



UNIVERSITY OF INDONESIA

**DEVELOPMENT OF MODIFIED
LOCAL NUTRIENT-DENSE COMPLEMENTARY FOOD
RECIPES FOR 9-11 MONTH OLD INFANTS**

THESIS

**In partial fulfillment of the requirements for the degree of
Master of Science in Community Nutrition**

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JAKARTA
JULY, 2010**

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PREFACE

At about sixth month of age, the supply of energy and some nutrients from breast milk is no longer adequate to meet an infant's needs. Consequently, complementary foods, preferably with a relatively high energy and nutrient density must be provided. Results from several studies showed that many of the complementary foods fail to meet the desirable levels for calcium, iron and zinc, when expressed as intakes per day and as nutrient densities (per 100 kcal).

In 2007 the underweight prevalence in East Lombok District hasn't achieve the National nutrition recovery target, which is 20%. The prevalence In East Lombok District was 25.5%, which still above the West Nusa Tenggara Province and National prevalence (24.8% and 24.9%). Moreover, among infants, several studies conducted in East lombok showed that the complementary feeding practices was still suboptimal. Moreover, the nutrient-density of the complementary foods was still below the requirements.

One of several strategies that exist to fulfill needed amounts of problem nutrients which is through *low-cost complementary foods*, prepared with locally available ingredients using suitable small-scale production technologies in community settings to help the infants meet their nutritional needs. This strategy was believed to be the most sustainable solutions since it use the resources from community itself.

This thesis was divided into six part which consisted of introduction, literature review, methodology of the research, description of the results, discussion and conclusion and recommendations. One manuscript to be submitted to The Journal of Nutrition.

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I may leave out of the name of some people who have contributed to this thesis, please apologize; I realize and do appreciate all of your kindly contributions.

Nur Handayani Utami

Jakarta,

June 2010

PUBLICATION APPROVAL FOR ACADEMIC PURPOSES

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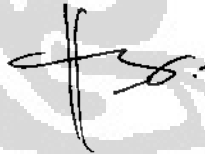
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ABSTRAK

Nama : Nur Handayani Utami
Program Studi : Ilmu Gizi, Fakultas Kedokteran
Judul : Pengembangan Resep Makanan Pendamping ASI Lokal Padat Gizi untuk Bayi 9-11 Bulan

Salah satu strategi untuk meningkatkan asupan gizi adalah melalui makanan pendamping ASI dengan biaya rendah, menggunakan makanan lokal yang tersedia dan pengolahan makanan sederhana. Kami menyajikan hasil dari studi formatif pengembangan resep makanan pendamping ASI lokal padat gizi untuk bayi 9-11 bulan. Penelitian dilakukan di Lombok Timur pada bulan Februari 2010. Pengumpulan data termasuk survey pasar, wawancara kelompok dengan pengasuh dan kader, uji coba resep, pengembangan resep dan 7 hari uji coba penerimaan resep di rumah tangga. Resep yang dicoba oleh sebagian besar rumah tangga di dusun dekat dan jauh pasar adalah bakso ikan dan cap cay, sedangkan resep yang paling sedikit dicoba adalah resep abon hati ayam. Terdapat potensi untuk memperoleh manfaat dari modifikasi resep lokal pada kecukupan gizi pada bayi 9-11 bulan.

Kata kunci:

resep makanan pendamping ASI padat gizi lokal, bayi, uji coba penerimaan, kecukupan gizi

ABSTRACT

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Study Program : Nutrition science, Faculty of Medicine
Title : Development of Modified Local Nutrient-dense Complementary Foods Recipes for 9-11 Month Old Infants

One of the strategy to improve the intake of problem nutrients was through the low cost complementary foods, using locally available foods and simple food processing. We present results from a formative study on the development of modified local nutrient-dense complementary foods for 9-11 month old infants. The study was conducted in East Lombok on February 2010. The data collection including a series of market survey, group interview with caregivers and cadres, recipe trials, recipe development, and 7-day HH acceptability trial. The recipe that mostly tried by the household in near and far-market hamlet was fish meatballs and cap cay, while the least recipe tried was chicken liver abon. This study suggested that there would be potential to benefit from the modified recipes on nutrient adequacy among 9-11mo infants.

