags could go down if there were appropriate alternatives to be offered. Producers are critical about options for alternatives because they are not familiar with these alternatives and cannot afford to take financial risk, as stated above. Also they do not trust intermediaries to buy alternative produce for a good price.

Other alternatives, such as exploring different markets could be an outcome. When exploring other alternatives however, it is important to take into account that producers will probably only change their method of production when there is no risk of losing income.

Intermediaries do not feel as if they have a stake in alternative modes of production. In theory they would buy the plantain for a good price if the quality is good.

Looking at the mechanisms behind the use of the bags with the principles of health promotion in mind, it stands out that there is a lack of empowerment among the producers (they feel dependent and without much possibility to change), a lack of equity (people living in the territory have less opportunities and a lower human development rate than the rest of the country) and a lack of sustainability (using pesticides is not a sustainable solution to generate income – health and the environment are affected). Empowerment, equity and sustainability are important requisites to take into account when promoting health (WHO 1986). Addressing these basic requisites for health is important when thinking about interventions to diminish the use of chlorpyrifos-treated bags in the Bribri and Cabécar Indigenous Territories.

The settings approach states that every setting should health promoting (WHO 1986). The different settings that have been a part of this research do not appear to be health promoting. A main reason for this is that (at least) one of the basic requisites for health is missing: (stable) income.

Also the society (represented by the government) takes decisions that are not in favour of health (conflicting interests on the political level). Further, the producers and hired workers do not have control over their own living conditions. Because a basic life requisite (having enough income to

provide for themselves and their family) is at stake, they do not have the freedom to make healthy choices.

9.2 Discussion on the methods

The used research methods are appropriate for an explorative research. The interview topic lists could have been more elaborate if the theoretical framework had been adopted in an earlier stage (see discussion on the theoretical framework, 9.4). The combination of interviews, literature study and observation make the methods strong, because it allows for triangulation of information. A point of critique in the interviews is that they were conducted in the third language of the researcher and that the language skills have developed profoundly during the time of data collection. This allowed for more extensive and deep interviews in the final weeks of data collection compared to the first weeks.

It is possible that due to the limited language skills at the start of the research some information has been missed. The interpretation of the obtained data however is believed to be correct, because in all interviews the researcher repeated main conclusions in other words to make sure the information was well-understood. Also information obtained in early interviews was later checked in subsequent interviews. Another way in which information may have been missed is that the researcher was obviously foreign by appearance, so that even after five months of being in the field it was not possible to completely blend in and be 'invisible'. Respondents may have withheld information because the researcher was not 'one of them'. On the other hand, respondents may not have seen much danger in sharing their stories with the researcher, because she was not part of the community.

9.3 Discussion on the theoretical framework

As described in the methods chapter, the theoretical framework was adopted after data collection. Although this is not the ideal structure for research, the theoretical framework has proven to be very useful in organizing the collected data. To organize the data a new framework was developed, the ANGELIPU framework.

In my opinion this framework is useful to explore the context of problems related to pesticide use. It would be even more useful when used at the time of data collection to locate important actors and to develop topic and observation checklists. For example elements in the physical environment could have been observed in a more structural fashion, and more relevant actors in the home and community could have been included. This would have given a more complete picture of the context of the problem.

The used theory was appropriate for the explorative character of this study. However, what misses is that the theory does not provide explanations, but only shows structures and connections.

The nature of the settings approach also contains a limitation. It tries to dissect a complex situation in less complex pieces, to better understand the complexity of the system. However, in reality these

‘pieces’ not separated, and this forms a problem when trying to use such a framework in real life situations. The created boundaries are artificial or forced. This can make the organization of the data complicated: what goes where? On the other hand, this struggle clarifies exactly where the connection and complexities in a system lie, making the settings approach a very useful approach to better understand the context of a problem.

9.4 Contribution of the research to the solution of the problem

This research elaborates on prior research by Barraza et al. (2011) and Polidoro et al. (2008). Taking into account different environments and settings in exploring reasons for the use of chlorpyrifos-treated bags, and perceptions of alternatives, has not been done before in any research that I am familiar with. This approach puts actors’ perceptions in a different perspective and provides a more nuanced view on why chlorpyrifos-treated bags are being used. This research can be used to explore possibilities for intervention on diminishing the use of chlorpyrifos-treated bags and the introduction of alternatives.

9.5 Recommendations for further research

This research suggests that economic considerations are the most important motive for the use of the bags. It would be useful to gain more insight in the trading process, the role and power of intermediaries therein, the devaluation of the product and what exactly happens with the plantain in the national market.

Also, this research has suggested that the chlorpyrifos-treated bags are mostly placed by hired workers instead of by the producers themselves. Since only two hired workers have been interviewed in this research, further research could contribute in creating a clearer picture of who the hired workers are and what is their exposure and health risk. Also, it would be valuable to gain more insight in how many producers hire labourers to place the bags. As the sample of this research was relatively small, there is a possibility that the sample happened to contain producers that hire workers, but that this is not the case for all producers. If the majority of the producers would hire labourers to place the bags this would be a new development since 2007 (personal communication B. van Wendel de Joode).

