

# PREVENTION WITHOUT BORDERS

SUSTAINABLE  
FOOD SAFETY:  
FROM FARM  
TO FORK TO WOMB

## PRIMARY PRODUCTION

AN INSIGHT INTO  
MALIAN ZOOTECHNY  
FOR SUSTAINABLE  
INTERVENTION FOR  
PRIMARY PRODUCTION  
OF FRESH MILK

## KITCHEN TOXICOLOGY

THE "HIDDEN"  
BURDEN OF  
STREET FOODS

## DIET

SUSTAINABLE FOOD  
SAFETY: A "CONSUMER  
SAFARI" IN SENEGAL

## HIGH RISK SCENARIOS

GENDER TARGETED  
PREVENTION AND  
FEMALE AGRICULTURAL  
WORK IN DEVELOPING  
COUNTRIES: HINTS FOR  
DISCUSSION

## AWARENESS RAISING

PUBLIC HEALTH  
INFORMATION AND  
COMMUNICATION IN  
CAMEROON:  
A DIAGNOSTIC OF THE  
SITUATION

## NEWSBOX

EDES PROGRAMME:  
STRENGTHENING FOOD  
SAFETY SYSTEMS IN  
AFRIQUE CARRIBEAN  
AND THE PACIFIC  
COUNTRIES

THE 2013  
CONFERENCE OF  
THE WEST AFRICAN  
SOCIETY OF  
TOXICOLOGY



***First Editor***

Chiara Frazzoli

***Editorial Board***

Alberto Mantovani  
Orish Ebere Orisakwe  
Elie Fokou  
Ilaria Proietti  
Guy Bertrand Pouokam

***Graphic Designer***

Giovanna Monfeli

***Contact***

[journal@noodlesonlus.org](mailto:journal@noodlesonlus.org)

Cover photo by Chiara Frazzoli for NOODLES © Cameroon, 2010.  
Photos in this collection are drawn from the NOODLES photo gallery  
<http://www.noodlesonlus.org/gallery/photo-gallery.html>.





# PREVENTION WITHOUT BORDERS

SUSTAINABLE  
FOOD SAFETY:  
FROM FARM  
TO FORK TO WOMB



# INTRODUCTION

Networking provides a strong driver in promoting multidisciplinary interaction, creative participation and community formation around health and prevention issues. “Prevention without borders. Sustainable food safety: from farm to fork to womb” is the collection of booklets elaborated by the Network “Nutrition & food safety and wholesomeness. Prevention, education and research”, or NOODLES for short.

The Network joins multidisciplinary competencies crosscutting public institutions, universities, scientific societies and networks, women’ organizations, professional organizations, producers’ organizations, and informal and formal education, and intends to contribute bridging the international scientific gap between countries that historically have had minimal scientific contact in the field of food safety and risk analysis.

Risk analysis integrates the components of risk assessment, risk management and risk communication: its development needs proactive role of local communities in shaping information, especially when the continent’s problems are looked out of context. The collection serves the Network as tool for scientific dissemination linking societal and scientific components of the Network: networking can greatly help in exploiting human, cultural and resources to generate new knowledge and understand risk scenarios towards the translation of global knowledge into local proactive knowledge and policy.

Trough horizontal and vertical cooperation, the Network promotes a “social toxicology” based on the proactive capability of local communities to widen the field of international cooperation towards the prevention early in life of chronic multifactorial diseases. In particular, the Network NOODLES has the mission of promoting nutrition and food safety and wholesomeness by protecting and promoting local food chains and food sovereignty. NOODLES pivots around the core concept of Sustainable Food Safety, i.e. the complex of actions intended to minimize adverse health impact on future generation associated to today’s safety of foods and nutritional quality of diet: the sanitary objective of NOODLES is the mitigation of infant morbidity and mortality, the increase of healthy life expectancy in children and adults as well as the achievement of the Millennium Development Goals.

This first booklet is the kick-off of the collection “Prevention without Borders. Sustainable food safety: from farm to fork to womb”, as the natural outcome of five years of cooperation experience among different societal and scientific components of the Network.

The collection publishes papers that are judged, after editorial review, to support research in its attempts to improve risk analyses and science-society dialogue. The Editorial Board will launch the invitation to present papers for each booklet intended to be published and will determine the suitability of manuscripts for publication; manuscripts are usually 3000 words long.

The collection is published in electronic form; besides full-length contributions, it includes news about activities and publications on issues related to prevention without borders from farm to fork. The collection issues will deal with five main areas: primary production, kitchen toxicology, diet, high risk scenarios, and awareness raising. The contributions may be short reviews, stage reports, mission reports, field activities, opinions, and focus articles.

Reports based on alternative materials like photos in data poor countries are appreciated, as they are intended to generate information on real-life scenarios for risk analysis. Indeed, supporting the visibility of real-life exposure scenarios and role of neglected research are the specific purpose of the Prevention Without Borders collection.



# CONTENTS

## **PRIMARY PRODUCTION**

STAGE REPORT

**AN INSIGHT INTO MALIAN ZOOTECNY FOR SUSTAINABLE INTERVENTION  
FOR PRIMARY PRODUCTION OF FRESH MILK**

by RACHEL CHANG

**06**

## **KITCHEN TOXICOLOGY**

OPINION

**THE “HIDDEN” BURDEN OF STREET FOODS**

by ILARIA PROIETTI

**18**

## **DIET**

MISSION REPORT

**SUSTAINABLE FOOD SAFETY: A “CONSUMER SAFARI” IN SENEGAL**

by CHIARA FRAZZOLI

**28**

## **HIGH RISK SCENARIOS**

SHORT REVIEW

**GENDER TARGETED PREVENTION AND FEMALE AGRICULTURAL WORK  
IN DEVELOPING COUNTRIES: HINTS FOR DISCUSSION**

by RAMONA CIPOLLA

**38**

## **AWARENESS RAISING**

FIELD ACTIVITY

**PUBLIC HEALTH INFORMATION AND COMMUNICATION IN CAMEROON:  
A DIAGNOSTIC OF THE SITUATION**

by GUY BERTRAND POUOKAM

**48**

## **NEWSBOX**

**EDES PROGRAMME: STRENGTHENING FOOD SAFETY SYSTEMS IN AFRIQUE CARRIBEAN  
AND THE PACIFIC COUNTRIES**

by GUY BERTRAND POUOKAM

**58**

**58**

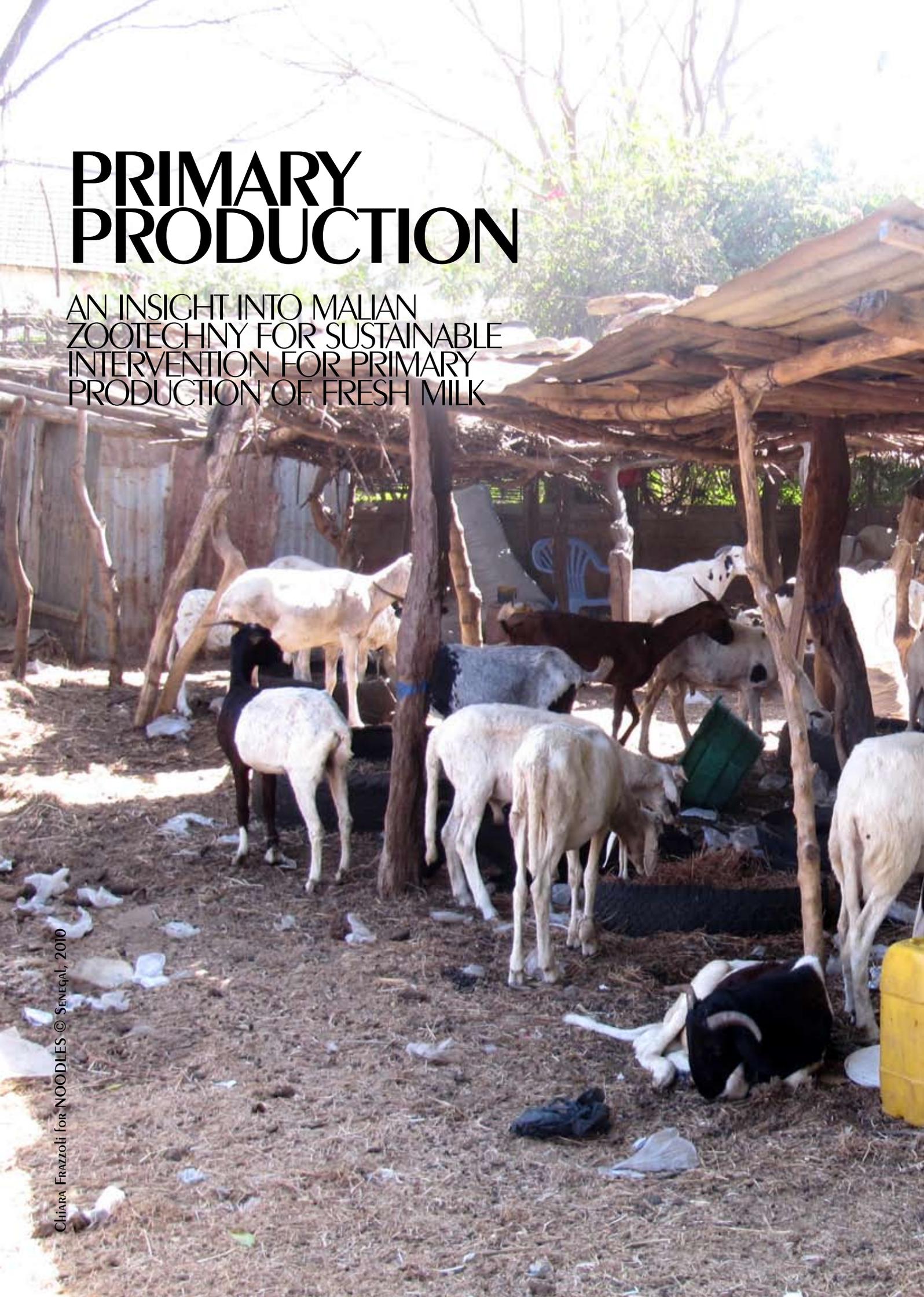
**THE 2013 CONFERENCE OF THE WEST AFRICAN SOCIETY OF TOXICOLOGY**

by ORISH EBERE ORISAKWE

**60**

# PRIMARY PRODUCTION

AN INSIGHT INTO MALIAN ZOOTECHNY FOR SUSTAINABLE INTERVENTION FOR PRIMARY PRODUCTION OF FRESH MILK





# AN INSIGHT INTO MALIAN ZOOTECNY FOR SUSTAINABLE INTERVENTION FOR PRIMARY PRODUCTION OF FRESH MILK



## STAGE REPORT

by RACHEL CHANG

RACHEL.CHENG@NOODLESONLUS.ORG

*PhD student in Vegetal Biochemistry at the Tuscia University and the Istituto Superiore di Sanità, Rome, Italy.*

## UN APPROFONDIMENTO SULLA ZOOTECNIA DEL MALI PER UN INTERVENTO SOSTENIBILE PER LA PRODUZIONE PRIMARIA DI LATTE FRESCO

*Il presente lavoro ha esaminato il sistema di allevamento di bestiame in Mali. A tale proposito, sono state esaminate le questioni cruciali relative al settore dell'allevamento e della produzione lattiera, con una particolare attenzione alla produzione di latte fresco. E' stato inoltre esaminato il sistema di controllo della filiera alimentare in Mali e, allo stesso tempo, è stata analizzata la Sicurezza Alimentare (intesa come Food Security), relativa alla produzione animale, nelle sue quattro dimensioni: disponibilità alimentare, accesso al cibo, stabilità produttiva e utilizzo del cibo. Sono stati quindi identificati i diversi scenari della filiera del latte ed è stato utilizzato l'approccio HACCP per identificare le potenziali fonti di contaminazione da sostanze tossiche. L'obiettivo finale è stato l'individuazione degli aspetti rilevanti per l'empowerment della sicurezza alimentare, dalla produzione primaria al consumatore finale.*

**SUMMARY:** This paper investigated the livestock systems which exist in Mali. It looked at the critical issues related to livestock sectors as well as dairy production, with a particular focus on fresh milk production. Investigation was also done on the food control system in Mali, meanwhile, Food Security related to animal production was analysed in four dimensions: food availability, food access, food stability and food utilisation. Different scenarios of milk chain were thus identified and HACCP approach was used to identify potential sources of toxicants contaminations. The final purpose is the detection of significant aspects of food safety (both chemical and microbiological) empowerment along the milk chain, from primary production to consumption.

## 1 RATIONALE

Mali, with a population of 14 million habitants, situates west of Africa with neighbouring countries: Algeria up North, Mauritania North-West, Niger and Burkina Faso East and Senegal, Guinea and Cote d'Ivoire down South (Figure 1. map of Mali). Mali has a Human Development Index<sup>1</sup> 0.359 which ranks 175 out of 187 countries and its GNI per capita in purchasing power

parity (PPP) terms is U.S.\$1,123 together giving it a position in the low human development category (Human Development Report 2011 & Mali Country Profile: Human Development Indicators). Not only Mali has a low Human Development index but also a high Gender Inequality Index of 0.712.

According to USA Department of State, Mali's 70% of

## Acknowledgements

*This article is part of internship work done in collaboration of Noodles. ONLUS and the Master of Human Development and Food Security at Università degli Studi Roma Tre (2011 cycle), with material supports from the Italian Breeders Association (AIA).*

labour force is engaged in agricultural activities which include producing commodities, keeping livestock and fishing. These activities give the country a total of 33% of gross domestic product (GDP \$9 billion estimated in 2010) which is around \$2.97 billion in 2010 (USA Department of State); cotton, gold and livestock alone give a staggering export earnings of 80 to 90%. Its main source of livestock includes cattle, sheep and goats in number of millions as well as chicken (FAO Livestock Brief).

Keeping livestock is an important source of income, yet the livestock systems/ activities from the North and the South of Mali are very different which are summarised by FAO Mali Country Report. On a whole, North of Mali has a difficult time to keep the animals healthy or

even alive due to constant seasonal droughts or floods. The livestock activities are usually less controlled in the North, activities include self-sustained pasturing while the Southern part has a more organized way to manage livestock in farms for commercial meat as well as milk production.

Looking closely at the productions of livestock products, milk production seems to have a great potential to be improved drastically within the country since milk powder is imported from abroad to make reconstituted milk due to insufficient production within the country. The amount of milk powder imported by Mali costs between 10 to 15 billion CFS Francs (around 1.5 to 2.2 million euros) each year according to Mali Ministère de L'Elevage et de La Peche (2008).

<sup>1</sup> HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living (Human Development Report 2011)



>> Map of Mali

## 2 TYPES OF LIVESTOCK SYSTEM AND CONCERNED AREAS OF THE COUNTRY

FAO stated that rural land use is agro-pastoral which is based on livestock and crop production. Different herding systems are found within the country; the type of activities the herders do depend on the weather and the nature of the land.

FAO Mali Country Profile listed different system in different geographic areas:

**a.** In the sub-desert zones in the north of the country, Nomadic Stock Rearing is practiced and this includes free movements of the herds without any limits of where to feed the animals. Meat, milk and wool are produced from cattle, Sahelian sheep, goats and camels but with limited production for self-consumption.

**b.** Internal Delta of the Niger, people practice Transhumant Stock Rearing which is related to the rainfall the flooding season of the year. Herders move the animals back and forth between pastoral territories which is particular found in Sahel and different practices are found: garti formed by large herds which undertook transhumance under a chief herder; benti composed of milking cattle and young calves which remained close to the villages but made a small transhumance (the action of moving livestock from one grazing place to another one with a seasonal cycle); dumti composed of a small dairy herds to assure the food supply of those who remained in the village (women, children and the elderly).

**c.** Northern fringe of the Sahelian zone, Livestock-Dominated Sub-system is found where irregular rainfall cannot guarantee crop production but with availability of forage for animal feeding. Animals do not obtain a lot of care and the system is poorly integrated with crop production. Herders cultivate bottom land in rainy seasons. Animals provide meat and milk for domestic use and act as a saving for the local people.

Other farming systems which dominate in the South of Mali:

**d.** Crop Dominated Sub-System. This is a sedentary system with the emphasis on agriculture. Some settled-down herders who have become farmers practice a minor transhumance of short duration. Animals are integrated into the agricultural production as a means of work (work oxen) and of dung. This system is highly developed in areas of cash crop production (cotton zone) and of agriculture which is becoming intensified (zone of cotton and rice production, zones with strong technical support inputs). The livestock have constant care (health care, shelters, feeding) and participate increasingly in agricultural production supplying dung, draught and marketable products (milk, fattened stock). Relatively there is plenty of

feed resources stock, therefore movements are short. The productivity of the stock is not very high and attempts are being made to improve it (FAO Mali Country Profile).

**e.** Commercial Production Systems. The improvement of livestock production not only aims at increasing output for the domestic consumption of stock-rearers, but also to provide a marketable surplus. Commercial production systems are therefore in two main fields, milk production and fattening (FAO Mali Country Profile):

**1-Milk.** To increase their milk production some agro-pastoralists have begun to select the best milkers of their herd in order to improve their feeding. The improvement in feeding by the use of cultivated forage, cotton cake, molasses, treated straw and cotton seed or concentrates has made it possible to raise milk production from zero to 3 to 5 litres per day during the dry season in some farms of the cotton zone. Their milk is sold to small dairies which have set themselves up in some urban centres. Producers, attracted by the income are now turning to genetic improvement through artificial insemination to increase their milk production. This strategy is adopted by some stock owners in the CMDT (La Compagnie Malienne pour le Développement des Textiles) zone of Koutiala and Sikasso and by others in Mopti and Ségou. Milk production has become the dominant activity of urban and peri-urban livestock keeping and these have a number of stock of improved breeds. Peak productions of 20 litres per day have been achieved by farmers in the peri-urban zone of Bamako.

**2-Fattening.** This is less developed than milk production. It is done by a few stock-owners in peri-urban areas and some agro-pastoralists in the rural areas. USAID's study for Eager policy brief identified that fattening enterprises buy cattle or sheep from the north and feed them intensely for weight gained, then the animals are resold with higher prices. The animals are essentially cattle in peri-urban areas and sheep (for Tabaski) or cull cattle (sterile cattle, work oxen or other males at the end of their useful life) in rural areas.

From the geographic activities mentioned above, central Mali (Sahelian zone) as well as the northern sub-desert part of the country is considered to be areas where food deficit and crisis vulnerability exist because of the irregular rainfall with natural resource degradation (IFAD CSOP). Deforestation and desertification are common environmental degradation found in these areas makes pasturing extremely difficult (OXFAM Mali Country Report).

## 3 ROLE OF LIVESTOCK IN FOOD SECURITY IN MALI

The animal population of the country was estimated at 8.141 million of cattle, 9.761 million of sheep, 13.593 million of goats, 0.852 million of camels, 0.35 million of horses, 0.8 million of donkeys, 0.071 million of pigs and 30 million of poultry in 2007 (Mali Ministère de L'Élevage et de La Pêche, 2008).

Mali runs a chronic trade deficit, as livestock related production exports cover only about half of the imports. The country has been a major exporter of cattle and small ruminants in the past e.g. Cote d'Ivoire, Ghana for the live cattle export (FAO livestock sector brief, 2005). Overall milk production is not enough for the consumption within the country and its net import as a percentage of consumption is high over the years from 1980 to 2002: 4.45% in 1980, 13.78% in 1990, 11.88% in 2000 and 6.80% in 2002 while net exports as percentage of production is 0 in all these years.