Key words:

local nutrient-dense complementary foods recipes, infants, acceptability trial, nutrient adequacy

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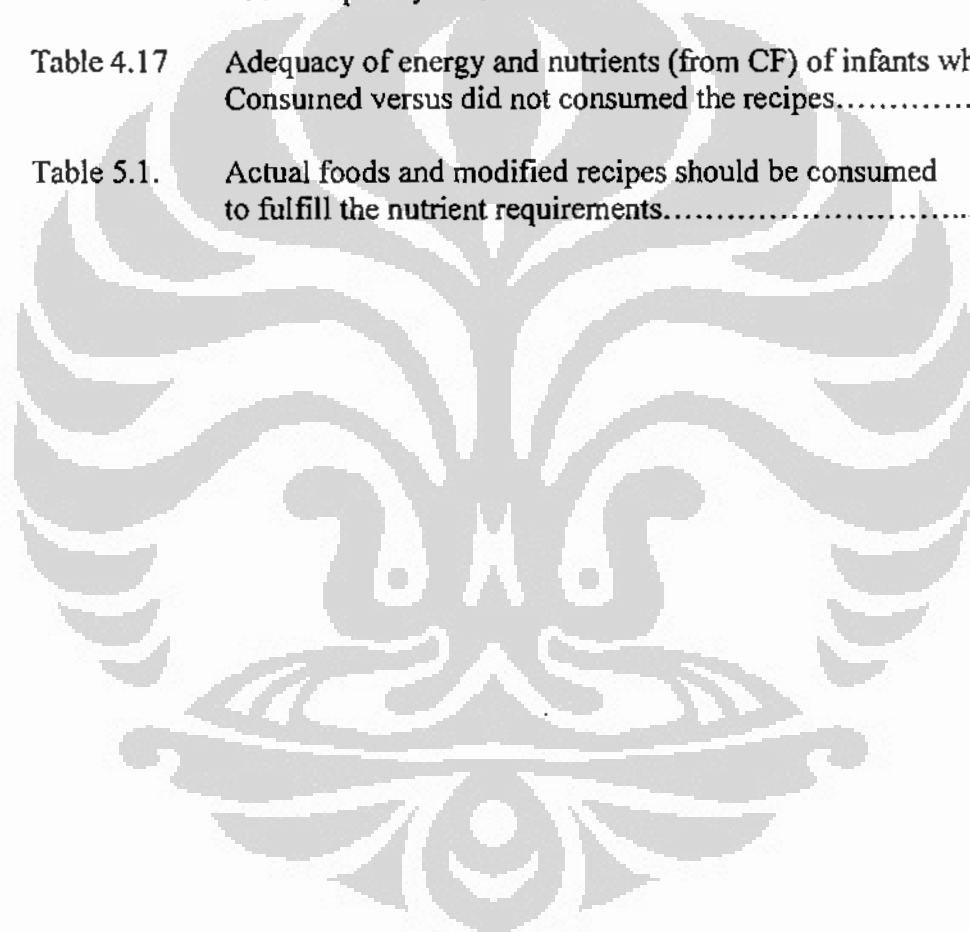