One of the possible alternatives is searching for alternative market. To explore possibilities to commercialize plantain in alternative market, a market research is needed.

In this research the focus has mainly been on ‘where it goes wrong’. However, there are also still many producers that do not use the bags. It would be interesting to get more insight in their background and motives to why they do not use the bags, and how they then generate enough income. These ‘positive deviances’ can provide valuable insight in how ‘the healthy choice’ can be made the easier choice.

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Appendices

- Appendix 1 - Interview topic lists
- A: Producers
 - B: Intermediaries
 - C: Hired workers
 - D: Non-governmental organizations
 - E: Governmental organizations
- Appendix 2 - Table of alternatives

Appendix 1: Interview topic lists

In this appendix the used topic lists for (A) the producers, (B) the intermediaries, (C) hired workers and (D) organizations are presented. The original topic lists were in Spanish. Here, a translation in English is given.

A: Producers

Introduction

Excuse me sir/madam, would you have a moment to talk with me? I am a student from the agricultural university in Holland and I'm doing an internship in the National University of Costa Rica. I am interested in the use of the blue bags that are used in plantain production. I am doing a research to better understand why the bags are being used.

Starting questions

Name

Telephone number

Age

Community

Children?

Use

- Do you use the blue bags for you plantain? Why (not?)
- According to you, are there any problems with the blue bags?
- Do you use other chemicals?

Intermediaries

- To who do you sell your plantain? To intermediaries?
- How much do you receive for a bunch now?
- There are producers that say that the intermediaries form a problem.. what is your opinion?

Effects of the bags

- Do you think the bags can have some effect on your health?
- What could you do to have less risk?

Alternatives

- What would be a solution for the problems with the bags?
- Do you think the problems are different for men than for women?

- Do you think it would be possible to grow plantain without chemicals? And still earn enough? Why do people not do this?
- Are there other practices or ways to combat plagues without using chemicals?
- Show folder with alternatives – what is your opinion on these alternatives?

Roles men/women

- I haven't seen many women work in the fincas. Are there more men that work in plantain?
- I hear that traditionally women own the soil? Is that true?
- In your plantation, who makes the decisions about the use of chemicals?

Do you know other plantain producers that I can interview?

B: Intermediaries

Introduction

Excuse me sir/madam, would you have a moment to talk with me? I am a student from the agricultural university in Holland and I'm doing an internship in the National University of Costa Rica. I am interested in the use of the blue bags that are used in plantain production. I am doing a research to better understand why the bags are being used.

Starting questions

- Do you buy and sell plantain?
- Since when do you do this?
- Do you have your own truck?

Buying

- From who do you buy? (producer/gatherer/other intermediary) Do you always buy of the same people? Do you have agreements with them? Could you explain me more about how you do this?
- Where do you go to buy?
- When you buy? Do you have fixed days?
- How many bunches do you buy each time?
- How many times per week do you buy plantain?
- How do you buy the product? Per bunch, box, finger, bags, weight?
- Can you explain what requisites you have for the buying?
- How much are the bunches/boxes etc worth?
- How do you set the price for the plantain?

Selling

- To who and where do you sell the plantain? Always to the same people?
- When do you sell it? Do you have fixed days?
- How do you sell it? Bunch/box/bag/finger/weight...?
- How many bunches/bags/boxes/kilos do you sell each time?
- How many times a week do you sell?
- What are the requisites for the market? Can you explain how this works?

The bags

- Why do the producers use the bags?
- Where do they buy the bags?
- Does the price you give for the plantain depend on the use of the bags? How/Why?
- Do you sell the bags?
- I have heard that the producers must use the bags to receive a good price... What do you think about this? Why must they use it?
- Are there any problems with the bags? Do you think they have some sort of effect? (on nature/on health?)

Intermediaries

- How many intermediaries are there in the territory?
- Do you meet with each other? Do you have agreements/ an organization with different roles? How do you make decisions? Do you work independently?
- How do you decide where to go to buy plantain?
- Are there agreements about the buying and selling between intermediaries?
- Are there any problems regarding the buying/selling/your job?
- What do you think about the other intermediaries? How do they work? How is the competition? Do they have the same way of working?

Alternatives

- If there would be alternatives to create a good quality for the plantain, what would be the requisites for the quality?
- On what does the price depend? (quality/bag?)
- Is it necessary to use the blue bag? Or if there would be an alternatives that would give the same quality, could you also buy them as if it where embolsado?
- What do you think other intermediaries would do? On what does their price depend?

- There are people that say that they have to use the bags, and others that the price only depends on the quality...?
- What would be possibilities to change?

C: Hired workers

Introduction

Excuse me sir/madam, would you have a moment to talk with me? I am a student from the agricultural university in Holland and I'm doing an internship in the National University of Costa Rica. I am interested in the use of the blue bags that are used in plantain production. I am doing a research to better understand why the bags are being used.