### 3.1 FOOD AVAILABILITY

Depends on the type of livestock systems practice mentioned above, the role of livestock can either be subsistence or for export particularly with dairy products such as milk and meat producing from fattening. Recently, due to consistent drought situation, Mali is struggling to keep their own animals alive not mentioning livestock export to their export partners. Due to scarcity of feed and grazing land, livestock dies of hunger or even thirst in dry season and droughts (OXFAM International). Dying of animals meaning less regular income for the owners from milking and processed dairy products, also no animal bartering. Therefore, less source of food available for the people.

### 3.2 ACCESS TO FOOD

According to FAO's Mali country profile, classical farms do not exist while all the land and resources are exploited by the people with greater power. Two problems of the herding practices are identified: social and socio-economic problems. Social problems include land tenure among the Malians, different social classes have different ability to obtain land and hence access to grow food. Aspirations for land by certain groups (young households and the landless) within a social group also causes disputes which lead to disruption of the extended family and the fragmentation of holdings (FAO Mali Country Profile). Socio-economic problems for rural development is that people do not have security of their own land tenure. Most of them do not own their own land and makes it difficult to have long term investment. Hence, people only use the land for subsistence farming or production which gives them immediate

returns. Therefore there is hardly any surpluses with very small sized-farms available for Malians.

Land grabbing in Mali is threatening small farmers not being able to own the land and instead land is sold to foreign investors and they end up working for the foreign industrial agriculture producers (IRIN, 2009).

### 3.3 FOOD PRODUCTION STABILITY

Stability of livestock productions seems to be very fluctuating because of the problems of land tenure including land grabbing, extreme weather conditions and social and socio-economic problems mentioned above in the type of livestock system section.

### 3.4 UTILISATION

This term means how people use the food to obtain the energy and nutrients in from the food, including storage, preparation and diversity of diet and intra-household distribution of food etc.(FAO, 2008). In terms of milk, it is found that FAO has done researches to improve the ability to consume nutritious milk in Mali by adding an appropriate amount of thiocyanate and hydrogen peroxide, the LP-s can be reactivated in raw milk to inhibit bacterial growth (FAO Lactoperoxidase). This in theory to allow milk to be kept without spoiling at ambient temperature. This might help with the process of transportation to collective centres before to be processed and still keep the good nutrient contents for the final consumers.

## 4 CRITICAL ISSUES FOR THE LIVESTOCK SECTOR

Mali experienced two big droughts during 1972-1974 as well as 1983-1985; according to USA department of State, 40% of the herd was lost during the first drought mentioned above and animals are not expected to be recovered as the pre-drought level. Activities are shifting geographically from the north of the country to the south due to the consequences of the droughts happened in the 70s and 80s. Other constraints include bad weather, natural disasters, locust infestations and environmental degradation etc (WFP). Mali is in the Sahel area and the climate in the Sahel changes between extreme heat and more temperate conditions. Between May and October, rainfall happens and the growing season gets underway.

For the dry season, the landscape comprises rocks, sandy plains of bushes, grass and stunted trees (IRIN, 2008).

IRIN (2008) also stated that rainfall is a problem when it does happen or it does not. When it happens flooding is a major problem which destroys plantation for herding feed or even washes away the entire villages. According to IFAD, CSOP is targeting small agropastoralists, farmers and breeders in the Sahelian belt and the northern regions because they are vulnerable with climate change, exploited natural resources, limited social services as well as poor people organisation.

IMF PRSP is also in line with IFAD targeting to improve agricultural infrastructure which is lacking at the moment in the sector. i.e. Water control; access to equipment and input e.g. draughts and animal feed; access to finance for herders and opening up rural markets and production areas etc.

## 5 MILK CONSUMPTION AND MILK MARKET

According to Mali Ministere de L'Elevage et de La Peche (2008), local raw milk production is insufficient, milk powder is imported instead. Mali spends each year between 10 and 15 billion CFA FRANCS for the importation of milk and dairy products despite its significant animal resources. This is due to the lack of infrastructure within the country to utilise the existing milk production.

With the Mali Ministere de L'Elevage et de La Peche (2008) reports that Malian dairy policy has had a low level of implementation which fails in its objectives. Milk production remains low. Available amount is estimated to 500 000 000 litres of milk per year all species combined.

Actually milk consumption is poorly known in Mali and the latest figures are a great regional disparity.

Average consumption of milk estimated 30 litres/person/year in nomadic areas, 5, and 6 litres in the South of the country and 10 litres for the rest of the country. 50% of the urban population of Bamako consumes between 25 and 100 kg of milk/capita/year and 40% of the urban population of Ségou approximately 39 kg of milk/capita/year. The level of consumption of milk remains weak as a whole in Mali. Due to remoteness of the raw milk producers, industrialised plants tend to import milk powder for reconstitution instead of using

local milk which is worrying because local producers are not utilised properly (Mali Ministere de L'Elevage et de La Peche, 2008).

In terms of Food Safety, WHO Africa's Mali Country Profile: Food Safety and Nutrition has identified that Mali is lacking of quality control for food exportation while importing of food, the country faces insufficient control at the border posts; insufficient human & material resources as well as lacking of adequate collaboration and fraud. There is also absence of coordination and cooperation in enforcing food standard in national bureau.

## 6 TYPOLOGY OF MILK PRODUCT: FROM RAW MILK TO DAIRY PRODUCTS

In 1985, the Government adopted a dairy policy which was the increase of production and consumption of local milk and the reduction of imports of milk and dairy products following a technical support from FAO to promote the local milk sector. However, despite having the policy in place milk production is still low (Mali Ministère de L'Élevage et de La Pêche, 2008).

Milk production is provided by the bovine, ovine, caprine and cameline. With all the species combined, total quantity to date is 50 million litres in Mali. Domestic production of milk is provided to 98% by farming type traditional and only 2% by peri-urban farming character semi-intensive herdsmen (Mali Ministère de L'Élevage et de La Pêche, 2008).

According to Mali Ministère de L'Élevage et de La Pêche (2008), in rural area raw milk is collected at production level and the surplus is either sold directly in markets as well as collective centres; or milk is transformed in curdled milk is sold in markets; or even milk is boiled and sold in the urban area as well as the making of ghee from curdled milk. The types of products which are usually made by traditional rural female farmers are curdled milk, butter, ghee, dou-

ble cream, cheese and yoghurt. Nature curdled milk (thick milk curd with a very strong odor and has an acidic taste more than yogurt which is resulted from a spontaneous curdling without pasteurisation (wild ferment); the ghee or butter liquid; the “féné”, which is a mixture of cream and seeded fresh whole milk; “takkamart” is a very dry cheese made from curdling of the cow's or goat's milk with a fragment of dried goat stomach. However, in urban areas, individuals will try to transform imported milk powder into liquid milk because of the remoteness of the milk production centres by using simple equipment to pasteurize and ferment the milk, minimum packaging is applied. There are also mini dairy plants of the capacity of 1000 litres/day located in the cities such as Koutiala, Fana, Sikasso, San and Niono, they use the milk to make sweetened curds, yoghurts, curdled milk and double cream. Industrial milk processing plants are used to reconstitution of imported milk powder e.g. transforming powder in 20,000 litres of milk per day. Hardly any raw milk from the farmers and pastoralists makes it to the industrialised plants because of lack of infrastructure.

## 7 FOOD SAFETY AND FOOD CONTROL SYSTEM FOR MILK PROCESSING IN MALI

One of the big food safety problems is the consumption of contaminated ‘boiled’ milk by the local people in Mali, an investigation done by Hetzel *et al.* (2004). The milk is either pasteurised industrially, boiled on open fire in small collection centres or boiled at home. The milk which is sold in the open market is not always treated properly with any food safety standard procedures; re-contaminations happen too during transportation and storage. It is found that awareness of the potential risks associated by consuming milk is very low and education level reflects the understanding of the danger to drink unsafe milk. Milk is consumed in small quantity both as a drink as well as an ingredient of local dishes by households (Hetzel *et al.*, 2004). Bonfo *et al.* (2006) suggest that in milk production area, besides udder infection and water quality, hygiene behaviour in respect with hand washing, containers cleaning and disinfection are the key areas for milk hygiene intervention. The reduction of

time between the farm and the market, water quality improvement by adding sodium hypochlorite and subclinical mastitis control at the end of lactation period will improve milk hygiene. Water scarcity, only 64% of the people in Mali had access to water in 1998 (OXFAM report), makes it a challenge for people to clean their utensils properly and to keep basic personal hygiene since they are very water consuming. This situation is more severe in the north (where sits Sahara) than south of Mali.

Food quality should include safety, health and shelf-life, however, a lot of the industrialised manufacturers in Sub-Saharan countries focus much more on the extrinsic factor in terms of sales and image of the brand. As a result often they have the ISO 9000:2000 certification before the HACCP system is in place (Nguz, 2007). Actual Hygiene and Food Safety practices are inevitable to ensure safe food and healthy lives for Malians.

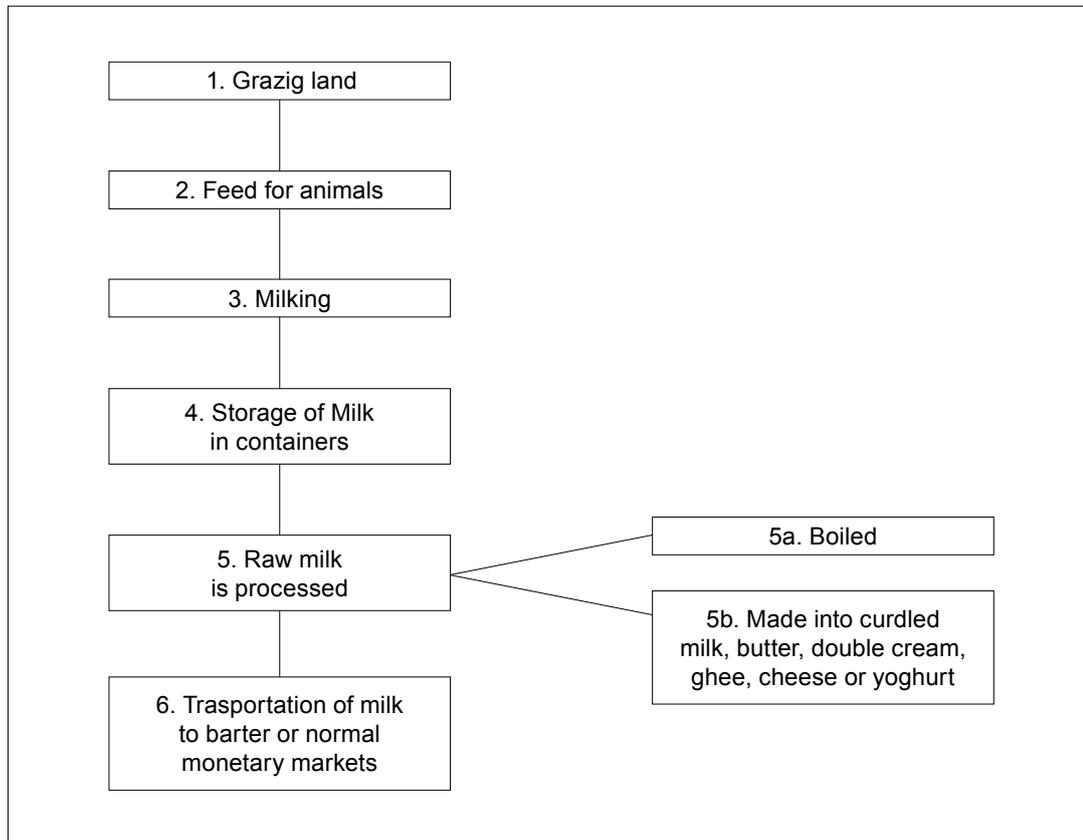
Milk production has to be investigated with the HACCP approach from the beginning of the food chain which is mentioned from the previous paragraph, the environment-feed-food chain. e.g. For milk production in Mali, the inspection should begin with the safety and quality of the feed for the cows, the environment where the cows are kept, then the cow's state of health, medicines used for the cows in case of illness, the equipments used to obtain the milk, the milk itself after being obtained, the transportation of raw milk to processing centres and the equipment used, the pasteurising process as well as the containers for the milk and the environment which the milk is kept after processing and finally to the consumers. But it does not stop here, consumers should understand how to keep the food safe until they eat them e.g. fresh pasteurised milk should be stored in fridge temperature with short shelf-life. However, due to lack of refrigerations in Mali, UHT, Ultra High Temperature treatment (which can be kept without refrigeration for up to 9 months in sealed containers) should be applied to enhance the surplus of milk available in rainy season for the benefit consumers in the dry season (Mali Ministere de L'Elevage et de La Peche, 2008).

In line with the strategies of the Malian government, the following relationships are studied and investigated in order to achieve an increase in production of raw milk and implementation of milk production infrastructures with the HACCP approach in two identified scenarios of milk value chain from nomadic

herders (North of Mali) and milk processing from farms (South of Mali) by participatory method to understand how people manage their milk production in real life. Classic check points of milk controlling according to Lievaart *et al.* (2005), a Belgian study, are butterfat and milk protein content, bacterial counts, somatic cell counts and antibiotic residues. Toxicants are needed to be looked at for sustainable food safety because bio-accumulation of toxicants in animal bodies can be transferred to human beings (including in utero life) through consuming animals' edible tissues and milk (Frazzoli *et al.*, 2009).

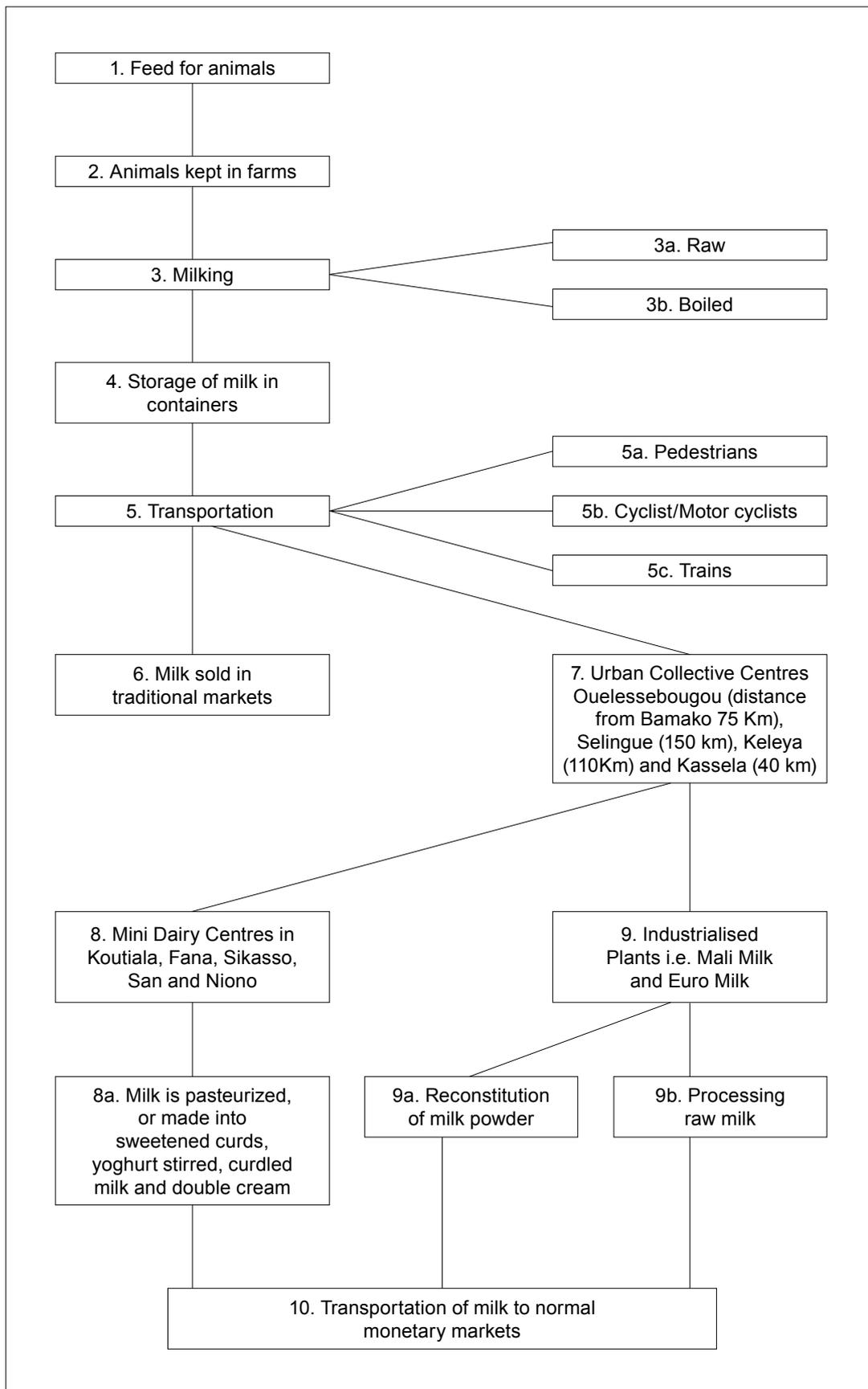
Procedures are identified in each of the scenarios, however, participatory methods are essential to understand people's real practice in processing the milk and hence find out the risks and hazards with local people together. Figures 2 and 3 show the overall process how milk is produced till the market point. Each step is being analysed to see the potential hazards before going to the field to investigate with the participatory method with all the people who are involved in the milk value chain e.g. herders, farmers, transformers etc. Local knowledge and experience are important to make the processes work, they should be cooperated with the HACCP approach (Table 1) we are trying to implement in Mali.

Dealing with live animals and the milk produced by them which is very different from designing a HACCP system for a closed factory environment.



>> Milk processing chain in Pasteured areas (Overall Rural Pasteured based milk chain).

>> Milk processing chains in urban and periurban areas.