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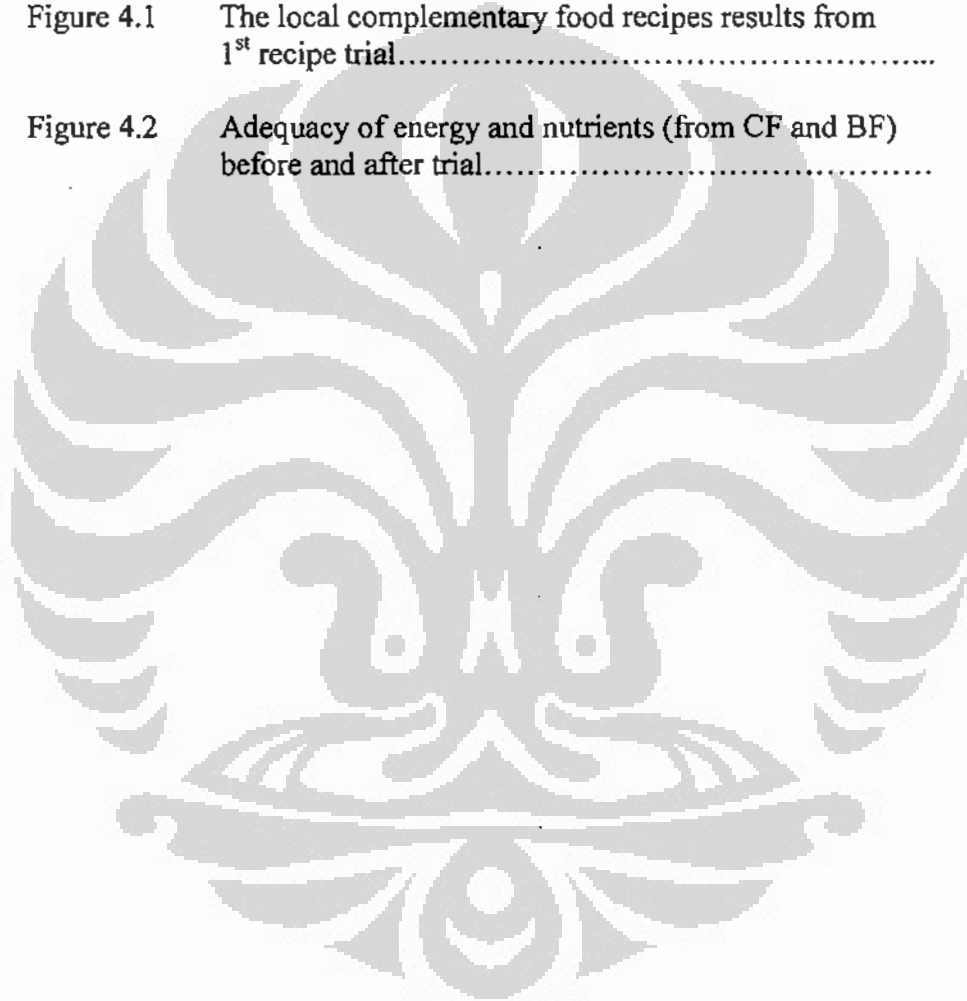
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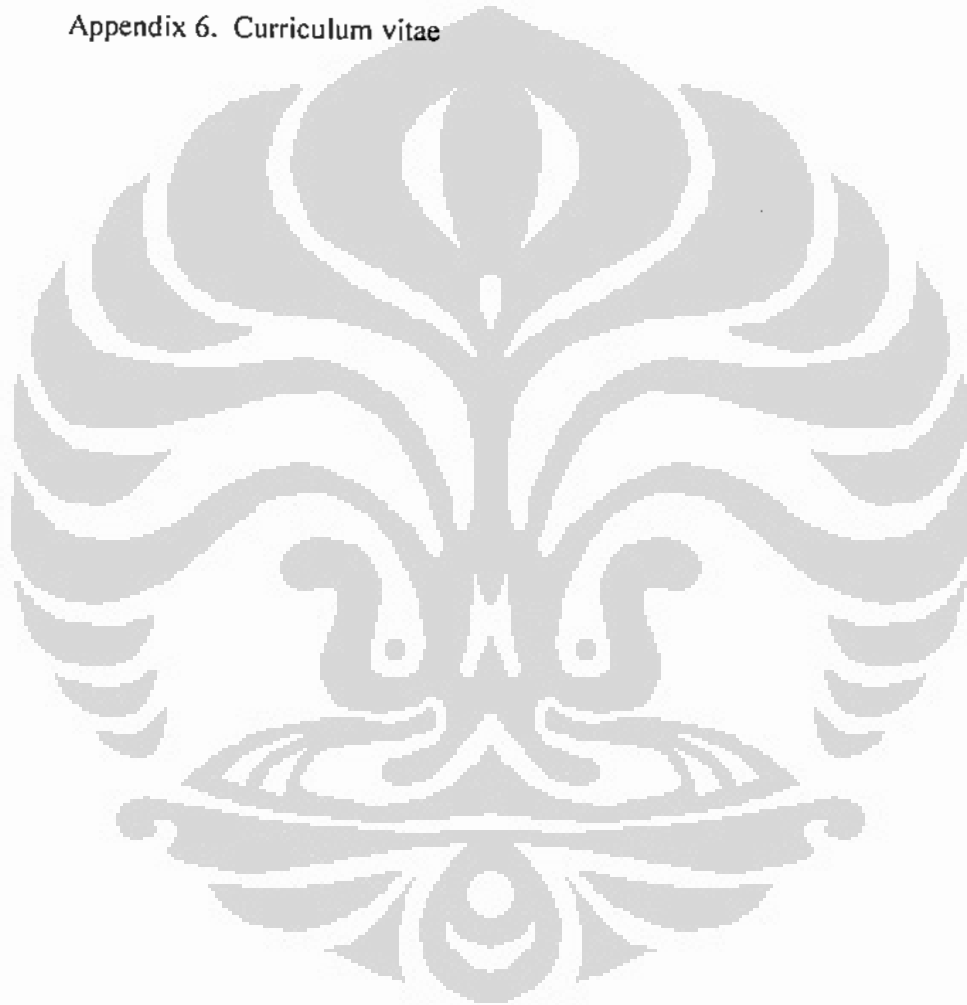
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- Appendix 6. Curriculum vitae