Starting questions

Name

Age

Community

The job

- Can you explain to me what you do in your job? Do you place bags in your job? Do you only place bags or also do other things?
- On who's plantation? For how many producers do you work?
- How are you being paid? Contract/hour/bag?
- How many bags can you place per dag/week?
- Do you have other work besides this job?
- Why do you do this job? Would it be possible for you to do another job?
- Do you have plantain yourself?

Problems with the bags

- Have you ever experienced problems with the bags?
- Have you experienced effects on your health because of the bags?
- Do you think that there could be health effects?

Other people with this job

- Can you tell me about other people who do this work? What is their age? Men and women? Etc.

Alternatives

- Show materials alternatives – what do you think about these alternatives? Could you change something about working with these bags?

D: Non-governmental organizations

Introduction

Thank you very much for making time for this interview. I am a student from the agricultural university in Holland and I'm doing an internship in the National University of Costa Rica. I am interested in the use of the blue bags that are used in plantain production. I am doing a research to better understand why the bags are being used.

The organization

- Is there any written information about your organization that you could provide?
- Could you explain to me what your organization does?
- What is the mission of your organization?
- How do you try to reach this goal?
- Are there any problems regarding your organization of the objective? Why? How could that be changed?
- Since when do you work here?
- How many people are part of your organization?
- Are there any rules that apply to the members?

The bags

- Why do producers use the bags? Are there other options?
- Where do they buy the bags? (where do the bags come from?)
- What types of bags do you know? Are there any types that do not contain chemicals?
- According to you, what are the problems with the bags? Why?
- Why has the use of the bags not changed up till now?

Collection of the bags

- Who collects the bags? Where are the bags being collected? Of how many producers are the bags being collected?
- Why are not all the bags being collected?
- Is there a fixed day of collection?
- Where are the bags being transported? What is done with the collected bags?

Changes/solutions

- What do you think would be a solution for the problems with the bags? Why? How could it be done?
- According to you, who can make the change happen? Why?
- What do the ministries do about these problems?

E: Governmental organizations

Introduction

Thank you very much for making time for this interview. I am a student from the agricultural university in Holland and I'm doing an internship in the National University of Costa Rica. I work with the IRET and Melvin Díaz. I am interested in the use of the blue bags that are used in plantain production. I am doing a research to better understand why the bags are being used.

Organization

- Could you provide me with written information about:
 - o The structure of your ministry
 - o Do you have an organogram?
 - o How is this ministry related to other ministries/organizations or people?
- What are the responsibilities and interests of this ministry?

Bags

- What do you know about the blue bags? (chemical/chlorpyrifos/how many are being used in the territory?)
- What advantages do the bags have according to you?
- What disadvantages/problems?
- There are people that say that the bags cause problems. What do you think about that? What problems could they cause according to you?
- What would be a solution to those problems according to you?

Alternatives

- Would it be possible to elevate the price of organic plantain?
- Are you familiar with the IRET project in which alternatives are being tested? What do you know about alternatives? Is it useful?
- Do you think it would be possible to change to a production without chemicals? How/why not?

- Would it be possible to change the use of the chlorpyrifos-treated bags? On what does that depend? Which factors are important? Who can facilitate the change? Who has the responsibility?
- What can your ministry do?

Appendix 2 – table of alternatives

Agro-ecological alternatives to chemical pesticides that are being tested by the Infants' Health Project (ISA) (IRET-UNA n.d.-b)

| | Problem | Plantation using chemical | Without chemicals: cultural practice | Without chemicals: Organic product |
|----------|---------------------------------|---|---|--|
| 1 | Red stains on roots (nematodes) | Vydate (oxamil) Counter (Terbufus) | Applying surplus harvest to the ground, excrements of animals such as pigs or cows | Efficient microorganisms (EM, ACmicro, Nemaüt) |
| 2 | Tunnels in the seed (Picudo) | Counter (Terbufus) | Using traps with pieces of pseudo-stem | Using plastic boxes with pheromones |
| 3 | Black Sigatoka | Mancozeb, dithane (dithiocarbamatos), Calixin | Using shade, preferably of pulses They cut and heal the damaged leaves | Using foliar fertilizer and microorganisms (Activa and EM or ACmicro). |
| 4 | Stains on the fruits peel | Chlorpyrifos-treated plastic bags | Using shade, preferably of pulses | Using recyclable or biodegradable bags Using foliar fertilizer and micro-organisms (Activa and EM or ACmicro). |
| 5 | Weeds (bad herbs) | Gramoxone (Paraquat), Round up (Glifosato) | Using shade, preferably of pulses Using plants covering plants ('oreje de ratón') Clearing the land with machete or scythe. | Using organic herbicide bases on lemon seeds |
| 6 | Fertilizers | Phosphorus (10-30-10), nitrogen (ureá, nutran), Potassium (15-3-31) | Using shade by pulses to complement the nutritional cycle | Using grinded rocks (Phosphoric rocks), using organic fertilizers (compost, 'bocashi') and using foliar fertilizers (Activa) |

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