## REFERENCES

- Bonfoh B. and Roth C. *et al.*, (2006). Effect of washing and disinfecting containers on the microbiological quality of fresh milk sold in Bamako (Mali), *Food Control*, 17:153-161.  
Department of State <http://www.state.gov/r/pa/ei/bgn/2828.htm>
- FAO (2002). Lactoperoxidase Project  
<http://www.fao.org/ag/againfo/themes/documents/LPS/dairy/dap/LPSMali/index.htm#toc>
- FAO (2005). Livestock Sector Brief  
[http://www.fao.org/ag/againfo/resources/en/publications/sector\\_briefs/lsb\\_MLI.pdf](http://www.fao.org/ag/againfo/resources/en/publications/sector_briefs/lsb_MLI.pdf)
- FAO Mali Country Profile (accessed in Nov. 2011)  
<http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Mali/mali.htm>
- FAO (2008). An Introduction to the Basic Concepts of Food Security  
<http://www.fao.org/docrep/013/a1936e/a1936e00.pdf>
- Frazzoli C., Petrini C. and Mantovani A. (2009). Sustainable development and next generation's health: a long-term perspective about the consequences of today's activities for food safety  
<http://www.noodlesonlus.org/NoodlesDocuments/tabid/501/Default.aspx>
- Galey FD, Slenning BD, Anderson ML, Breneman PC, Littlefield ES, Melton L & Tracey ML (1990). Lead concentration in blood and milk from periparturient dairy heifers seven months after an episode of acute lead toxicosis. *Journal of Veterinary Diagnostic Investigation*, 2:222–226.
- Hetzel, M, Bonfoh, B *et al.* (2004). Diarrhoea, vomiting and the role of milk consumption: perceived and identified risk in Bamako (Mali), *Tropical Medicine and International Health* Volume 9, No 10, 1132–1138
- Human Development Report 2011  
<http://hdrstats.undp.org/images/explanations/MLI.pdf>
- IFAD Country Strategic Opportunity Programme (CSOP) (2007)  
<http://www.ifad.org/gbdocs/eb/92/e/EB-2007-92-R-12.pdf>
- IFAD Rural Poverty Portal (accessed in Oct. 2011)  
<http://www.ruralpovertyportal.org/web/guest/country/approaches/tags/mali>
- IMF Mali Poverty Reduction Strategy Paper  
<http://www.imf.org/external/pubs/ft/scr/2010/cr10266.pdf>
- IRIN (2004). MALI: There are worse things than life on a rubbish dump  
<http://www.irinnews.org/report.aspx?reportid=50295>
- IRIN (2008). In-depth: Food and nutrition crisis in Niger and the Western Sahel SAHEL: Backgrounder on the Sahel, West Africa's poorest region  
<http://www.irinnews.org/InDepthMain.aspx?InDepthID=81&ReportID=78514>
- IRIN (2009). Mali: Land Grab fears linger  
<http://www.irinnews.org/report.aspx?reportid=87284>
- Joint FAO/WHO Food Standard Programme Codex Alimentarius Commission (2009). Food Hygiene Basic Text Fourth Edition  
<http://www.fao.org/docrep/012/a1552e/a1552e00.pdf>
- Lievaart, J. J., Noordhuizen J. P. T. M *et al.*, (2005). The Hazard Analysis Critical Control Point's (HACCP) concept as applied to some chemicals, physical and microbiological contaminants of milk on dairy farms. *A prototype Veterinary Quarterly*, 27(1), 21-29.
- Mali Country Profile: Human Development Indicators  
<http://hdrstats.undp.org/en/countries/profiles/MLI.html>

National Library of Medicine

[http://toxtown.nlm.nih.gov/text\\_version/index.php](http://toxtown.nlm.nih.gov/text_version/index.php)

Nguz, K (2007) Assessing food safety system in sub-Saharan countries: An overview of key issues, *Food Control*, 18:131–134.

Oxfam. International Water Scarcity causing food insecurity in Mali (accessed in Nov. 2011)

<http://www.oxfam.org/en/emergencies/west-africa-food-crisis/mali-water-scarcity-causing-food-insecurity>

Oxfam Mali Country Report by On the Line (accessed in Nov. 2011)

<http://webcache.googleusercontent.com/search?q=cache:AkedH0ZCx08J:www.oxfam.org.uk/coolplanet/onthe-line/explore/journey/mali/downloads/malreport.doc+Oxfam+Mali+Country+Report+by+On+the+Line&cd=1&hl=en&ct=clnk&client=safari>

Oxfam West Africa Regional Pastoral Programme

[http://www.oxfam.org.uk/resources/countries/wafrica\\_pastoralism.html](http://www.oxfam.org.uk/resources/countries/wafrica_pastoralism.html)

Oxfam (2004). Oxfam GB's work with partners and allies around the world

[http://www.oxfam.org.uk/resources/downloads/reports/pir\\_2004.pdf](http://www.oxfam.org.uk/resources/downloads/reports/pir_2004.pdf)

Oxfam (2011). Research Report: Who will feed the world?

<http://www.oxfam.org/en/grow/policy/who-will-feed-world>

Republique du Mali Ministere de L'Elevage et de La Peche (2008). Strategie et Propostition D'Actions pour la Valorisation du Lait Cru Local au Mali

UNEP (2010). Full Report United Nations Environment Programme

[www.unep.org/transport/pcf/PDF/leadphaseoutreport.pdf](http://www.unep.org/transport/pcf/PDF/leadphaseoutreport.pdf)

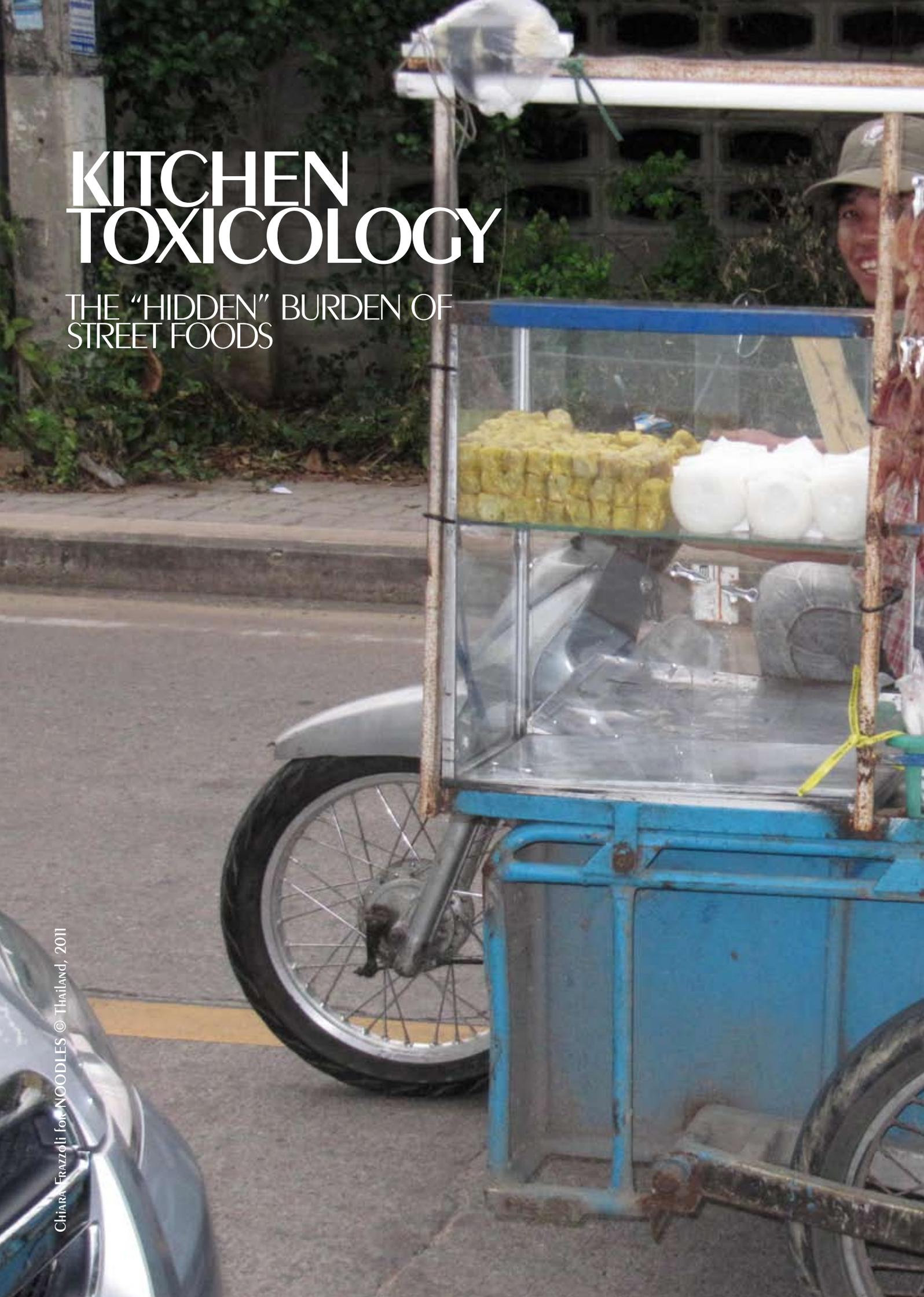
Wilkinson, J.M., Hill, J. and Philips, C.J.C (2003). The accumulation of potentially-toxic metals by grazing ruminants, *Proceedings of the Nutrition Society* (62) 267–2, UK.

WFP Country Programme Mali (accessed in Oct. 2011)

<http://www.wfp.org/content/country-programme-mali-2008-2012>

# KITCHEN TOXICOLOGY

THE "HIDDEN" BURDEN OF  
STREET FOODS





# THE “HIDDEN” BURDEN OF STREET FOODS



## OPINION

by **ILARIA PROIETTI**

[ilaria.proietti@noodlesonlus.org](mailto:ilaria.proietti@noodlesonlus.org)

*PhD in Food Quality and Safety, Istituto Superiore di Sanità, Rome, Italy.*

## IL RISCHIO “NASCOSTO” DEL CIBO DI STRADA

*La vendita di cibo di strada rappresenta ormai una componente indispensabile del sistema alimentare di molti Paesi in via di sviluppo, grazie anche al processo di urbanizzazione che si sta diffondendo sempre di più in queste regioni, e contribuisce significativamente alla sicurezza alimentare delle persone che fanno affidamento sulla loro vendita e/o disponibilità. Grazie alla vasta presenza sul territorio, al basso costo e all'offerta molto variata di alimenti, il cibo di strada rappresenta, inoltre, un importante mezzo di sussistenza per le comunità a basso reddito.*

*Nonostante i benefici nutrizionali, sociali ed economici, la vendita di cibo di strada suscita grandi preoccupazioni per la salute della popolazione urbana. La principale preoccupazione è legata alla sicurezza alimentare, ovvero all'igiene e alla qualità degli alimenti, soprattutto a causa della possibile presenza di agenti biologici e/o sostanze chimiche nei prodotti alimentari venduti al pubblico. Nel corso degli anni il rischio microbiologico è stato ampiamente studiato, mentre resta ancora molto da chiarire sui pericoli chimici/tossicologici e, in particolare, sulle misure da adottare per prevenire e/o ridurre la probabilità della loro presenza.*

*L'obiettivo di questo documento è quello di descrivere i rischi chimici/tossicologici a cui esposto il cibo esclusivamente preparato sulla strada, al fine di: identificare e caratterizzare i principali pericoli chimici/tossicologici e valutare il rischio di esposizione della popolazione generale. A partire dalla vulnerabilità intrinseca delle matrici alimentari a diverse sostanze chimiche, vengono quindi esaminati punti critici di controllo: come la locazione del punto vendita, lo stoccaggio e la preparazione dei piatti pronti, allo scopo di fornire ai venditori di cibo di strada le informazioni necessarie per prevenire e/o ridurre la presenza di sostanze tossiche nei loro prodotti e tutelare, così, la salute del consumatore.*

**SUMMARY:** Street-vended foods (or street foods) are an indispensable component of the food system in many cities of developing countries, increasingly emphasized by the rapid urbanization process, and significantly contribute to the food security of people who rely on their daily and widespread availability. Due to their easy accessibility and diversified supply of meals, street foods also represent an inexpensive and accessible means for low income communities of meeting their basic nutritional needs.

Despite the nutritional, social and economic benefits that may originate from it, the selling of street foods raises serious concerns for the health of urban population. The major concern is related to food safety, in particular due to biological agents and chemical substances in food products presented to the public. Over the years, the microbiological hazards have been deeply examined, though proper management and communication would require further efforts; on the other hand, a lot still needs to be clarified about chemical/toxicological hazards and, in particular, on the measures that can be taken in order to prevent them or reduce the probability of their occurrence.

The purpose of this opinion paper is to present an overview of chemical/toxicological risks of street cookery (to be considered as the activity of preparing and cooking foods exclusively on the street) in order to: identify the main chemical hazards for foods and characterize the toxicological risks for the general population. Starting from the intrinsic vulnerability of the food matrices to different chemicals, points of particular attention are considered -from the location through the handling, storage, processing and sale of meals- in order to produce recommendations addressed to the food vendors, thus protecting the healthy value of their goods.

# 1 STREET FOODS: AN EMERGING HOT ISSUE FOR HEALTH?

Street foods are defined by FAO/WHO Codex Alimentarius Commission as ready-to-eat foods prepared and/or sold by vendors and hawkers especially in the streets and other public places (FAO, 1989). This definition includes a wide range of ingredients and products, as well as raw materials and methods of preparation which often reveal traditional local cultures and recipes and include a large variety of meals, snacks and drinks (WHO/FAO, 2010).

There is growing awareness that street-vended foods (or “street foods”) represent an indispensable component of the modern food supply system as well as an important global issue worldwide (FAO, 1991; FAO, 1997; FAO/WHO, 2003; Nago, 2005; Chukuezi, 2010). The increasing spread of the phenomenon throughout the world, but mainly in developing countries, is the evidence of the rapid urbanization process and the changed patterns of living and eating (FAO, 2000; Johnson *et al.*, 2000). In many cities of developing world, indeed, the vending of street food significantly contributes to the food security of people who rely on

their daily and widespread availability.

In fact, due to their easy accessibility and diversified supply of meals, street foods represent an inexpensive and accessible means for low income communities of meeting their basic nutritional needs: it is estimated that the recommended daily energy intake can be met by consuming around US\$1 of street foods (FAO, 1991). In Africa, for instance, street alimentation enables 80% of urban populations to feed themselves easily and at lower prices and represents around 40% of their food budget expenditure (IFPRI, 2000).

Nevertheless, despite the nutritional, social and economic benefits that may originate from it, the selling of street foods raises serious concerns for the health of urban population. The major concern is related to food safety, in particular due to biological agents and chemical substances in food products presented to the public. The way forward the management of food safety of street vended food cannot escape the assessment of raw materials and processing and the accurate identification of those factors more vulnerable to hazards.

>> *Street food, Chiara Frazzoli for NOODLES © Thailand, 2011.*



## 2 STREET FOOD AND HEALTH: NOT ONLY MICROBIOLOGICAL RISKS...

Over the years, the microbiological hazards have been deeply examined and a number of studies on the detection of foodborne bacterial pathogens in street vended foods have been performed (e.g., FAO, 1991; Muleta *et al.* 2001; Abdussalam *et al.* 1993; Mensah *et al.* 2002; Omemu *et al.* 2008; Von *et al.* 2006, Opeolu *et al.*, 2010). The findings of these studies clearly demonstrate the role of street foods in the transmission of pathogens like *Bacillus cereus*, *Staphylococcus aureus* and *Salmonella* spp and their short-term effects.

On the other hand, a lot still needs to be clarified about chemical/toxicological hazards and, in particular, on the magnitude of risks posed by them in the long term. Limited investigations and data on toxicological hazard of street foods exist, suggesting the probability of multiple contaminants of different origin presence in street food scenarios.

The scarcity of studies on chemical/toxicological hazards of street foods can be due to the fact that most effects of their exposition are “hidden”, i.e. not immediate (as those of microbiological hazards) but visible only in the long term and therefore often difficult to associate with past exposure. Therefore, chemical substances/toxicants can be considered “silent risk factors” for adverse health effects such as carcinogenic, teratogenic, mutagenic as well as endocrine effects. It is known that the effects on human health depend mainly on the exposure pattern and magnitude, the toxicity as well as the vulnerability and susceptibility of subject.

The long term exposure to chemical/toxicological haz-

ards of street foods raises further concerns because of the cumulative daily intake of a certain toxicant and the fact that vulnerable and most-at-risk populations, such as children and women of childbearing age, represent an important segment of street foods consumers. In Nigeria, for instance, 96% of the elementary school children buy breakfast from street food vendors and in Bangkok, children 4-6 years old got 80% of the energy, protein, fat and iron intake from street foods (FAO, 2000).

In this scenario, women (including those in childbearing age) account for the majority of street vendors in many countries: e.g. they are involved in 81% of street-food business in Zimbabwe, 90% in the Philippines, 53% in Senegal and 66.67% in Nigeria (Graffham *et al.*, 2005; Chukuezi, 2010). Mensah *et al.* (2002) observed that in Accra (Ghana), even though the majority of street food consumers are men, many mothers working at the markets in Accra also bought some food items from vendors to feed their babies and it is reasonable not to exclude that women-vendors consume the same meals they prepare and sell. The specific concern for women in childbearing age lays in long-term effects implicating health risk also for future generations. In fact, intrauterine exposure and first infancy requires, indeed, particular attention due to the vulnerability of the foetus and the likelihood for the developing organisms to trigger situations regulating the chances of developing future health outcomes such as endocrine and metabolic diseases (Frazzoli *et al.*, 2009).



>>> *Street food, Chiara Frazzoli for NOODLES © Thailand, 2011.*

## 3

## CHEMICAL/TOXICOLOGICAL HAZARDS OF STREET COOKERY

Despite the fact that the term street-vended foods includes both the foods prepared on the street and ready to eat, as well as those prepared at home and consumed on the street without further preparation (FAO, 1989), this opinion examines foods exclusively prepared on the street as area deserving special attention for chemical/toxicological hazards as more prone to those risks.

Thus, NOODLES purpose is to focus on street cookery, intended as the activity of preparing and cooking food exclusively on the street.

The large collection of ingredients, methods of preparation and street cookeries are proportional to the number of risks to whom they are exposed: food is susceptible to contamination by chemical/toxicological hazards at various stages: from the preparation process to storage and sale of meals, and the following depicts the scenario.

#### Location

For profitable reasons, street food stalls are mainly placed in the most congested streets, close to crowded centers and manufacturing activities, at bus/train stations, etc. Food processing and displaying area is so exposed to several airborne toxicants, such as lead and other heavy metals, polycyclic aromatic hydrocarbons (PAHs) and persistent organic pollutants (POPs) such as dioxins and polychlorinated biphenyls (PCBs). Furthermore, the majority of the vending sites are poorly constructed, determining the lack of proper protection of foods from air pollution (Muinde *et al.*, 2005). A study conducted in Indonesia, for instance, reported the presence of heavy metals (e.g. iron and lead) in several food samples, linked, at least partly, to atmospheric pollution, especially from automobile exhaust fumes (Simopoulos *et al.*, 2000).

Poor sanitary conditions in the area where food is prepared and vended also contribute to high risks exposure of foods to toxicants: lack of services, such as potable water supplies, inadequate refuse disposal facilities and open burning of wastes expose foods to dangerous toxicants such as PAHs and dioxins. In Nairobi (Kenya) 92.5% of the street food processors did not have a waste disposal area and threw waste water close to the stalls, increasing the pollution of the soil and groundwater (Muinde *et al.*, 2005).

#### Raw materials

Source and quality of raw materials play a fundamental role in the safety of street foods. Contamination introduced by raw materials could be carried over through processing and cooking.

A critical raw material in street-vended operations is water. Water is present in many stages of food sale: it is used for drinking, as well as to wash foods, equipment, utensils and hands; it can also represent

an ingredient and be used in the processing of food, e.g., by boiling. Depending on the scenarios, water sources can be contaminated by industrial or domestic wastewater, pesticides or sewage; moreover, the frequent unavailability of potable water near the stalls and the consequent re-use of the water used for cleaning utensils and dishes is a major concern (FAO, 2009; Rane, 2011).

Moreover, in order to apply low prices, vendors may purchase cheap raw materials from unreliable sources and/or clandestine dealers. These raw materials are often substandard and present health hazards: for instance, spoiled materials, especially nuts, grains and related products, may be contaminated by mycotoxins, while foods of plant or animal origin may bear unauthorized residues, or illicit biocides (WHO, 1996, WHO/FAO, 2010). A safety study from Accra found that 70% of street food samples contained residues of the organophosphorous pesticide chlorpyrifos; while benzoic acid, tetradifon and aflatoxin have been reported in a survey of 74 samples of street food sold in Bangkok (Vatanasuchart *et al.*, 1994).