LIST OF ABBREVIATIONS



BF	Breastfeeding
CF	Complementary foods
EBF	Exclusive Breastfeeding
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
GI	Group Interview
WAZ	Weight for Age Z score
HH	Household
KMS	Kartu Menuju Sehat
MP ASI	Makanan Pendamping Air Susu Ibu
Posyandu	Pos Pelayanan Terpadu
TIPs	Trial of Improved Practices
UNICEF	United Nations Children's Fund
VIM	Variable Indicator Matrix
WHZ	Weight for Height Z score
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Nutrient-dense recipes	: recipes containing high level of the nutrients in particular problem nutrients
Complementary foods	: any food, whether manufactured or locally prepared, suitable as a complement to breast milk or to a breast-milk substitute, when either becomes insufficient to satisfy the nutritional requirements of the infant
Modified local complementary foods recipes	: complementary food recipes that processed in home or in Posyandu, made by available foods in the local area, accessible and affordable for the community based on the existing local complementary food recipes, that were modified to enhance the nutrient content
Problem nutrients	: those for which there is greatest discrepancy between their content in complementary foods and the estimated amount required by the child
Exclusive breast feeding	: giving infants no other food or drink, not even water, apart from breast milk (including expressed breast milk), with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines during the first six months of age
Malnutrition	: a broad term commonly used as an alternative to under nutrition, but technically it also refers to overnutrition. People are malnourished if their diet does not provide adequate calories and protein for growth and maintenance or they are unable to fully utilize the food they eat due to illness (undernutrition). They are also malnourished if they consume too many calories (overnutrition)
Under nutrition	: the outcome of insufficient food intake and repeated infectious diseases. It includes

being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition)

Formative research : a general term describing investigations conducted for program design and planning

Consultative research : type of formative research that uses several quick, interactive information-gathering methods with mothers and other key people who are likely to be beneficiaries or participants in a program

Linear Programming (LP) : a mathematical tools to optimize (minimize or maximize) a linear function of a set of *decision variables* while respecting multiple *linear constraint*.