Finally, since organic and inorganic pollutants have different lipophilicity, different accumulation patterns are implicated in the level of toxicants of the meal, depending on the relevant composition of raw materials. Certain persistent lipophilic chemicals, such as polychlorinated biphenyls (PCBs) and DDTs can accumulate in the adipose tissue of animals, causing an increased likelihood of toxicants in edible tissues. For all this reasons, the selection of raw materials represents a major step in the safety of street foods.

#### Storage

The place where foods are stored is often not properly sheltered from contamination sources.

In most cases, foods are not covered and presences of liquid and solid wastes in the storage areas have been frequently reported (Rane, 2011) and the ill-aimed attempts at defending stored foods from pests may lead to an overenthusiastic use of biocides (organophosphorus insecticides, disinfectants such as formaldehyde, anticoagulant rodenticides, etc.), leading to contamination by residues.

Most important, inadequate storage conditions (such as temperature, moisture and prolonged time) and/or facilities promote the growth of mycotoxin producing fungi and the production of mycotoxins in numerous raw materials, mainly cereals, dry fruits, spices, coffee and cocoa. Contamination with aflatoxins has been reported in two surveys of street foods in Bangkok (Vatanasuchart, 1994; Dawson *et al.*, 1996), in 35% of the samples collected in Khatmandu (Nepal) and 17% of foods containing peanuts in Indonesia (Winarno, 1993).

As for chemical/toxicological risks food faces during the storage, big importance is given to the quality of utensils and equipment where foods are stored, as reviewed in the following sub-section.

### Utensils and Equipment

The use of adequate utensils and equipment for the preparation and storage of food is critical to the safety of street vended foods. Inappropriate cookware, food containers and packaging and kitchen utensils used for and during the preparation, cooking and serving, as well as the storage of raw materials and prepared food, may determine food contamination with toxicants. Moreover, the combination of poor quality materials and improper practices may lead to the formation or leaching of toxic compounds, such as heavy metals, perfluorinated compounds (PFOS, PFOA) and bisphenol A.

An important risk factor for the equipment is the frequent purchase of pots and other utensils from informal manufacturers/retailers. This is obviously attributed to their inferior cost and the consequent lower economic loss that would occur when equipment would be confiscated by the police during a raid (in fact street food vending is still an informal sector). Interviews with vendors in Harare (Zimbabwe) and Accra showed the high frequency of using informally fabricated pots, often manufactured with poor quality materials, such as scrap metals from various sources: derelict cars, car batteries or industrial machinery, that may leach a number of toxic metal compounds (Tomlins *et al.*, 2004; FAO/WHO, 2005). The study carried out in Accra reported a number of food samples with high levels of lead, cadmium, arsenic, mercury and copper, suggesting a probable leaching from the utensils (Tomlins *et al.*, 2004).

Besides metals, utensils and equipment may release also other contaminants, especially at high temperature and/or in contact with acidic or fat foods. Melamine and formaldehyde, for instance, may be released by utensils or plates made of melamine resin if exposed to high temperature, e.g. when frying (BfR, 2011). Perfluorinated compounds might be released by the Teflon or non-stick coatings when deteriorate or at temperature above 230°C. Leaching of DEHP (Bis(2-ethylhexyl)phthalate) from polyvinylchloride (PVC) may occur upon prolonged contact with fat foods, such as dairy products. Finally, bisphenol A, an additive of polycarbonate plastic containers (e.g. baby bottles and plastic containers) may be released upon prolonged use and/or when in contact with hot liquids.

### Food processing and cooking practices

Preparation and processing of street foods should be done adequately in order to reduce chemical/toxicological hazards in the final food product. Food processing and cooking practices can involve boiling, frying, baking and grilling. Particular attention should be given to overcooking, grilling and/or excessive reuse of cooking oils for frying because of the possible production of carcinogenic chemicals.

Formation of PAH, a group of different carcinogenic and genotoxic chemicals, for instance, may occur during the grilling or smoking of meat as well as from overbaking at high temperature of dough-based foods (Ruchirawat *et al.*, 2005). Acrylamides, another carcinogenic and genotoxic substance is generated in fried or overheated carbohydrate foods, especially if cooked at temperature higher than 120°C. In his study carried out in Owerri (Nigeria), Chukuezi (2010) found that 72.42% of street food vendors reused oil for frying several times, determining a probable production of cancer-causing chemicals, such as PAHs and acrylamide.

Use of banned or hazardous (for toxicity and excess amount) food additives, such as coloring agents, is another diffused chemical hazard to be considered in street food. Johnson *et al.*, (2000) in their study in Accra, reported that many vendors add some coloring agents during the preparation of waakye (a popular Ghanaian food) to give it a characteristic color. Presence of banned or hazardous coloring agents, like Metanil yellow, Orange II and Rhodamine B has been detected in India (Simopoulos, 2000), while in West Java (Indonesia) non-food-grade additives, such as textile coloring agent, were detected in several street food preparations as well as soft drinks (IPB, 1990).

On the other hand, adequate food processing may improve the quality of food by reducing the presence of such hazards, as anti-nutritional factors: substances endogenously present in several foods (mainly cereals) able to reduce the bioavailability of minerals and digestibility of proteins. Anti-nutritional factors in foods can be, indeed, reduced by adequate processing and, consequently, bioavailability of nutrients will increase: e.g., the augmented bioavailability of iron and zinc and the digestibility of proteins in sorghum after adequate fermentation (Wisal *et al.*, 2005; Ibrahim *et al.*, 2005; Mohammed *et al.*, 2010).

### Cleaning practices

Finally, the excessive use or misuse of insecticides and cleaning agents in the stalls may determine the laying down of chemicals on the surface of displayed meals or contaminate the soil or the ground water. Cleaning products may present, indeed, several health and environmental concerns. They may contain chemicals classified as hazardous for human health as well as toxic for aquatic species in polluted waters.

Weather and environmental conditions of street food stalls in developing countries may entrain a high presence of insects, which are potential vectors of microbiological contamination. Thus, there is no doubt that measures should be taken to reduce the insect presence; however, an inaccurate and exceedingly eager use may be hazardous itself. Neurotoxic insecticides such as organophosphorates, carbamates and pyrethroids are typical examples of biocides with direct toxicity. Organochlorine insecticides are stable compounds persisting in the environment for prolonged periods and can be accumulated in the body's adipose tissue with long term effects on liver and on the central nervous, endocrine and reproductive systems.

Most organochlorine insecticides have been banned in industrialized Countries and many developing Countries since decades (DDT since 1970's under the Stockholm Convention). However, household uses

may still be common in scenarios such as street food vending, due to the lack of proper regulations and/or controls and the low cost of “dumped” pesticide stores (Johnson *et al.*, 2000; Abaidoo, 2009).

## 4 A NEEDED STEP FORWARD

Even the fact that is an important source of affordable food, street foods sector has still not being officially recognized in many countries and, consequently, it does not meet adequate standards neither there is public awareness of risks posed. The reasons are several and may differ according to the countries; these include inadequate regulatory laws and systems, lack of infrastructures and financial resources to invest in safer equipment and lack of education for street food vendors.

All such reasons may reflect an understatement of street food role for food security as well as for economic and social welfare of urban communities.

Nevertheless, since street food vending has become increasingly important as urban phenomenon, it would be necessary to take different measures in order to prevent all sort of hazards, including the chemical/toxicological ones and/or reduce the probability of their occurrence in foods. Different preventive measures have been proposed and, occasionally, put in place. Among them, HACCP (Hazard Analysis and Critical Control

Point) is the main reference model: a preventive proactive approach which allows identifying potential risk factors before they occur. Nonetheless, HACCP strategy is exclusively focus on hygienic/microbiological risks and do not take into account the chemical/toxicological risks. Consequently, there is the necessity of a systematic and comprehensive extension of HACCP approach to factors associated with chemical/toxicological hazards. Since the introduction of chemical/toxicological hazards to HACCP model has not yet been explored, it is a field study that requires be carrying out and deeply investigating. The adaptation of HACCP model to natural and man-made chemical hazards is a study field at its starting stage that requires being carried out and thoroughly investigated.

The reduction of both microbiological and chemical/toxicological in street cookery, indeed, would allow improving the quality of foods, reducing the occurrence of short and long term foodborne illness, thus enhancing the health and social benefits from the street food sector.

## REFERENCES

- Abdussalam M. and Kaferstein F.K. (1993). Safety of street foods. *World Hlth. Forum*, 14:191-194.
- BfR (Federal Institute for Risk Assessment) (2011). Release of melamine and formaldehyde from dishes and kitchen utensils. Opinion Nr. 012/2011, 09 March 2011.
- Chukuezi C.O. (2010). Food Safety and Hygienic Practices of Street Food Vendors in Owerri, Nigeria. *Studies in Sociology of Science*, 1:50-57.
- Dawson R., Liamransi S. and Boccas F. (1996). Bangkok's Street Food Project. Food, Nutrition and Agriculture / Alimentation Nutrition and Agriculture. *FAO Publication 17/18*.
- FAO (1989). Street foods. Report of an FAO Expert Consultation, Jogjakarta, Indonesia, 5-9 December 1988. *FAO Food Nutr. Pap.*, 46:1-96.
- FAO (1991). Street foods in developing countries: lessons from Asia. Food, Nutrition and Agriculture - 1 - *Food for the Future*. FAO. Rome
- FAO (1997). Street food. Food, Nutrition and Agriculture – 63. *Report of an FAO Technical Meeting on Street Foods*, Calcutta, India 6-9 November 1995
- FAO (2000). FAO Technical Support for Improvement within the Street Food sector. GAUTENG PROVINCE, Pretoria.
- FAO (2009). Good hygienic practices in the preparation and sale of street food in Africa- Tools for training. Rome, FAO.
- FAO/WH (2003). Assuring Food Safety and Quality: Guidelines For Strengthening National Food Control Systems. *Food and Nutrition Paper n°76*. Rome, FAO.
- FAO/WHO (2005). Informal food distribution sector in Africa. FAO/WHO Regional Conference on Food Safety for Africa. Harare, Zimbabwe, 3-6 October 2005.
- Frazzoli C., Petrini C. and Mantovani A. (2009). Sustainable development and next generation's health: a long-term perspective about the consequences of today's activities for food safety. *Annali dell'Istituto Superiore di Sanità*, 45(1):65-75.
- Graffham A., Zulu R. and Chibanda D. (2005). Improving the safety of street vended foods in Southern Africa. *Final Report*, CPHP project R8272.
- Ibrahim F.S., Babiker E.E., Nabila E.Y., Abdullahi H. and ELTinay (2005). Effect of fermentation on biochemical and sensory characteristics of sorghum flour supplemented with whey protein. *Food Chem.*, 92:285-292.
- IFPRI (2000). Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana. Report 112. International Food Policy Research Institute. Washington, USA.
- IPB, TNO, VU, 1990. Consumption of street foods: Total-diet studies among students in Bogor. *Streetfood Project Working Report* no. 3. Jakarta and The Hague: BPPT and DGIS, Food Technology Development Center (Bogor Agricultural University, Indonesia).
- Johnson P.N.T. and Yawson R.M. (2000). Enhancing the food security of the peri-urban and urban poor through improvements to the quality, safety and economics of street-vended foods. *Proceedings of workshop for stakeholders, policy makers and regulators of street-food vending in Accra*, at Miklin Hotel, Accra, 25 –26th September, 2000. DFID/NRI/FRI Crop Post Harvest Program Project.
- Mensah P., Yeboah-Manu D., Owusu-Darko K. and Ablordey A. (2002). Street foods in Accra, Ghana: how safe are they? *Bulletin of the World Health Organization* 80(7): p546-554.
- Mohammed N.A., Isam A.M.A. and Babiker E.E. (2010). Nutritional Evaluation of Sorghum Flour (Sorghum bicolor L. Moench) During Processing of Injera. *International Journal of Biological and Life Sciences*, 6:1.

- Muinde O.K. and Kuria E. (2005). Hygienic and sanitary practices of vendors of street foods in Nairobi, Kenya. *AJFAND*, 5: 1-13. Available at [www.ajfand.net](http://www.ajfand.net)
- Muleta D. and Ashenafi M. (2001). Salmonella, Shigella and Growth potential of other food-bourne pathogens in Ethiopian street vended foods. *East African Medical Journal*, 78:576-580.
- Nago C. (2005). Experiences on street foods in West Africa. Paper presented at an FAO/Consumers International workshop on street-vended foods in Eastern and Southern Africa: Balancing safety and livelihood, 15-17 June, 2005. Lilongwe, Malawi.
- Omemu A.M. and Aderoju S.T. (2008). Food safety knowledge and practices of street food vendors in the city of Abeokuta, Nigeria. *Food control*, 19:396-402.
- Opeolu B.O., Adebayo K., Okuneye P.A. and Badru F.A. (2010). Physicochemical and Microbial Assessment of Roadside Food and Water Samples in Lagos and Environs. *J. Appl. Sci. Environ. Manage*, 14(1) 29 – 34.
- Rane S. (2011). Street Vended Food in Developing World: Hazard Analyses. *Indian J Microbiol.*, 51(1): 100–106.
- Ruchirawat M., Navasumrit P., Settachan D., Tuntaviroon J., Buthbumrung N. and Sharma S. (2005). Measurement of genotoxic air pollutant exposures in street vendors and school children in and near Bangkok. *Toxicol. Appl. Pharmacol*, 206(2):207-14.
- Simopoulos A.P. and Bhat R.V. (2000). Street foods. *World Rev Nutr Diet. Basel, Karger*, 2000, 86:53–99.
- Tomlins K., Johnson P.N. (2004). Developing food safety strategies and procedures through reduction of food hazards in street-vended foods to improve food security for consumers, street food vendors and input suppliers. Crop Post Harvest Programme (CPHP) Project R8270. Funded by the DFID.
- Vatanasuchart N. and Hutabarat L.S.R. (1994). Chemical contaminants in street food. *Univ. Annual Conference, Bangkok (Thailand)*, 3-5 Feb 1994.
- Von H.A. and Makhoane F.M. (2006). Improving street food vending in South Africa: Achievements and lessons learned. *International Journal of Food Microbiology*, 111: 89-92.
- WHO, 1996. Essential safety requirements for street-vended foods. World Health Organization, Switzerland.
- WHO/FAO (2010). Basic steps to improve safety of street-vended food. Safety of street-vended food. International Food Safety Authorities Network - *INFOSAN Information Note No. 3/2010*.
- Winarno F.G. (1993). Street foods in developing countries: Lessons from Asia. Abstracts-Final Programme Street Foods Epidemiology, Management and Practical Approaces, Beijing, Oct 19-21, 1993, pp 2-3.
- Wisal I.H., AbdelRahman S.M., ELMaki H.B., Babiker E.E. and EL Tinay A.H. (2005). Effect of germination, fermentation and cooking on phytic acid and tannin contents and HCl extractability of minerals of sorghum (*Sorghum bicolor*) cultivars. *J. Food Technol.*, 3 (3):410-416.

# DIET

SUSTAINABLE  
FOOD SAFETY:  
A "CONSUMER SAFARI"  
IN SENEGAL





# SUSTAINABLE FOOD SAFETY: A “CONSUMER SAFARI” IN SENEGAL



## MISSION REPORT

by CHIARA FRAZZOLI

chiara.frazzoli@noodlesonlus.org

*Researcher at the Food and Veterinary Toxicology Unit, Dept. of Veterinary Public Health and Food Safety, Istituto Superiore di Sanità, Rome, Italy.*

## LA SICUREZZA ALIMENTARE SOSTENIBILE: UN “SAFARI FRA I CONSUMATORI” IN SENEGAL

*La salute sostenibile, cioè transgenerazionale, implica la corretta programmazione fetale e le possibilità di salute in età adulta. L'identificazione e la gestione dei fattori alimentari (sicurezza alimentare sostenibile) nel “flusso di salute” materno-infantile è particolarmente urgente in popolazioni che stanno vivendo profondi cambiamenti che stanno inducendo invecchiamento e urbanizzazione della popolazione, con crescente incidenza delle malattie croniche. In questo “consume safari” viene analizzata la dieta Senegalese per porre le basi per l'identificazione di fattori gestibili, tra i quali l'HACCP tossicologico, con importanti implicazioni per la prevenzione e la sovranità alimentare. La comprensione delle radici culturali delle preferenze e dei sistemi alimentari contribuisce a sanare le disparità di salute mediante strategie, canali e strumenti per coinvolgere la popolazione alfabetizzata e analfabeta nelle aree urbane, semiurbane e rurali.*

**SUMMARY:** Sustainable, i.e. transgenerational, health implies proper conceptus programming and health challenges of healthy adulthood. The identification and management of dietary factors (sustainable food safety) in the mother-child health flow factors is especially urgent in population undergoing sweeping changes that are shifting the balance toward an older and more urbanized population that experiences more chronic disease. The Senegalese diet is analyzed in this “consumer safari” to put the basis for the identification of malleable factors, including toxicological HACCP, with important implications for prevention and food sovereignty. The comprehension of cultural roots of diet preferences and food systems contributes filling health disparities by laying-down strategies, channels and tools for empowering literate and illiterate people in urban, semi-urban and rural settings.

## 1 AN INTRODUCTION ON SUSTAINABLE FOOD SAFETY: MATERNAL DIET AND CHILD HEALTH

The aim of a consumer safari is to gain insights into the social- and cultural-environments of consumers: diet is a complex issue, influenced by environment and lifestyles, providing macronutrients (e.g., proteins, lipids) and micronutrients (vitamins, trace elements) to such vulnerable life stages as intrauterine life and breastfeeding. Maternal diet before and during pregnancy is critical

to prevent an inadequate and/or unbalanced embryonic nutrition which can lead damage to foetal development, and also to long-term risk of increased burden of diseases in adulthood.

Analogously, early and exclusive breastfeeding for 6 months for all children improves the infant resistance to diseases and especially reduces infant deaths caused

## Acknowledgements

*I thank the friendly sustain received from the Italian Association of Senegalese Women DEGGÒ during my ISS mission in Senegal. In particular, I thank Ms. Thiama Mbow (Mbacke region) and Ms. Ndeye Djenaba Tine (Dakar region).*

by diarrhoea, asthma and pneumonia; most important, it provides the nutrients required at appropriate amounts for an adequate development of the baby. For instance, breast milk is a source of iodine that is essential for the function of thyroid, hence, to body growth and intellectual development.

Early and exclusive breastfeeding is a highly recommendable health-promoting practice that needs further support in Senegal where, e.g., feeding water still is a common practice and neonates are not regularly fed colostrums.

Moreover, communication related to the market replacement foods and breast milk substitutes should be severely surveyed in health systems, sales outlets, distribution points, and the news media, to monitor compliance with the International Code of Marketing of Breast milk Substitutes.

### 1.1 METABOLIC DISORDERS

While malnutrition and micronutrient deficiencies are not eradicated in Senegal, there is also an increased prevalence of a group of severe diseases related to an excessive and unbalanced consumption of foods and calories such as obesity, hypertension, diabetes, hypercholesterolemia and cardiovascular disorders.

Much of the rise of obesity pandemic is attributed to lifestyle factors as hyper-caloric/nutritionally poor diet and sedentary life; however, the risk of developing metabolic disorders in adult life is also much influenced by factors that operate during pre- and early postnatal development.

In particular, a wrong or inadequate nutritional stimulus

in utero or in the early neonatal life stages may enhance the risk of developing adulthood disease. The risk can remain “hidden” or further increased and triggered to elicit disease later on, depending on the safety, quality of diet and living environment, involving such factors as poor intake of non-essential but beneficial food components (e.g., antioxidant in fruits and vegetables) and enhanced exposure to undesirable compounds (mycotoxins, heavy metals, pesticides, man-made contaminants).

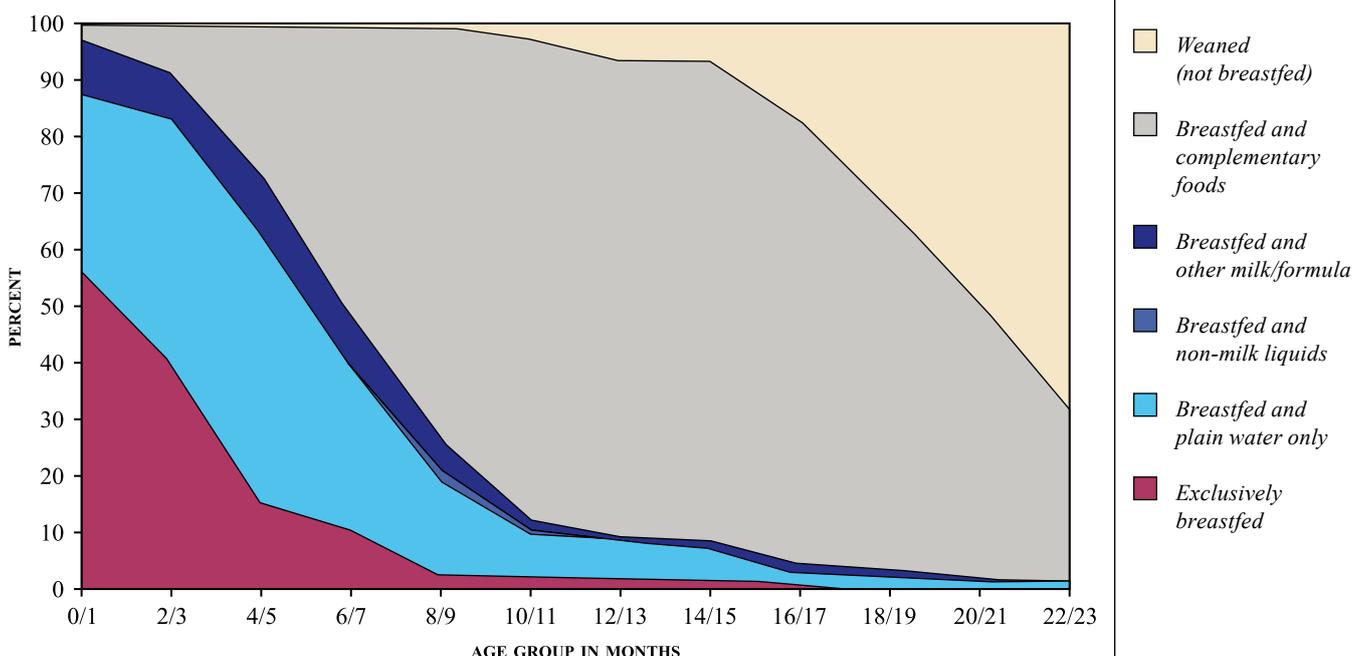
For instance, a strong programming stimulus in later development of diet-induced obesity is the mismatch between the prenatal under-nutrition and postnatal high-fat nutrition. In this case, the trigger may be the alteration of the placental function by some widespread chemical contaminants: one example is Bisphenol A, a constituent of polycarbonate plastic used for packaging of many baby-food products and biberon bottles. The exposure to other triggering substances, such as dioxins, that accumulate in fatty foods, especially of animal origin, could be decreased by selecting lower-fat meats, fishes, poultry, and dairy products.

### 1.2 PAEDIATRIC SUSCEPTIBILITY TO INFECTIONS

Beyond the infectious agent itself, other factors are required to support the onset of an infectious disease, and/or to facilitate its progression or to weaken the effectiveness of immune responses. In particular:

I. Nutritional deficiencies leads to deregulation of response to infection, thereby enhancing the virulence of pathogens; in its turn, infections aggravate micro-

**BREASTFEEDING PRACTICES BY AGE, SENEGAL 2005**



Source: DHS

nutrient deficiencies both by reducing nutrient intake (decreased strength and appetite, increased diarrhoea) and by directly interfering with their metabolism, e.g., viruses in the body using essential minerals for their own purposes.

II. Immunotoxic contaminants (e.g., Aflatoxin B1, produced by microscopic fungi contaminating wheat and grain) can directly impair the immune function; other contaminants (heavy metals, dioxins) can also alter immunity indirectly, causing or exacerbating either primary and secondary nutritional deficiencies,

III. Even in the absence of primary deficiencies in the mother, secondary deficiencies (caused by unbalanced intakes or contaminants) in infants may contribute a less effective innate and adaptive immune responses and increased susceptibility to infections.

### 1.3 BIRTH DEFECTS

Food components have a role in the prevention of birth defects. The most well-known example worldwide is the major preventive effect of an adequate intake of the vi-

tamin folic acid towards neural tube defects (NTDs), a group of severe malformations of the brain and spine. In general, a diet rich in fruits, eggs, but especially green vegetables gives the woman sufficient folic acid: it is important that such healthy diet is taken as a habit before the start of the pregnancy, because NTDs are induced very early in gestation.

NTDs and other malformations are not prevented solely by folic acid. A healthy diet rich in fruits and vegetables, low in fats and sugars as well as composed by foods from unpolluted areas and stores supports a healthy pregnancy. This diet will provide a better intake of preventive nutrients (zinc, inositol) and a lower intake of contaminants (e.g., arsenic, the mycotoxin fumonisin B1) which interfere with the metabolism of folic acid and other nutrients.

Overall, diabetes, obesity, and the excess of food sugars or fats, have been signaled as risk factors for malformations. Thus, when we prevent today the risk of developing obesity and diabetes by healthy and safe nutrition of pregnant women and newborns, we will also protect the health of the future generations fathered by the today's children.

## 2 NOTES ON SENEGALESE DIET

Besides snacks, street cooked food is not marketed; eating is a main component of social life and, even some restaurants along main streets serve travelers, food is preferably cooked at home to be eaten with friends and relatives.

Daily diet is not deficient in calories and proteins; however, especially in rural areas and in the poorest areas of cities, is also less varied, and possibly less rich in trace nutrients, than it would seem at first glance. Fish is mainly consumed dried and, even though diffused, is considered as a cheap food. Palm oil is the widespread vegetable fat for cooking.

Further to the regional ones, all dishes have many variations: the ceebu yapp may also be red, the ceebu ginaar also white, the cu can be prepared with meat, shrimp or bulett (fish balls). The precious coff in the ceebu jén can be replaced with less expensive fish (e.g. the yaboy), the use of vegetables can be limited or, away from the sea, simple dishes of millet and tapioca (manioc starch) are prepared. Noticeably, fruit is not a traditional part of the meal; moreover, it is relatively expensive and especially consumed as canned juice.

Meals are eaten in a single flat dish on the ground,

the guests sit down on the floor or on small stools and eat using the right hand or the spoon.

### 2.1 NDÉKKI LI (BREAKFAST)

For breakfast you eat mainly bread (French baguette) accompanied by tuna (Pinton, a sardine paté produced in Dakar), imported cheese, mayonnaise (in the traditional version or white, made by Fulani with milk and without eggs) or imported margarine and Senegalese chocolate. These foods are available in any boutique (small shop, the equivalent Italian grocery store of several years ago), at least in cities. Also sandwiches with gruyère, beef saucisson or omelette and, since some years, jams of Senegalese production are consumed.

### 2.2 AÑ BI (LUNCH)

Lunch is the main meal and for many Senegalese is equivalent to ceebu jén (rice with fish) with the variation of colour (white or red). In addition to the ceebu jén, ceebu jaga, ceebu yapp (rice with meat), ceebu



>> Senegalese cooking recipes ([www.insenegal.org/20Cucina/](http://www.insenegal.org/20Cucina/)).



ginaar (rice with chicken) and all the ñaari cin, i.e. white rice accompanied by a sauce of meat or fish and vegetables, as: mafe, domoda, yassa jén, yassa ginaar, cu jén, cu diw tiirr, suppokanja, curry.

The rice brisé, whose grains appear very small because broken, is the best for ceebu jén.

### 2.3 REER BI (DINNER)

Lighter and more various dishes are served for dinner: meat, chicken or fish and salads, firir, bulett (fish balls) to eat with bread, risotto-like rice (ceebu toy, such as the daxinn, the mbaxall or the ceebu tatu naar), couscous or pasta (spaghetti or small macaroni) with meat and onions sauce, the supp and the traditional cérè, i.e. Senegalese couscous made from millet that is consumed with a sauce of meat and vegetables or served as a basis for the preparation of desserts.

Sweets can replace dinner or breakfast, for example the lax or the ngallax, or be served during particular periods (e.g. the caakry on nights of Ramadan).

The local fast-food serve hamburgers or chawarma (Arab bread filled with meat cooked on the spit, onions, tomatoes and fried chips); in the dibiteries you can buy beef or lamb meat just grilled and served with mustard and chilli.

### 2.4 LECCANTU (SNACKS)

Peanuts grills in the sand, salted or with sugar (gerte caff o gerte xott o gerte sucar), cashews from the Casamance, fataya, pastel or akra with spicy souce, beñè (sweet), green mango with a little salt or the ce-rises (small green and bitter fruits), tandarm (fresh or dried dates, especially consumed during Ramadan), mboqq (toasted corn cobs).



>> Senegalese cooking recipes ([www.insenegal.org/20Cucina/](http://www.insenegal.org/20Cucina/)).

## 2.5 SOFT DRINKS

The term *boisson* means all American sodas or their Senegalese version, which are sold in all the boutiques.

Local drinks are named *jus* (juice), the most famous is the ice served *bissap* (infusion of red flowers similar to

*karkadé*), but also *daqqar* (tamarindo), ginger (slightly spicy taste), *ditax* juice, the *buy* and cocktails.

Most popular drinks are the *duté* infusion, milk powder and soluble coffee; children add cacao powder to milk; very few use UHT milk. The *Touba coffè* contains *jarr* (a slightly pepper flavoured spice).

The meal ends with *ataya* (tea).

## 3 IMPLICATIONS OF THE “PASTORAL ROOTS” CULTURE ON DIET AND DEVELOPMENT

*Before you cook pap to sell, cook to eat first.*

*local proverb*

One reason for the limited variety of dishes in Senegal may lie in the absence of food recycling. One can think that both climate (over 30°C all the year) and daily availability of food do matter and that the food recycling practice arises in farming cultures that need to optimize resources and save foods for the winter; this cultural framework defines its values in terms of economising behaviours. On the other side, in the pastoral culture the relative abundance (availability of food, dressing and housing) decreases the need of socio-economical development, and storing and recycling have less reason to exist. Thus, in a “pastoral roots” view of the “quality of life”, the food surplus from the meal is not recycled nor saved; it is offered to poorer families or to visitors (who may be migrants, pilgrims, sellers, or even people passing-by). Thus, food offering is part of a series of actions that maintain the social links; visiting and sitting around food or beverages are all-important activities in the Senegalese everyday life. This behaviour receives further support by the bonds and customs created by the Islamic community, which in Senegal, is characterised by the influence of the Mouride brotherhood.

Noteworthy, it should be kept in mind that pastoral social organisation is the basis of the traditional social security functions of the entire community.

Another component is the agricultural structure of Senegal, which pivots on the peanut farming. Monocultural farming, basically linked to the production cycle of a single plant species, is less able to foster a varied side-production accompanied by timely rotation of cultures and food storage. In a country where plantations of peanuts cover 40% of the cultivated lands, the subsistence farming that produces millet, cassava and rice does not receive adequate support and the country is forced to import staple foods. For instance, since the end of the 19th century, when the French colonialists imposed the rise from their settle-

ments in Indochina, rice is often imported from Asia, because local production does not cover national requirements.

Overall, development planning in Africa may have been unsuccessful so far because both pastoral cultural roots and pastoral systems are poorly understood. The assumptions on pastoral production systems as “inert”, “backward” and economically “unreasonable” need to be deeply reconsidered in a framework where labour is cheap, capital is scarce and the infrastructure (including transport) is poorly developed; this is particularly important given the rapidly changing circumstances of pastoral production (from subsistence to commercial production), increasing population load and growing per capita needs.

This changing scenario is related to significant environmental problems linked to increasing pasture and water scarcity. The subsequent environmental degradation -and the accompanying high risk of poor health- can be faced only if fully understood in terms of the current social, economic and political context of production, that aims more at food security rather than at maximising profits.

The context is rooted in the individual/community/food production /environment relationships, as well as on the balance between civilization and progress. In this context, only the understanding of values and goals of pastoral production and viewpoint on life will allow to suggest more appropriate and feasible sustainable food safety initiatives.

## 4 PASTORAL ROOTS AND TODAY DAIRY PRODUCTIONS

Since 2002, Senegal was administratively divided into 11 regions and 34 departments, inhabited by different ethnic groups: the Wolof and Lébou (45%), Pular (25%), the Serer (14%) and other less representative groups (Manding, Socé, Soninké). Of over 10 million people living in the country, more than 2 live in Dakar, the rest in other cities particularly in central and southern zones of Senegal; urbanisation has led the percentage of the population living in cities currently to 41%, of which 54% in Dakar.

The Senegal beef capital was estimated in 2004 to approximately 3 million cattle, which produce a quantity of milk equal to 130 million litres/year. The main breeds are the Zebu Gobra, at the North and the Centre Sahel area of the country, and the N'Dama in the southern areas. Where the two breeds coexist, the Djakoré has developed. Besides bovine milk, there is also some production of goat and ewe milk, but it has a minor role.

Despite attempts to answer with local production to the increasing demand for dairy products, Senegal must import approximately 2/3 of the milk needs, both as milk powder and finished products.

Local milk is sold both raw and transformed into sour curdled milk (lait caillé), yoghurt, and regenerated milk.

Milk powder is the raw material for countless companies that, at various level (handcraft, small transformation industries up to multinationals) turn it into numerous brands, products, and types of packaging (e.g. bags, jars, plastic bottles); between products, the thiacyr (yoghurt and cereals), fondé (millet with yoghurt) and sombi (rice milk).

In the area of extensive pastoral system in the northern pastoral area (Ferlo) and at the Senegal River, farming is characterized by a periodic movement of the herds from the internal area of the Ferlo (Diéri) and the flood region (Walo). The pastoral zone is the only presenting milk production surpluses, but the lack of processing units and their remoteness from large roads and centres of consumption penalize its economic potential. The serious problems related to the system of collection (by foot, bicycle or car, sometimes even over long distances) as well as to the lack of the cold chain makes the number of associations for processing of local milk increasing; some benefit governative support, as in the peanuts area (administrative regions of Diourbel, Louga, Kaolack, Fatick and Thiès). Here, the agro-pastoral system integrates agriculture and breeding, and livestock is intended as investment, savings and workload; peanuts and by-products are used to feed livestock. Also in the South of the country (administrative regions of Tambacounda and Kolda, Ziguinchor) crops of peanuts, rice, cotton and sesame seed integrate N'Dama breeding. Recently, around the major urban centres (Dakar) the

intensive system is developing to meet the increasing demand for local product; noteworthy, the ferme de Niacoulrab and the ferme de Wayembam, both born from private initiatives. In intensive rearing, with predominantly foreign breeds of European origin such as the (local names) Jersiaise, Montbéliarde and Frisone, artificial insemination with imported semen and mechanised milking have developed; here, milk surplus becomes caillé only in more favourable seasons. The price of fresh milk is variable; in large urban markets, price fluctuates between the 450 and 700 cfa per litre, which makes it expensive and a poorly competitive food. Cheese is generally imported from Europe: to date, both dietary habits and cost make it a niche product.

### 4.1 NOMADIC PASTORAL FULANI (MBORORO'EN)

The Fulani (also known as Fulbe or Peuls) are among the most widely dispersed and culturally diverse peoples in Africa. Many Fulani trace their beginnings back one thousand years to the Senegambia area; nomadic, pastoral Fulani (full-time cattle keepers) are called Mbororo'en, whereas the settled Fulani are called Fulbe wuro. The Mbororo'en move about with their cattle for much of the year. They live in small, temporary camps that can be quickly dismantled as they move in search of pasture and water for their herds.

In rural areas, kin groups (lenyol) tend to live close together and join in work efforts, whereas in towns and cities they tend to widely disperse.

The primary goal of pastoral production is subsistence security in the short and long term, which is largely achieved through accumulation of animals, species diversification and maintenance of social ties. Seasonal and annual fluctuations in food supply are coped by hunting wildlife and, where possible,



>> Pastoral Fulani, Chiara Frazzoli for NOODLES © Senegal, 2010.

agricultural foodstuffs (obtained by trade or minimal cultivation).

Further to the need of secure markets to sell animals and purchase foods, the pastoral Fulani are currently facing many problems: i) drought that often reduces water supply and pasture, as well as impairing herd's health; ii) increasingly less land available for herding and iii) increased conflicts with settled people.

Present-day governments are also curtailing the Fulanis' movements or trying to force them to settle down. To respond to adverse socio-economic and environmental conditions, pastoralists in the Senegalese area of Ferlo are re-inventing their livelihoods by increasing their involvement in the national market economy in order to continue a "pastoral way of life".

## 5 APPROACHES TO EFFECTIVE COMMUNICATION ON HEALTHY FOOD PRODUCTIONS AND DIET

In spite of the long-standing conventional belief that they are rich country's diseases, infertility, diabetes mellitus and certain cancers are part of a broader epidemiological transition from infectious/parasitic diseases to non-infectious diseases in Sub-Saharan Countries, including Senegal. A number of factors are causing this transition, including urbanization (sedentary lifestyle, imported food) and preventable factors associated with maternal pre-, peri-, post gestation diet and behaviours. For instance, the benefits and protective effect of eating fresh fruit and vegetables are poorly known.

In general, the integration between food security and food safety can be managed by both promotion of good food chain practices (producing, handling and marketing raw and finished foods) and by consumer education (selecting and cooking foodstuffs). For instance, the widespread use of cooking pots made of tinned copper and the increasing preference towards high meat consumption whilst considering fish as a food for the poor, represent two points where improvements can be driven by consumer education.

Promoting good practice may have a greater impact at short-medium term, but it requires a keen understanding of the system, including the role of street markets and snack sellers; consumer education may be slower to implement (as it is difficult to change habits) but it can be started immediately and it fulfils the citizenship's right of empowerment about her/his own health.

In its turn, empowerment is related to the sustainable food safety framework, which implies promoting prevention of diseases for the generation to come by identifying and managing priority issues for mother-child health. Thus, updated information should be circulated on i) diet of young women before and during pregnancy and breastfeeding; ii) feeding practices for newborn and young children.

Early and exclusive breastfeeding is a highly recommended practice, however, common problems are

identified: throwing away colostrum, the highly nutritious first breastmilk, is common practice in Senegal; also, many mothers gave their infants water to drink in addition to their breastmilk, thus exposing their babies to many possible waterborne diseases and pollutants.