Complementary Feeding Recommendations (CFRs) : set of recommendations expressed as foods that give dietary advices for population to promote optimal infant and young child feeding practices

Household food access : defined as the ability to acquire sufficient quality and quantity of food to meet all household members' nutritional requirements for productive lives (FANTA, 2006)

Near-market hamlet : hamlets that length of time needed to reach nearest market less than or equal to 5 minutes by motorcycle with speed of 30 km/hour and if using "becak" the cost was not more than Rp. 2000,- to go to the market (back and forth) and also validated by local officers

Far-market hamlet : hamlets which length of time needed to reach nearest market more than 5 minutes by motorcycle with speed of 30km/hour and if using "becak" the cost was more than Rp. 2000,- to go to the market (back and forth) and also validated by local officers

CHAPTER 1 INTRODUCTION

1.1 Background of the study

During the transition period, between exclusive breastfeeding and the introduction of family foods (ages 6-23 months), the prevalence of malnutrition increases substantially in many countries because of increased infections and poor feeding practices (USAID, 2006). Regarding complementary feeding, it frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe (WHO, 2003).

Faber (2004) and Kanashiro et al. (1990) have shown that the complementary foods in developing countries were inadequate especially in micronutrient. Further, analysis done by Gibson, Ferguson & Lehrfeld (1998) on 23 complementary foods mixture used in developing countries, had emphasized that many of the complementary food studied fail to meet the desirable levels for calcium, iron and zinc, when expressed as intakes per day and as nutrient densities (per 100kcal). In Indonesia, multi-center complementary food study done in 6 locations by UNICEF 1997, found that the local complementary food consumed by the children was still below the Recommended Nutrient Intake (RNI). The most problem nutrients are micro nutrient which only fulfill 20% of the RNI, especially zinc and iron (Rozanna, 2001).

A technical workshop of coordinated strategies for controlling micronutrient malnutrition (1991) urged that of the micronutrient intervention programs available, effective food-based dietary strategies will be the most sustainable as long as nutritionally adequate diet based on local foods can be successfully identified and promoted (Trowbridge, 1993). In line with that, WHO in the Global Strategy of Infant and Young Child Feeding (2003) recommended *low-cost complementary foods*, prepared with locally available ingredients using suitable small-scale production technologies in community settings as one of the strategy to help the infants meet their nutritional needs. Abcbc et al. (2006) had proved that locally available and affordable foods can successfully enhance

nutritional quality of complementary foods in Southern Ethiopia. While, several studies have shown the significance of improved complementary feeding on infant's growth and dietary intake.

However, effort to improve complementary feeding in developing countries which focused on the use of cheap, locally available ingredients as a way to make these foods affordable to poor families often neglected the micronutrient quality (Lartey et al, 1999). Therefore, study needs to be done to improve the complementary foods with affordable, locally available, nutrient-dense foods, using simple food technologies in order to improve micronutrient quality of the infant's diet.

1.2 Problem statements and Rationale of the Study

1.2.1 Problem Statement

Among under-two children, under nutrition is still a public health problem in West Nusa Tenggara Province specifically in East Lombok District. Based on Basic Health Research (2007) the underweight prevalence in East Lombok District hasn't reached the National nutrition recovery target, which is 20%. In East Lombok District the prevalence was 25.5% which was still above West Nusa Tenggara Province and National figures (24.8% and 24.9%).

Based on Basic Health Research (2007), it was also found that the dietary intake of children 6-23 months in Indonesia was still below the requirements. Comparing the mean intake with the Indonesian RDA, it was found that the level of energy consumption was 65.9%, while protein was 75.5%, vitamin A was 78.0% and the worst was iron, only 54.9%.