To set up communication plans, the following points should be defined:

- a. the communications strategy;
- b. channels for delivering the messages;
- c. tools.

The following approach should be set up for communication activities in Senegal:

a. communication at the community level through the spreading of informative materials to young women and all those who have contact with mothers and children;

b<sup>1</sup>. direct communication through the empowerment of health operators that give primary health care inputs to mothers. In particular, the Senegalese Association of Midwives, already involved in family planning projects, can reach people in all the Senegalese territory by its network of 650 midwives working in villages, town and cities;

b<sup>2</sup>. implementation of the general health awareness in young generations and families by communication in schools and nurseries;

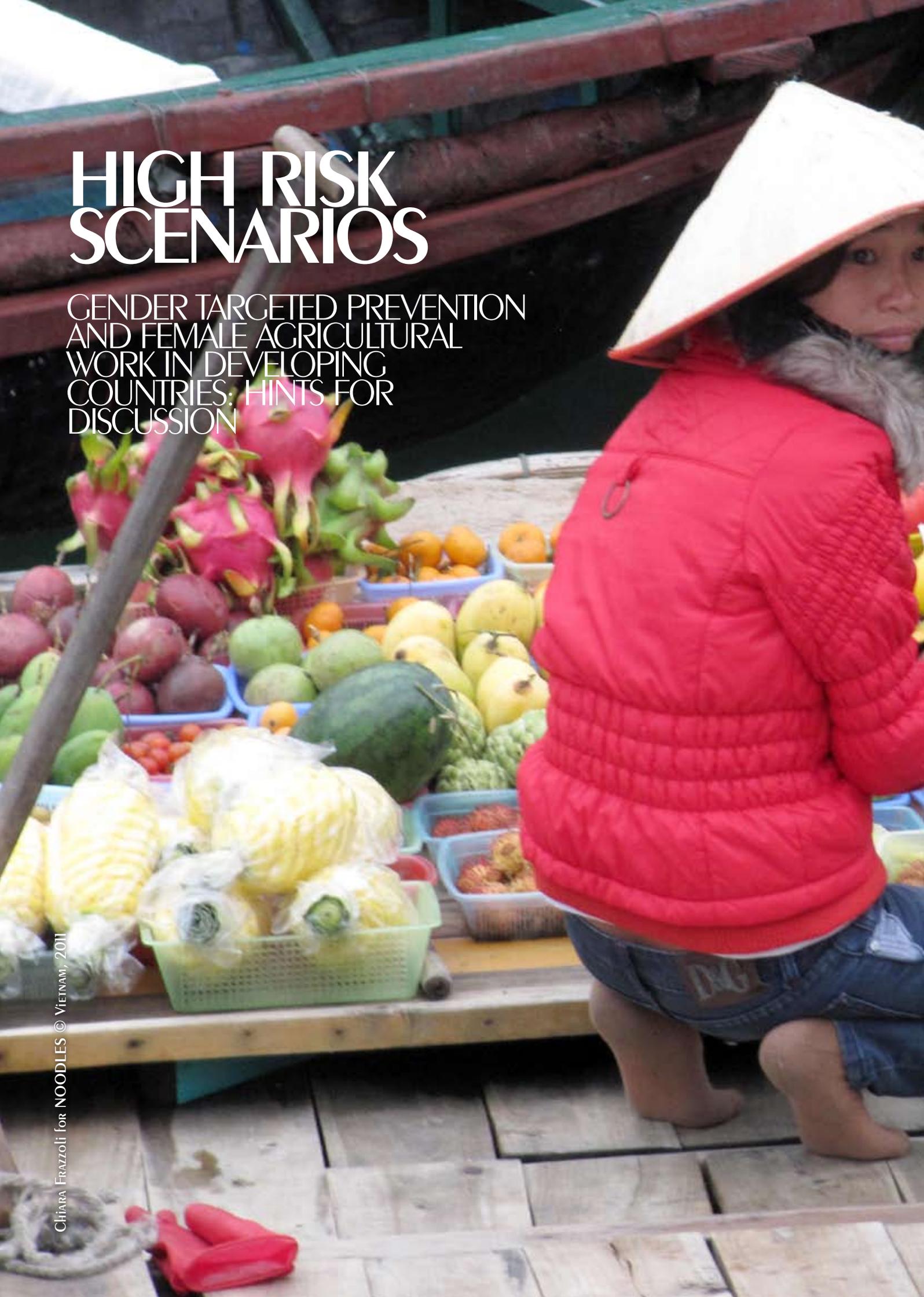
c. meetings and illustrated informative materials.

To effectively promote the awareness and empowerment on health, communication activities and their impact should be periodically revised and discussed with local communities.

**Relevant links**  
[www.iss.it/prvn](http://www.iss.it/prvn),  
[www.cncr.org](http://www.cncr.org),  
[www.insenegal.org/20Cucina/](http://www.insenegal.org/20Cucina/)

# HIGH RISK SCENARIOS

GENDER TARGETED PREVENTION AND FEMALE AGRICULTURAL WORK IN DEVELOPING COUNTRIES: HINTS FOR DISCUSSION





# GENDER TARGETED PREVENTION AND FEMALE AGRICULTURAL WORK IN DEVELOPING COUNTRIES: HINTS FOR DISCUSSION



## SHORT REVIEW

by RAMONA Cipolla  
cipollaramona@libero.it

*Graduated in Industrial and environmental biotechnologies at the Sapienza University of Rome, Italy.*

## PREVENZIONE DI GENERE E LAVORO AGRICOLO FEMMINILE NEI PAESI IN VIA DI SVILUPPO: SUGGERIMENTI PER DISCUTERE

*Generalmente viene prestata poca attenzione ai fattori di rischio professionali nelle economie emergenti e in via di sviluppo a cui sono esposte le donne che lavorano in agricoltura.*

*Queste donne rappresentano un'importante forza lavoro nelle imprese agricole, ma il lavoro nei campi, nelle fattorie, nelle serre, ecc., le espone a diversi fattori di rischio per la salute e questa breve rassegna mira ad individuarli per suggerire spunti di discussione.*

*Anzitutto, l'esposizione ai pesticidi è associata in diversi modi a differenti patologie che possono essere osservate nelle donne che lavorano in agricoltura, come nel caso di specifici problemi respiratori, sviluppo di cancro e infarto del miocardio. Più significativamente, l'esposizione delle donne ai pesticidi può influenzare la loro salute riproduttiva e così comportare il rischio di specifici difetti del neonato (per esempio ipospadia e criptorchidismo), basso peso alla nascita, aborto spontaneo, oltre che il rischio della riduzione della fertilità ed il ritardo del concepimento. I pesticidi sono generalmente necessari nella gestione delle produzioni alimentari ma, per bilanciare i rischi (per la salute) e i benefici (in termini di sicurezza alimentare), il loro uso dovrebbe essere correttamente regolato. Inoltre, l'esposizione ai pesticidi è un esempio significativo delle differenze nella suscettibilità di genere che hanno un ruolo significativo nella vulnerabilità agli effetti provocati dalle sostanze tossiche e, quindi, della necessità di prevenzione mirata al genere.*

**SUMMARY:** Scant attention is generally paid in developing and emerging economies to the occupational health risk factors that women working in agriculture are exposed to. Women are an important labour force in agro-enterprises, but the work in the lands, farms, greenhouses, etc., exposes them to several health risk factors and this brief review aims at identifying them to give hints for discussion. First of all, exposure to pesticides has been in different ways related to the development of several diseases that can be observed in women engaged in agriculture, for example in the case of specific respiratory problems, development of cancer and myocardial infarction. Most significantly, the exposure of women to pesticides may affect their reproductive health and this may imply risk of specific defects of the newborn (e.g., hypospadias and cryptorchidism), low birth weight, spontaneous abortion, as well as the risk of decline in fertility and delay in conception. Pesticides are generally necessary in the management of food productions but, for to balance of (health) risks and (food security) benefits, their use should be regulated properly. Moreover, pesticides exposure is a telling example of differences in gender susceptibility playing significantly in vulnerability to toxicants outcomes and, therefore, of the need of gender-targeted prevention.

# 1 PESTICIDE EXPOSURE: A GENDER ISSUE

Compared to developed countries, agriculture in developing countries is widely practiced by women, exposing them to more risk factors typical of this activity, such as exposure to pesticides. As a general trend, when considering living/residential places, rural areas are generally characterized by a more healthy environment than cities, and this seems explain, e.g., the lower incidence of several types of cancer, such as lung, colon-rectal, and ovarian cancer (Wang *et al.*, 2002).

On the other hand, when considering rural sites as working places, the use of pesticides in agriculture is very common and represents the main risk factor for the health of farm workers. From this point of view, the expectancy of healthy life of farm workers changes, as evidenced by data extrapolated from several studies. In their case-control study (2005), for instance, Mills and Yang found that breast cancer is higher among women exposed to different pesticides, including insecticides malathion and chlordane and 2,4-D.

The use of pesticides is also related to some respiratory diseases, because the respiratory system of occupationally exposed people, together with their skin and face, is directly in contact with these substances. According to Hoppin *et al.* (2007), a positive relationship exists between exposure to pesticides and the incidence of atopic asthma in farm women. This is confirmed in the case of exposure to 2 herbicides (2,4-D and glyphosate), 7 insecticides (carbaryl, DDT, malathion, parathion, coumaphos, permethrin and phorate) and 1 fungicide (metalaxyl).

Valcin *et al.* (2007) show respiratory complications among non-smokers female farmers exposed to pesticides; in particular, 5 types of pesticides (DDT, Cyanazine, paraquat, methyl bromide and dichlorvos) are responsible for the development of chronic bronchitis.

Dayton *et al.* (2010) studied the relationship between the use of pesticides and incidence of myocardial infarction among women working in agriculture. In general, no association was found with the use of pesticides, but in some cases there was a significant association between exposure to insecticides such as chlorpyrifos, coumapos, carbofuran, or the fungicide metalaxyl or pendimethalin and trifluralin herbicide and myocardial infarction.

The effects of pesticides may be influenced by gender. These data are not sufficient to conclude that exposure to certain chemicals be related to female gender. Even experimental data and assessments from international agencies are available, only epidemiological studies are reported here, with the awareness that the methodology of epidemiological studies (health outcomes in real life conditions) makes it difficult by definition to specifically link exposure to (generally multifactorial) health outcomes. However, these data provide

some useful information about it.

Various biological factors may influence the toxicity differently in men and women. In this last case, for example, these differences can be linked directly or indirectly through effects on reproductive hormones. Consequently, women of reproductive age exposed to pesticides may be subject to adverse effects on their health and the health of the offspring, resulting in a mothers to child health flow.

## 1.1 WOMEN'S REPRODUCTIVE HEALTH AND MOTHERS TO CHILD HEALTH FLOW

The relationship between occupational exposure to pesticides and the adverse effects on reproductive health, has been widely studied. Adverse effects include spontaneous abortions, low birth weight and specific birth defects of the infants exposed during intrauterine life; infertility and delayed conception are other reproductive effects, as reported in the following.

### Spontaneous abortion

It's important to emphasize that women working in greenhouses suffer various adverse reproductive health effects, probably due to their exposure to pesticides, which in this closed environment is intense and continuous. Epidemiological studies of occupational exposure to pesticides have repeatedly highlighted the risk of spontaneous abortions.

One of the first studies (Restrepo *et al.*, 1990) examined the reproductive history of female workers in floriculture and wives of greenhouses workers in Colombia; this study has shown that the use of pesticide increases the number of spontaneous abortions, especially among women directly exposed.

These initial data are confirmed today by more recent studies. For instance Petrelli *et al.* (2003) found the association between exposure to specific pesticides, including endocrine disruptors chemicals, in greenhouses workers and the miscarriages of the wives of workers. This study registered an increase in the number of miscarriages among workers exposed to atrazine, benomyl-carbendazim, carbaryl and DDT, compared to the group of wives of men occupationally unexposed. This suggests that both male and female exposure to pesticides, especially if they are able to interfere with the endocrine system, may cause adverse effects on the reproductive health in terms of spontaneous abortion.

### Low birth weight

Low birth weight (LBW) is a sensitive indicator of general health and nutrition of the mother, as in the

case of anemia, and it tightly associated with the level of education and social class. For this reason, studies in agricultural workers often fail achieving net results.

The study by Jusko *et al.* (2006), for example, examined the concentration of Dichlorodiphenyldichloroethane (DDE) and Dichlorodiphenyltrichloroethane (DDT) in maternal serum and infant weight at birth and at 5 years. In this case it was not found an association between fetal growth or early childhood and exposure to pesticides, but according to Rylander *et al.* (2000), there is a clear association between risk of low birth weight and high consumption of fish contaminated with persistent organic pollutants.

Studies examining the association between maternal exposure to pesticides and low birth weight provides sometimes conflicting results. Recent studies have defined exposure through maternal biological monitoring. The study by Sathyanarayana *et al.* (2010) examined LBW among female pesticide applicators and women married to pesticide applicators. On average, the weight at birth is 3586 (+/- 546 g) but 3% of newborns have low birth weight (<2500 g). Author reports no association with low birth weight if exposure to pesticides occurs in the first trimester of pregnancy. Anyway, this does not guarantee the absence of negative effects in terms of birth weight, because of the difficulty in obtaining specific data of exposure time to individual pesticides before and during pregnancy. This study also states that exposure to carbaryl, however, leads to a reduction in birth weight, in average of about 82 g.

Therefore, this study emphasizes that it is not possible to draw certain conclusions between exposure in specific time windows and the resulting effect.

### Birth defects

Currently the research is very active to define the effects of pesticides that can act on the endocrine system by interfering with fetal development during pregnancy, causing Testicular Dysgenesis Syndrome (TDS) or rather male genital tract defects. In particular, the TDS is represented by hypospadias (incomplete development of the urethra), and cryptorchidism (the failure of descent of one or both testicles in the scrotal sac).

In particular, an increased incidence of hypospadias and cryptorchidism was found among those born from mothers exposed to EDCs (chemicals that interfere with hormonal pathways) (<http://www.iss.it/inte/>; Giordano *et al.*, 2010; Carbone *et al.*, 2006; <http://www.iss.it/prvn/divu/cont.php?id=273&lang=1&tipo=2>). A descriptive study (Carbone *et al.*, 2006) on the prevalence of malformations following exposure to pesticides, detects that cryptorchidism are higher among children born from female agricultural workers or men in contact with pesticides.

To study the role of exposure to pesticides on malformation outcomes as hypospadias, Giordano *et al.* (2010) analyzed the concentration of some pesticides in serum of primiparous mothers. The levels of hexachlorobenzene are higher in the sera of mothers

with children affected by hypospadias than controls, with a statistically significant difference. They also assessed concentrations of DDE and it was noted that although the concentrations of DDE were slightly higher in mothers of "cases", the difference was not statistically significant.

### Delay in conception

In a retrospective study (Rosano *et al.*, 2009) to investigate the reproductive health of women occupationally exposed to pesticides in greenhouses, it was found that the greater alteration is a decrease in fertility, as measured by the delay in conception (TTP: time to pregnancy). The average TTP among female and male exposed to pesticides was 8.0 months (+/- 1.3), while 4.1 months (+/- 0.7) among non-exposed; the risk of having a TTP greater than 6 months is higher in women exposed to pesticides and even higher among women more exposed. Overall, these results show a reduced fertility in terms of TTP for women occupationally exposed, and higher for those who are exposed to higher doses in longer periods of time. Obviously other factors may be involved to contribute the delay in conception, but the occupational exposure is a very critical factor in reproductive health.

### Exposure to pesticides through breastfeeding

Occupational exposure to pesticides increases the risk of mother-child transfer of toxic compounds and the severity of this condition is even more clear when the non-occupational exposure of the general population is analyzed. The uncontrolled use of pesticides can harm not only women who apply them, but also women indirectly exposed by living in rural areas.

In developing/emerging countries pesticides are widely used to control pests. For example, organochlorine compounds (OCs) are widely used for malaria control and sanitary purposes and nowadays they are ubiquitous in environment and biota.

Several studies have found high levels of OCs as DDT and metabolites in breast milk from mothers living in Mexico (Waliszewski *et al.*, 1999), Thailand (Stuetz *et al.*, 2001), Guangzhou in China (Wong *et al.*, 2002), and Vietnam (Minh *et al.*, 2004) due to continuous exposure to DDT used for malaria control until the end of the 1990s. For example, for agricultural and malaria eradication control programs India has applied more than 100,000 tons of DDTs in the past, until it was banned for use in agriculture in 1989. Nevertheless, the mothers of the Chennai city (South India) have higher levels of DDT and HCH in breast milk than a decade ago, despite the prohibition of using these chemicals in the country (Subramanian *et al.*, 2007).

Mishra *et al.* (2011) examined DDTs and HCHs in human breast milk in two districts of Assam (North-east India) and they found a daily intake of these OCs exceeded the standards in 100% individuals for HCH and 21 and 24% for DDT in Dibrugarh and Nagaon districts, respectively. According ADI (acceptable daily intake) values, general population of North-east India is potentially at the high risk of OCs contamina-

tion. These and other studies on environmental and biotic matrices have shown that India is a prominent source for HCH pollution. However, the use of HCH in agriculture was also banned in 1997 in India although in this country it is produced yet  $\gamma$ -HCH in large scale.

Ennaceur *et al.* (2008) analyzed human breast milk samples of non-smokers Tunisian mothers without occupational contact with OCs to evaluate the risk of OCs significant presence in infants. In general, the concentrations of OCs followed this order: DDTs (dichlorodiphenyltrichloroethane and its metabolites) >

PCBs (polychlorinated biphenyls) > HCB (hexachlorobenzene) > HCH (hexachlorocyclohexane) > Dieldrin. The comparison of DDTs, HCHs, and HCB residues collected from urban and rural areas shows that DDTs concentrations are significantly higher in rural areas than those in urban areas indicating important exposure in rural locations due to intensive use in agricultural activities. As expected, concentrations of OCs in human breast milk of primipara mothers were higher than those in multipara mothers, due to previous lactation that reduce the mother body burden (Frazzoli *et al.*, 2009).

## 2 MITIGATION MEASURES TO DECREASE PESTICIDE EXPOSURE: EDUCATIONS, REGULATIONS AND ROLE OF ENTERPRISE.

A factor exacerbating pesticide exposure during pregnancy is the lack of protective equipment such as gloves, masks and coveralls, that in developing countries is almost never possible.

Obviously, behaviour is also important to mitigate the exposure; for example, changing and cleaning working clothes frequently. In fact, women can be exposed to pesticides even through their own and their partner working dirty clothes.

Exposure to pesticides can occur also directly to the offspring of agricultural workers: in fact, children may come into contact with contaminants by playing with dirty clothes of parents, or through the parent-child contact after returning from work. It also occur that mothers carry their babies on their backs during their working time.

The study by McCauley *et al.* (2001) shows that only 18% of workers use protective clothing, while 75% use it but goes back home with the same working clothes and only 33% change clothing after an hour and half after.

The exposure to pesticides can be achieved in different ways. Besides the lack of use of personal protective equipment, exposure can be achieved even when the farmers are unaware of the dangers that these substances cause. In developing countries, many pesticide poisonings occur than other countries. The study of Ngowi *et al.* (2002) in Tanzania has assessed the work of agricultural extension experts (such as district agricultural officers, assistant agricultural officers, agricultural assistants, and field assistants, working in the coffee and cotton growing areas) in relation to health effects of pesticides for developing strategies for the control of pesticide exposure and prevention of pesticide poisoning. The survey indicated that the knowledge

of extensionists on pesticide poisoning was inappropriate, whereas the majority of them showed awareness of potential health hazards of the different pesticides used in their service areas.

According to Ajayi *et al.* (2011) cotton farmers in Cote d'Ivoire suffer occupational health hazards from exposure to agricultural pesticides, as headache, rheum, cough, skin rash and sneezing. Although the applicators know that pesticides are toxic substances, in cases of poisoning only 2% of cases occur in medical assistance.

Therefore, protection against occupational exposure to pesticides is different from country to country. This probably depends on factors such as socio-economic level of development of the country, because the combination of factors, such as poor law, poverty and illiteracy are the main causes that increase health risk, reproductive health and not only.

Furthermore, exposure to pesticides may be curbed by adopting good working practices as directed by the HACCP system to avoid the exposure to pesticides of the general population that, although not occupationally exposed, may be exposed through contaminated foods.

Finally, strong support can come from the regulations that should require the replacement of toxic pesticides found. For example, doctors and Argentine citizens require a reevaluation of agro-toxic (EQUIVITA, 2011) by the institutions because only in Argentina are reversed each year (mostly by air) 340 million liters of pesticides because they are considered moderately toxic for human health, in contrast to what they really are. For example, unlike the data of LD50, glyphosate is very toxic to

reproductive health. Also, although the WHO considered paraquat, endosulfan and dimethoate as moderately hazardous pesticides, the human data show that suicidal acts are extremely dangerous and should limit its use around the world.

Moreover, to improve chemicals management and safety in the 1960s was adopted the Stockholm Convention to eliminate the release of 12 POPs (persistent organic pollutants, including certain pesticides even). Within the framework of the Africa Stockpiles Program (ASP), some pesticidal POPs have been completely or partially destroyed in certain African countries, e.g. Egypt, Namibia, Niger, Senegal, Seychelles, South Africa, Sudan, Tanzania, Uganda, Zambia. However, according

to Mansour SA (2009) the elimination of POPs obsolete in Africa requires coordination between all governments and alternative control measures for the management of vector-borne diseases such as mosquito.

Furthermore, the role of enterprise is important in determining the intensity of exposure to pesticides. As reported by Oxfam (2011), exposure to pesticides is often related to farming size. For instance, large monoculture farming requires greater use of technologies such as fertilizers and pesticides along with other actions like greater demand for water resources, deforestation, loss of biodiversity, etc, than small scale farming, as summarized in Table 1.

Objective	Detailed info	Small scale agriculture	Large scale agriculture
 <b>Marketing efficiency</b>	Economies of scale	⊖	⊕
 <b>Use of technology</b>	e.g. fertilisers, agrochemicals, irrigations	⊖	⊕
 <b>Maintain biodiversity</b>		⊕	⊖
 <b>Environmental cost</b>	e.g. water contamination, soil degradation	⊖	⊕
 <b>GHG emissions Reduction</b>		⊕	⊖

>> Table 1  
Small-scale versus large-scale agriculture (adapted from Oxfam Research Report, April 2011)

Consequently, depending on the type of enterprise, agricultural female workers may be exposed to different intensity of risk factors and this should be considered by the regulations should avoid the uni-

form use of pesticides on the ground and powdery formulation and promote their targeted use reducing the quantity released into the environment and human exposure.

## 3 ANOTHER RISK FACTORS: ERGONOMICS AND MENTAL HEALTH

Moreover, even under the ergonomic viewpoint specific outcomes should be assessed and managed, such as a certain tendency to accidents due to the use of agricultural equipment and livestock rearing, but mainly to working hours and physical fatigue. In fact, agricultural work exposes farmers to many dangers, and often different from those of other working environments. For example, the risk factors of main accidents to which women are exposed represented by long working days and co-habitation with animals (Stueland *et al.*, 1997). Another study estimated that the incidence of injuries among farm women is 5% and is higher in spring and in summer (Carruth *et al.*, 2001). The parts of the body most commonly affected are the lower limbs and the main causes are the contact with substances or objects, falls, lifting or towing of objects above their forces. Other ergonomic problems are persistent weakness or backache, driving a tractor and the transport of agricultural products to the market. In terms of mental and physical health, life in rural areas or on farm seems to be positive to health; at a deeper insight, stress faced by agricultural workers can contribute developing psychological problems such as depression (Carruth and Logan, 2002). Ag-

ricultural labour is one of the most dangerous and strenuous work and farm-related stress affects both men and women.

Agricultural workers have generally pivotal responsibilities (e.g., financial, organizational) that can contribute to the general health status with stress and depression; all these possible outcomes may be worsened by the exposure to pesticides. Beseler *et al.* (2006) found that poisoning by pesticides may contribute to the risk of depression. Most of the wives of the applicators of pesticides whom were diagnosed depression had been in contact with a high dose of pesticides.

Exposure to pesticides was also analyzed in terms of ability to trigger suicidal behavior in different professional tasks (Stallones, 2006). The data from this study show that suicidal behavior has been achieved among men and women who get in contact with pesticides in agriculture (agricultural workers, inspectors of agricultural products, farm managers, farmers in the greenhouses, gardeners and forestry agents). In addition, there was a greater tendency to suicide among women exposed to pesticides in different professional tasks than men.

## 4 FINAL CONSIDERATIONS

Among risk factors of agricultural work, some are typical (e.g. ergonomic factors as physical fatigue and injuries) and some others are new and due to modern farming and agricultural labour, such as exposure to pesticides whose effects may act in different aspects of reproductive, respiratory, cardiovascular, and mental health.

When risk factors are out of control, the agricultural work is not only physically and psychologically heavy, but may also significantly impair health and health chances of pregnancy following the so-called mother-to-child health flow, from in utero life to infancy. These aspects mirror are close to the Sustainable Food Safety approach and should draw more attention from Public Health managers and involve primary producers, whose role in prevention strategies is pivotal.

Pesticides are generally necessary in the management

of food productions but, for to balance of (health) risks and (food security) benefits, their use should be regulated properly, specially considering women in childbearing age. Epidemiological studies indicate which pesticides represent a risk (toxicity vs. exposure) to the health of women working in agriculture, and these substances should be replaced by less toxic compounds or be better managed. Noticeably, data gap emerges from developing economies. Research is expected to fill the literature gap related specifically to women as agricultural labours and to increasingly collaborate with enterprises to meet feasible and effective mitigation measures and properly communicate with risk assessors and risk managers for integrated and modern Public Health.

## REFERENCES

Ajayi, Akinnifesi, Sileshi (2011) Human health and occupational exposure to pesticides among smallholder farmers in cotton zones of Côte d'Ivoire. *Health 3* Vol.3, No.10, 631-637.

Beseler C., Stallones L., Hoppin J.A., Alavanja M.C., Blair A., Keefe T. and Kamel F. (2006). Depression and pesticide exposures in female spouses of licensed pesticide applicators in the agricultural health study cohort. *J Occup Environ Med.*, 48(10):1005-13.

Carbone P., Giordano F., Nori F., Mantovani A., Taruscio D., Lauria L. and Figà-Talamanca I. (2006). The possible role of endocrine disrupting chemicals in the aetiology of cryptorchidism and hypospadias: a population-based casecontrol study in rural Sicily. *Int J Androl.*, 30(1):3-13. Epub 2006 Jul 4.

Carruth A.K. and Logan C.A. (2002). Depressive symptoms in farm women: effects of health status and farming lifestyle characteristics, behaviors, and beliefs. *J Community Health*; 27(3):213-28.

Carruth A.K., Skarke L., Moffett B. and Prestholdt C. (2011). Women in agriculture: risk and injury experiences on family farms. *J Am Med Womens Assoc.*, 56(1):15-8.

Dayton S.B., Sandler D.P., Blair A., Alavanja M., Beane Freeman L.E. and Hoppin J.A. (2010). Pesticide use and myocardial infarction incidence among farm women in the agricultural health study. *J Occup Environ Med.*, 52(7):693-7.

Ennaceur S., Gandoura N. and Driss M.R. (2008). Distribution of polychlorinated biphenyls and organochlorine pesticides in human breast milk from various locations in Tunisia: Levels of contamination, influencing factors, and infant risk assessment. *Environmental Research*, 108:86–93.

EQUIVITA (2011)

<http://www.equivita.it/index.php/it/component/content/article/12-comunicati/401-comunicato-310711>

Frazzoli C., Petrini C. and Mantovani A. (2009). Sustainable development and next generation's health: a long-term perspective about the consequences of today's activities for food safety. *Ann Ist Super Sanità*, 45 (1):65-75.

Giordano F., Abballe A., De Felip E., di Domenico A., Ferro F., Grammatico P., Ingelido A.M., Marra V., Marrocco G., Vallasciani S. and Figà-Talamanca I. (2010). Maternal exposures to endocrine disrupting chemicals and hypospadias in offspring. *Birth Defects Res A Clin Mol Teratol.*, 88(4):241-50.

Hoppin J.A., Umbach D.M., London S.J., Henneberger P.K., Kullman G.J., Alavanja M.C. and Sandler D.P. (2007). Pesticides and atopic and nonatopic asthma among farm women in the Agricultural Health Study. *Am J Respir Crit Care Med.* 2008 Jan 1;177(1):11-8. Epub 2007 Oct 11. ISS Endocrine disruptors  
<http://www.iss.it/inte/>

ISS Progetto PREVIENI

<http://www.iss.it/prvn/divu/cont.php?id=273&lang=1&tipo=2>

Jusko T.A., Koepsell T.D., Baker R.J., Greenfield T.A., Willman E.J., Charles M.J., Teplin S.W., Checkoway H. and Hertz-Picciotto I. (2006). Maternal DDT exposures in relation to fetal and 5-year growth. *Epidemiology*, 17(6):692-700.

McCauley L.A., Lasarev M.R., Higgins G., Rothlein J., Muniz J., Ebbert C. and Phillips J. (2001). Work characteristics and pesticide exposures among migrant agricultural families: a community-based research approach. *Environ Health Perspect*, 109(5): 533–538

Minh N.H., Someya, Minh T.B., Kunisue T., Iwata H., Watanabe M., Tanabe S., Viet P.H. and Tuyen B.C. (2004). Persistent organochlorine residues in human breast milk from Hanoi and Hochiminh city, Vietnam: contamination, accumulation kinetics and risk assessment for infants. *Environmental Pollution*, 129:431–441.

Mills P.K. and Yang R. (2005). Breast cancer risk in Hispanic agricultural workers in California. *Int J Occup Environ Health*. 11(2):123-31.

Mishra K. and Sharma R.C. (2011). Assessment of organochlorine pesticides in human milk and risk exposure to

infants from North-East India. *Science of the Total Environment*, 409:4939–4949.

Mansour S.A. (2009). Persistent organic pollutants (POPs) in Africa: Egyptian scenario. *Hum Exp Toxicol*. 28(9):531-66.

Ngowi A.V., Maeda D.N. and Partanen T.J. (2002). Knowledge, attitudes and practices (KAP) among agricultural extension workers concerning the reduction of the adverse impact of pesticides in agricultural areas in Tanzania. *Med Lav.*, 93(4): 338-46.

Oxfam (2011) Research Report: Who will feed the world?  
<http://www.oxfam.org/en/grow/policy/who-will-feedworld>

Petrelli G., Figà-Talamanca I., Lauria L. and Mantovani A. (2003). Spontaneous abortion in spouses of greenhouse workers exposed to pesticides. *Environ Health Prev Med*. 8(3):77-81.

Restrepo M., Muñoz N., Day N., Parra J.E., Hernandez C., Blettner M. and Giraldo A. (1990). Birth defects among children born to a population occupationally exposed to pesticides in Colombia. *Scand J Work Environ Health*, 16 (4):239-46.

Rosano A., Gemelli V., Giovannelli C., Paciotti G., Sabatucci A. and Spagnolo A. (2009). Fertility changes in women working in greenhouses.[Article in Italian]. *Med Lav.*, 100(6):448-54.

Rylander L., Strömberg U. and Hagmar L. (2000). Lowered birth weight among infants born to women with a high intake of fish contaminated with persistent organochlorine compounds. *Chemosphere*, 40(9-11):1255-62.

Sathyanarayana S., Basso O., Karr C.J., Lozano P., Alavanja M., Sandler D.P. and Hoppin J.A. (2010). Maternal pesticide use and birth weight in the agricultural health study. *J Agromedicine*, 15(2):127-36.

Stallones L. (2006). Suicide and potential occupational exposure to pesticides, Colorado 1990-1999. *J Agromedicine*, 11(3-4):107-12.

Stueland D.T., Lee B.C., Nordstrom D.L., Layde P.M., Wittman L.M. and Gunderson P.D. (1997). Case-control study of agricultural injuries to women in central Wisconsin. *Women Health*. 25(4):91-103.

Subramanian, Ohtake, Kunisue, Tanabe (2007). High levels of organochlorines in mothers' milk from Chennai (Madras) city, India. *Chemosphere*, 68; 928–939.

Stuetz W., Prapamoto T., Erhardt J.G. and Classen H.G. (2001). Organochlorine pesticide residues in human milk of a Hmong hill tribe living in Northern Thailand. *The Science of the Total Environment*, 273; 53-60.

Valcin M., Henneberger P.K., Kullman G.J., Umbach D.M., London S.J., Alavanja M.C., Sandler D.P. and Hoppin J.A. (2007). Chronic bronchitis among nonsmoking farm women in the agricultural health study. *J Occup Environ Med.*, 49(5):574-83.

Waliszewski S. M., Aguirre A. A., Infanzon R. M., Benitez A. and Rivera J. (1999). Comparison of Organochlorine Pesticide Levels in Adipose Tissue and Human Milk of Mothers Living in Veracruz, Mexico. *Bull. Environ. Contam. Toxicol.*, 62:685-690.

Wang Y., Lewis-Michl E.L., Hwang S.A., Fitzgerald E.F. and Stark A.D. (2002). Cancer incidence among a cohort of female farm residents in New York State. *Arch Environ Health*, 57(6):561-7.

Wong C.K.C., Leung K.M., Poon B.H.T., Lan C.Y. and Wong M.H. (2002). Organochlorine Hydrocarbons in Human Breast Milk Collected in Hong Kong and Guangzhou. *Arch. Environ. Contam. Toxicol.*, 43:364–372.

# AWARENESS RAISING

PUBLIC HEALTH INFORMATION  
AND COMMUNICATION IN  
CAMEROON:  
A DIAGNOSTIC OF THE SITUATION



# PUBLIC HEALTH INFORMATION AND COMMUNICATION IN CAMEROON: A DIAGNOSTIC OF THE SITUATION



## FIELD ACTIVITY

by Guy BERTRAND POUKAM  
guy.pouokam@noodlesonlus.org

*Post Graduate Diploma in Biochemistry, University of Yaoundè, Cameroon.*

## LA COMUNICAZIONE IN SANITÀ PUBBLICA IN CAMERUN: UNA DIAGNOSI DELLA SITUAZIONE

*La prevenzione è la pietra angolare di ogni strategia di sanità pubblica. La comunicazione e la promozione della salute è tutto ciò che concerne lo scambio di informazioni sulla salute, offrendo prodotti e servizi per correggere i comportamenti delle persone e migliorare la salute pubblica. Il sistema di comunicazione in Camerun è in rapida crescita e offre numerosi strumenti per raggiungere la popolazione di interesse. Purtroppo, questi strumenti sono ancora sottoutilizzati dai professionisti della sanità pubblica.*

*L'esperienza di Noodles nella diffusione delle informazioni circa i potenziali effetti per la salute del Bisfenolo A presente nei biberon in Camerun ha rivelato alcune difficoltà nell'effettuare campagne di comunicazione attraverso i mass media. Nonostante queste difficoltà, l'ambiente della comunicazione rimane favorevole ed è necessario maggiore sforzo per intraprendere azioni appropriate per attività efficaci di prevenzione sanitaria.*

**SUMMARY:** Prevention is the corner stone of any public health strategy. Health communication and marketing is all about exchanging health information, delivering products and services to correct people behaviors and ameliorate public health outcomes. The communication system in Cameroon is fast growing and provides numerous tools to reach the target audience. Unfortunately, these tools are still underexploited by public health professionals.

Noodles experience in spreading information around potential health effects of Bisphenol A baby bottles in Cameroon revealed some difficulties to carry out communication campaign through mass media. Despite these difficulties, communication environment remain conducive and more effort should be done to take appropriate actions for effective health preventive activities.

## INTRODUCTION

Health communication is defined at the school of public health and health services (Georges Washington University) as “the production and exchange of information to inform, influence or motivate individual, institutional and public audiences about health is-

sues.” In essence, it’s about the message and successfully getting it out; while public health marketing in essence is about developing and successfully delivering products and services that help target audience members live more healthfully.

This underlines the importance of building adequate, understandable and careful design strategies to deliver the message. Of course, this message becomes useful only if put into actions and bring change.

At each step, there are varieties of channels that must be considered when communicating with stakeholders, from face-to-face to mass communications. The social contexts in which health communication occurs are also widely varied and can include homes, schools, restaurants, workplaces.

The recent explosion of ICT tools (Information and Communication Technologies) as online support groups, web portals, tailored information systems, telehealth centers, electronic health records, social networking and mobile devices is an unexpected opportunity to empower media as a whole and health communication. In the following lines, we will revisit Cameroon legal texts organizing communication activities, communication environment and existing opportunities to spread public health messages.

# 1

## MEDIASCOPE

Article 1 of the general provisions of Cameroon's 1990 Freedom of Social Communication law<sup>1</sup> and the 1996 revised constitution both guarantee freedom of the press.

Article 2(1) of the 1990 law stipulates that freedom of communication applies to all forms of communication.

However, at present, there is no specific law mandating access to information (Republic of Cameroon, 1990b; 1996b). A number of others provisions exist in relation to media regulation, but there is no provision for an independent media regulator. The main regulatory bodies are the Cameroon Media Council (CMC) and the National Communications Council (NCC), their still to make their impact felt. While the former is answerable to the Minister of Communication, the latter answers to the Prime Minister.

There are no current provisions that aim to secure the independence of state-owned media.

A share public opinion is that state media, in their mission of providing public services, rely more on official information, other sources of information are control and filter to verify their conformity to government exigencies before public diffusion. Because of this, they are considered to be pro-government. The 2000 Decree on Private Audio-Visual Communication Enterprises (private media) authorized the creation of both community and alternative media (Republic of Cameroon, 2000a)<sup>2</sup>. A 2002 Ministerial Order further supported development of a community sector by providing for public assistance to private communication (Republic of Cameroon, 2002b)<sup>3</sup>. It should be noted that the assistance given by the Ministry of Communication to private media houses has not been accompanied by attempts to exert government control.

More than 200 press enterprises are functional in Cameroon (Newspapers, Radios, and Television). Televisions and radio channels are on satellite and are

received worldwide for a good number of them. Cameroon has many journalist associations that work for the wellbeing of its practitioners. The most outstanding to cite a few are Cameroon Union of Journalist (UJC), Cameroon Association of English Speaking Journalist (CAMASEJ), Cameroon Association of Sports Reporters, Cameroon Association of Commonwealth Journalists (CACOJ) etc.

According to the last estimate from the UJC, in 2005 there were 874 practicing journalists in the country: 183 women and 691 men (UJC, 2005); 21% of the country's journalists are female and 79% male<sup>3</sup>.