Fitriyani (2005), on the final CFRs (Complementary Feeding Recommendations) developed by *Linear Programming Analysis* showed that with all the constraints met, calcium, iron and zinc could not achieve 2/3 recommended nutrient intake. Moreover, Harper (2006) found that the density of several growth-limiting nutrients, such as iron, zinc, calcium and vitamin A were below 50% than the recommended nutrient-densities.

Several local food resources were identified for their potential to fill the nutrient-gap. However, Fitriyani (2005) found that there were still acceptability constraints on those nutrient-dense foods among 9-11 mo infants. In addition, mothers the 9-11 mo infants no longer cooked special foods for the infants, and provided their infants foods prepared for the whole family member., Harper (2006) only found one complementary foods recipes among 9-11 mo infants, identifying the lack of mother's skill on food preparation.

1.2.2 Rationale of the study

Food based dietary strategies to alleviate malnutrition among infants was recommended as the most sustainable solutions. WHO has urged the use of low-cost complementary foods which use the locally available foods, which is affordable and utilizes small-scale food technologies to improve the nutritional status of the infant's. Several studies have been done in order to improve the local complementary foods in developing countries but limited study on this has been done in Indonesia.

The District Health Office of West Nusa Tenggara Province through its guideline on local complementary foods recipes had endorsed several local complementary food recipes. However, these recipes only focus on the macronutrient content, not specifically intend to solve the micronutrient problems. Moreover, the recipes recommended were still on the provincial level. Given the importance of local-specific recommendations, therefore, it is necessary to conduct the study on the development of local-specific complementary food recipes which improve micronutrient quality at the same time.

Due to different characteristics (developmental and nutrient requirements) that exist throughout the age groups, age-specific complementary food recipe was recommended. However, there are still limited studies on this, especially in Indonesia.

To design feasible intervention, participatory or consultative approach, by which investigators interact extensively with potential beneficiaries, is essential.

There are still limited studies identified using this approach, particularly on the development or modification of local complementary foods.

1.3 Research questions

What are local food availability and their prices and how is availability and accessibility of nutrient-dense foods found from previous study among 9-11 mo infants? How is the 9-11 mo infant feeding practices related to complementary feeding?

What are the nutrient-dense foods potential to develop the modified recipes? What modified local nutrient-dense complementary food recipes can be developed?

How is the acceptance of 9-11 mo infants and their mothers toward those recipes? How much improvement in nutrient intake, specifically the problem nutrients (Fe, Zn and Ca), can be achieved by the consumption of those modified local nutrient-dense recipes?