Practicing journalists are expected to register with the government. A 2002 Decree established a press card system for registered journalists (Republic of Cameroon, 2002c). To obtain a press card a journalist must prove to belong to a legal media house or a media organization. Only journalists who own a press card are allowed access to cover public events related to the state<sup>4</sup>.

There is one vocational journalism school, the Advanced School of Mass Communication, based in Yaoundé. There are also three university departments offering journalism programs, two of which are private institutions (Siantou Supérieure and Institut Ndi Samba), and the third is a public institution (Department of Journalism and Mass Communication, University of Buea).

In addition, some NGOs provide journalism training, such as UNESCO, Friedrich Ebert Stiftung (FES), and the British Council in collaboration with the Thompson Foundation.

Publications are done in English, French or in both languages; they are release daily, weekly, twice a week or monthly. The main press distributor is a French base company "Messapresse" with Headquarters in Douala. Not all papers are circulated by the company; others used their personal network connections.

Despite the impressive growth in the radio sector (about 100 stations between 2000 and 2010), no private radio services has been established at national level, leaving the state-run station (Cameroon Radio Television, CRTV) a national footprint. Apart from CRTV, Others international stations having a footprint are the French station Radio France International (RFI), The British Broadcasting Corporation (BBC), and the African service (Africa No 1).

National internet coverage area is more than 50% with the optic fibers. With this, Cameroon is experiencing an explosion of online media. Almost all newspaper has online edition, besides this others newspapers published exclusively online, on their website or sent into register members' email address. These newspapers for the majority covers general topics, while spe-

cialized ones covers topics on economy, law, women actuality and celebrities, but none in public health.

Three mobile phone operators also supply mobile phone services as far as in rural communities, making internet services accessible in the whole territory via computers and mobile phones. Despite the cost of this service relatively high for a good fraction of the population, its remains a wonderful communication opportunity to reach the final target who is the consumer. The number of people using social network, especially in the youth population is exponentially growing. Unfortunately, no public health newspaper or magazine printed or online exist to take advantage of this environment.



## 2 THE PUBLIC HEALTH SECTOR

Despite the growing communication facilities, no specialized health newspaper or magazine exist among the hundreds periodic published nationwide. A positives notes however, could be that all TV and radio stations (public or private, French / English) somehow propose health programs on weekly basis, but this remains greatly insufficient compared to the urgent need raise by to the National Burden of Diseases. In addition, no communication training school offers course in public health communication, this can explain why very few health programs and debate are opened by journalist on major public health topics. The scientific and technical characters of these health topics may constitute a barrier for ordinary journalist with little scientific background to discussed health issues.

Promoters of traditional medicine and natural health clinics are more prone to invest media space to talk health issues. Health professionals from medical schools and scientists in Universities do not communicate enough about their findings and health actuality, especially into mass media.

Public health curriculum in Cameroon is diverse: from classic: biochemistry, chemistry, animal and plants biology, to medical studies (pediatric, gynecology, obstetric, endocrinology, surgery, nursery) and others fast growing biomedical specialities: virology, bacteriology, immunology, pharmacognosy, pharmacy, public health, radiology to cite few.

Relevant and useful health information most often end up in books, articles and other intellectual support rather than staying in people mind for effective implementation.

Knowledge and findings from health's professional should be made available to population. The actual most use means of communication is through scientific peer review journal in international and regional

publications. Few professional associations like the association of medical doctors and the Cameroon bio-science society have periodic publication to channel their research works and findings. However, the inconstancy of these publications makes them unknown and greatly inaccessible to the general population.

This overall confusion and lead to misunderstandings, inefficient health promotion campaign, waste of time, energy and resources.

Civil Society Organizations are playing an important role to address specifics health topics. NGOs and Associations work to address HIV/AIDS, tuberculosis, malaria, cancers, cholera outbreaks. Infant malnutrition, river blindness and other diseases. Their role is important assistant decision makers to design and spread important messages.

Particular attention is given to endemic and epidemic transmissible diseases probably because of their rapid devastating effects. Chronic non communicable diseases are generally unknown by the population.

Group of journalists are trained to communicate on specific health topics, in collaboration with National programs fighting against particular chosen diseases: Roll back malaria program, the national committee for fight against HIV and tuberculosis to mention few of them.

Mobile phone operators, also in conjunction with private/public initiatives, help spread useful health information by SMS (Short Message Services).

Public health actors in Cameroon under exploit the constantly growing communication potential to reach targets with health messages. More can be done, the existing potential remain huge and opportunities should be oriented towards health communication, with require both good understanding of health topics as wells as communication skills. Health challenges are big and required biggest interventions.

## 3 EMERGING TOPICS NEEDS PUBLIC OUTREACH

Current projects in Cameroon cover topics mainly related to **endemic - transmissible diseases** (Malaria, HIV/AIDS, tuberculosis, river blindness, sexually transmitted diseases), **episodic epidemic outbreaks** (cholera, meningitis) and long term **m micronutrients**

**malnutrition** (Vitamins A, D, B12, Zinc, Iron, Folic acid).

The general tendency is the focus on acute devastating diseases that force for reaction after drastic consequences on people health. The great part of funds

used in this portfolio is donated by international funding's agencies.

Preventive measures need to become the milestones for health promotion strategies.

With the rapid changes observed in the structure of the traditional society and the fast "westernisation", added to diverse phenomena as the intensive use and consumption of chemical products, occurrence of natural disasters, climate changes and global warming, environmental pollution, fast foods, people are more and more exposed in various ways to pernicious new chemical compounds.

Attention should be paid also to ubiquitous, invisible but toxic chemicals with long-term effects, indicated sometimes like "silent killers". Their impact on the National Burden of Diseases is expected to be high even if difficult to see and to estimate.

In the lack of proper specific regulations, assessment projects should appeal for more intensive communication to inform the general population and educate on measures to avoid or mitigate risks.

Our world keeps changing, risks keep changing too, and we need preparedness to anticipate and prevent them to live healthy.

## 4 NOODLES FIELD EXPERIENCE

At its pilot experience in the country NOODLES attempts to communicate its findings about potential threats that Bisphenol A from baby bottles could pose in Cameroon. The organization decided to **post information on its website**, to attract general attention and widen discussion by **social network**, publish on international **scientific peer review journal** and **platform**, present at scientific congresses and social events, as well as contact **mass media** enterprises to widespread information and enable them to take informed decisions.

### 4.1 WEBSITE AND SOCIAL NETWORK

Noodles research findings, documents as well as others relevant documents are loaded on Noodles web-pages<sup>5</sup> and others organization websites<sup>6</sup> to allow rapid and easy access for people worldwide. Reaction can be done by contacting Noodles officials for clarifications and discussions, also forum discussions are opened via Noodles Facebook page<sup>7</sup>. Despite people access to internet, it can be noted that reactions came mostly from people abroad and very few from Cameroon. Eventhough the target population is not restricted to Cameroonian but opened to people worldwide, absence of reactions from inside the countries should be probably due to the fact that the website is still largely unknown. In addition, social networks are still mostly used to keep in touch with friends than to communicate professionals and health issues; moreover. Efforts should be increase to advertise and let interested people to take advantage of these forums.

### 4.2 PLATFORM, POSTER PRESENTATIONS AND SCIENTIFIC PUBLICATIONS

Communication in scientific forum is the more successful part of the information campaign till now. As a research organization, these platforms are useful to exchange with the scientific community, research activities, findings and efforts. Since its creation, Noodles has participated to numerous scientific events with publications available on its website<sup>8</sup>. However, the greatest challenge here is to convince and get involve the legislators who of course beyond scientific argument will consider others economic and social factors. Meeting that gathered health stakeholders, researchers, decision makers, civil societies' organization and consumers should be multiply to increase awareness on specific health questions and facilitate effectiveness of prevention measures.

### 4.3 MASS MEDIA (NEWSPAPERS, RADIO AND TV STATIONS)

Communicating public health information in mass media has to face numerous barriers, the editorial line of the newspaper for example. Although it was always possible to have the paper published in the rubric reserved to "society", this required a certain amount of money. Even the social character of the information and the not-for-profit character of the organization proposing it, it doesn't make any difference in the fix charges the enterprise has to pay. No media, even the public media, has options for free publication, except if coming from an official governmental source; in that case, substantial considerations can be done.

Some of the plethora problems mention is high cost

of printing materials, lack of communication targets and the dwindling advertisement sector resulting on high taxes imposed by the government on the media. Crossing the economic barriers is not the end of the journey. The language issue should be considered: Cameroon is officially bilingual (French and English) and, unofficially, we have to take into account more

than 230 speaking native language, the unofficial but widely used “pidgin” language which is a mix of French, English and native languages. The rate of illiteracy as well as national or regional character of certain media command to use well designed and targeted communication strategies to avoid missing important layers of the population.

## 5

### BRIDGING THE GAP

Public health challenges are multiple and prevention capacities underexploited. To bridge this gap and re-center prevention at the heart of public health strategy, stakeholders should take advantage of the changing media environment. A real desire to communicate science to people has to become a leitmotiv. Health and consumers’ programs should be solicited by public health professionals from all specialties.

Multi-target communication should be established. Scientific publications reinforce, made accessible by professionals and diffuse in a more accessible language, illustrate with pictures for the public.

Public outreach remains a priority. Apart from general information talk show, creation of specialized private health magazine or newspaper could certainly be a good tribune to channel health information not only to inform the general opinion, but also for their education. This media support may cover topics ranging from health legislations and policy, health system, health innovations, to research and educational projects.

Another way forward is improving human resources skills. Public health professionals may follow journalism and communications training to improve their skills and acquire appropriate skills for knowledge spreading. Online educational and training courses design and release for specific target groups.

Radio and TV production of health programs and talk show for people of all ages could facilitate interactions between health professionals and people. A good beginning could be to mobilize and sensitize a journalist with good scientific background and health related training to specialize in specific themes and be working with health authorities and other civil society organizations to help improve health outcomes.

An online national forum animated by a moderator can be created and opened to public. Forum moderator will be in charge to post information of public interest, let people express their concern and exchange their view. Advantage with such a forum is that those

in capacity to propose a solution will promptly react and share their experiences with those in needs.

Moreover, mobile operators under their social responsibilities can assist organization by sending SMS (Short Message Services) into personal mobile phone. 3 to 5 minutes videos periodically broadcast on different media could attract people attention.

Booklet, pamphlet and leaflet as educational material can be published and made accessible to authorities and the public. This will create awareness, initiate debate and discussion, help empower people, drive adoption of appropriate behaviors and inform decisions.

## CONCLUSION

The essence of communication is all about informing people; convince them to take informed actions. Prevention should be the corner stone of any public health strategy. Despite the fast growing information tools in Cameroon, the health sector still suffers of inefficient and inadequate communication campaign, leading to great lost. Despite problems encounter to implement efficient communication activities, the improvement of ICT tools should be used to improve public health outcomes. Much work remain to be done, public health stakeholders should as much as possible

discuss with people on existing and emerging risks, ways to mitigate this and of paramount importance, prevention measures.

Peer review publications should be reinforce and made known and accessible to the population.

Television, radio, newspapers, social network and forum discussions remains good platforms for experience sharing. A health magazine or newspaper can be created, providing an opportunity to health professional to communicate on their works and inform consumers.

## REFERENCES

Law N° 90/052 of 19th December 1990 relative to the freedom of social communication, modified by Law N° 96/04 of 4th January 1996.

Decree N° 2000/158 of 3rd April 2000 fixing the conditions and the modalities for the creation and the exploitation of private audiovisual communication enterprises.

The African Media Development initiative: “Cameroon Media health”

Decree N° 2002/2170/PM of 9th December 2002 fixing the modalities for the issuing of press cards

Noodles website: [www.noodlesonlus.org](http://www.noodlesonlus.org)

WEST AFRICA- Endocrine Disrupting Chemicals in Baby Bottles and their Threats to Child Health.<http://toxicology.org/display/wlt/WEST+AFRICA+Endocrine+Disrupting+Chemicals+in+Baby+Bottles+and+their+Threats+to+Child+Health>

<http://www.facebook.com/noodles.onlus>

<http://www.noodlesonlus.org/EventsCalendar/tabid/492/Default.aspx>

# NEWSBOX

## EDES PROGRAMME: STRENGTHENING FOOD SAFETY SYSTEMS IN AFRIQUE CARRIBEAN AND THE PACIFIC COUNTRIES



Launched in 2010, EDES is a cooperation programme managed by COLEACP (Europe-Africa-Caribbean-Pacific Liaison Committee) in collaboration with a consortium of European Organizations specialized in food safety. The programme is implemented at the request of the ACP (African, Caribbean and Pacific) Group of States, and funded by European Union.

The EDES Programme has been designed to assist ACP countries in strengthening their national SPS (Sanitary and Phytosanitary) Systems so as to ensure and enlarge access into the European Union of their products while participating, at large, into regional and international food trade. The programme will be funded during 4 years under the 9th European Development Fund. EDES is being implemented since March 2010 by a COLEACP-led consortium grouping major European food safety agencies who, together, cover the whole span of expertise needed for the achievement of the EDES goals.

The overall objective of EDES, an ACP-EU Programme, is to contribute to poverty alleviation through the integration of food products from ACP regions into international, and particularly European,

trade flows. The specific objective is to support the development in ACP of risk-based food safety systems for exports in line with European, international and regional standards.

EDES is open to the various food production and supervision actors throughout the ACP countries: competent authorities and public services, food business operators: producers, processors, food distributors and their professional associations, small producer's organizations and their related support bodies, laboratories and local experts.

After a joint needs analysis, the intervention procedures are formalized with the Programme before conducting an action plan.

- Institutional capacity building with regard to food safety management systems;
- Strengthening of self-assessment capacities in the food value chains and food safety supervision by the public services;
- Reinforcement of technical and business management capacities of laboratories along accreditation principles;

by Guy BERTRAND POUOKAM  
guy.pouokam@noodlesonlus.org

- Enhancement of good production and processing practices of small producers/fishers/processors;
- Strengthening the capacities of local experts in training and technical assistance for delivery to food safety management stakeholders.

EDES has developed 9 training packages which are currently in use at regional and countries level both in French and English language. Training focused on the organization and implementation of official controls, risk assessment, risk communication, management of food safety systems, and the role of laboratories in a food safety system, as well as training of trainer's methodology. The beneficiaries of these training courses are competent authorities, private operators, universities and ministries. The training is based on teaching materials available on the EDES website, including a series of publications. The following themes are now available: training methods, self-assessment systems, risk assessment and management, traceability, labeling and official controls amongst others.

<http://edes.coleacp.org/fr/edes/page/20324-publications> (in French)

<http://edes.coleacp.org/en/edes/page/20342-publications> (in English)

In May 2011, a workshop involving all stakeholders of the Cameroon food safety system was organized in Douala (Cameroon) jointly by the Standards and Quality Agency (ANOR), the National Codex Ali-

mentariux and Food Safety Committee (CNCOSAC) and the EDES staff in order to identify activities that need to be supported at national level by the project. Three food sectors were identified as priorities for first interventions: horticulture, fishery and coffee. In early 2012, a Technical Working Group and a steering committee were charged to produce a sectorial self-assessment guide for the coffee sector; also.

Still in 2012,, ANOR and EDES launched a Call for Interest for the selection and creation of a core group of multi-disciplinary national experts (scientists, researchers, university professors, consultants) interested in taking part in the national technical risk assessment working group for the "evaluation of sanitary and phytosanitary risk" .

The Working Group's missions included:

- The formulation of scientific and technical opinions, based on its own initiatives and problems discovered within the country;
- Publishing an annual summary report to update collective expertise on sanitary and phytosanitary food problems and contributing to the information available on sanitary and phytosanitary food risks;
- Informing stakeholders of the new results of expertise and contributing to the public debate on food safety in Cameroon.

Thought the working group is not yet functional, it is hope that activities implemented within the EDES programme will help to empower the Cameroonian food safety system.

# THE 2013 CONFERENCE OF THE WEST AFRICAN SOCIETY OF TOXICOLOGY



The West African Society of Toxicology WASOT recently concluded an international conference with the theme: "Global Understanding of Chemicals in Health, Diseases and Economics". The international conference which was held between 20 - 23<sup>rd</sup> February 2013 at the University of Port Harcourt, Nigeria, addressed the effects of various natural and man-made chemicals on man and the environment.

The keynote address was delivered by Prof. Judith T. Zelikoff, Director, Community Outreach Nelson Institute of Environmental Medicine New York University Medical College Tuxedo, New York, USA, on the toxicological effects of the gutkha, a globally-used smokeless tobacco product. While cigarette smoke contains approximately 4,800 constituents, smokeless tobacco contains approximately 3,000. Of these, 20 are different N-nitrosamines, 30 are different persistent organic pollutants, while approximately 30 are known or suspected carcinogens. Among others, health outcomes linked to smokeless tobacco were reproductive, cardiovascular and immunological problems. In conclusion, it was emphasized that smokeless tobacco could pose serious health risks in the foetus and/or growing neonate as well as the pregnant mother.

In a second keynote address, delivered by Prof. John I.

Anetor of University of Ibadan, the speaker highlighted the potential effects of environmental chemicals, like methyl mercury (Hg-CH<sub>3</sub>) and polychlorinated biphenyls (PCBs), on the reproductive system of populations in the Niger Delta Basin. The conference was held right in this region, considered an ecological waste land by several reports, due to environmental degradation and contamination from oil and gas production activities as well as rapid and mass industrial and urban development activities. He called on relevant stakeholders to intensify efforts to avert a repeat of the thalidomide experience; upholding the 'precautionary principle' to avoid late lessons from early warnings.

Over 20 platform and 80 poster papers were presented at the conference under the various sub-themes. There were questions and answer sessions as well as interactive sessions that resulted from exciting and resourceful discussion which gave rise to the following conclusions and recommendations in a communique:

1. It was noted that the National Tobacco Law of 2009 was not enacted yet. Government should ensure the speedy enactment of this law, going by the increasing proven toxic effects of tobacco to health.
2. Many of the major diseases and dysfunctions that have substantially increased over the past 40 years appear to be related, in part, to developmental factors.

Orish EBERE Orisakwe  
[orish.orisakwe@noodlesonlus.org](mailto:orish.orisakwe@noodlesonlus.org)

There is, therefore, need to redirect disease prevention strategies in order to focus more on vulnerable early life stages.

3. Time has come for reorientation of health care professionals toward greater care for developmental stages.

4. There is the need to employ environmentally or dietary relevant doses of compounds and monitor toxicity in cells.

5. Emphasis should be laid on multidisciplinary research teams to facilitate better use of evidence and research in policy making.

6. Effective ways of improving the transfer of evidence and facilitating links between researchers and policy makers to be pursued should be found.

7. It is necessary to enhance the development of knowledge sharing and support networks: coaching and

mentoring, networking between researchers in academia and industry.

8. WASOT should seek partnership with international journals and professional societies (e.g., Society for the Advancement of Science in Africa, SAFA, etc.) with a view to fostering collaboration, and to explore joint conferences/workshops with local professional societies with similar objectives.

9. Facilitating simple but effective environmental friendly cultures like not discarding wastes, especially non-biodegradable ones, in the surroundings should be spread.

10. WASOT commended University of Port-Harcourt for being the first institution in Nigeria and West African sub-region to mount a post graduate degree programme in Toxicology.