1.4 Objectives

1.4.1 General Objective

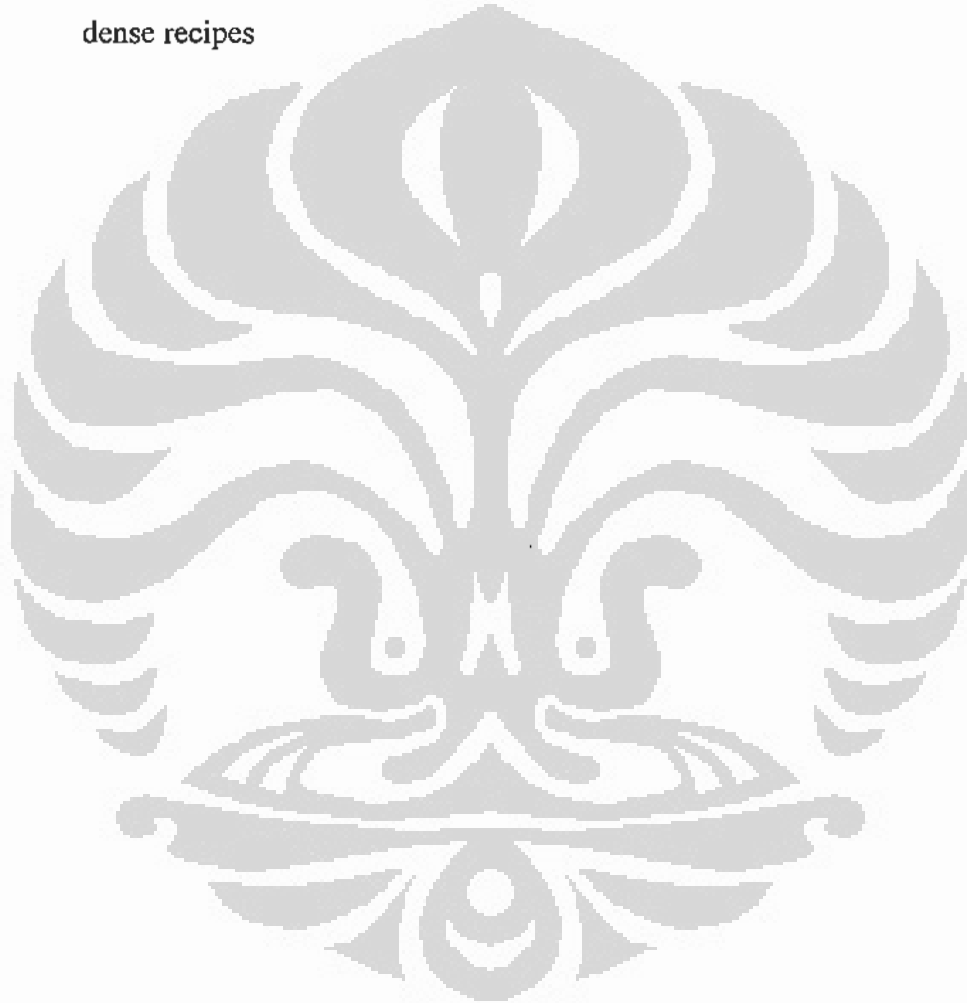
General objective of this study is to develop the modified local nutrient-dense complementary food recipes and to assess the acceptance of 9-11 mo infants and their mothers towards those recipes.

1.4.2 Specific Objectives

Specific objectives are:

1. To explore local food availability and their prices and to confirm availability and affordability of nutrient-dense foods found from previous study among 9-11 mo infants
2. To assess HH food accessibility

3. To assess the 9-11 mo infant feeding practices related to complementary feeding
4. To develop the modified local nutrient-dense complementary food recipes
5. To assess the acceptance of 9-11 mo infants and their mothers toward those recipes
6. To assess the improvement in nutrient intake, specifically the problem nutrients (Fe, Zn and Ca) by the consumption of modified local nutrient-dense recipes



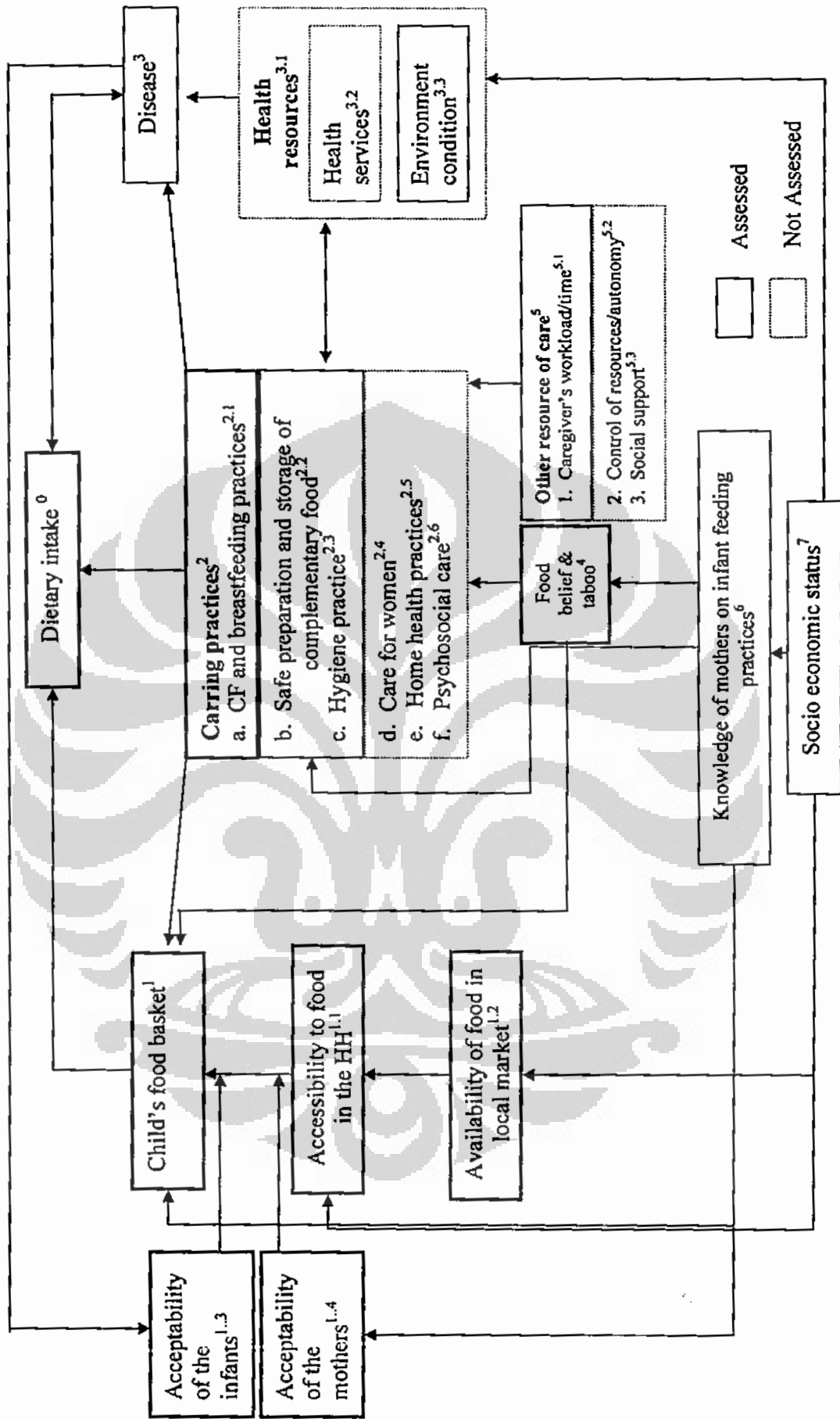


Figure 1.1 Conceptual framework of the study

1.5 Fact and hypothesis matrix

The fact and hypotheses matrix is shown in the table below.

Table 1.1 Fact and Hypotheses Matrix

No	Variables 1	Variables 2	References
0-1	Dietary intake	Child's food basket	Cook & Jeng (2009)
0-2	Dietary intake	Caring practices	UNICEF, 1992
0-3	Dietary intake	Disease	UNICEF, 1992
1-2	Child's food basket	Caring practices	Cook & Jeng (2009)
1-4	Child's food basket	Food taboo and belief	Engle (2000)
1-6	Child's food basket	Knowledge of mothers on infant feeding practices	Engle (2000)
1-1.1	Child's food basket	Accessibility to food in the HH	Cook & Jeng (2009)
1-1.3	Child's food basket	Acceptability of the infants	Paul et al, 2008 Sullivan & Birch, 1999
1-1.4	Child's food basket	Acceptability of the mothers	Paul et al., 2008, Sullivan & Birch, 1999
1.3-3	Acceptability of the infants	Disease	Paul et al, 2008
1.4-6	Acceptability of the mothers	Knowledge of mothers on infant feeding practices	Paul et al, 2008
1.1-1.2	Accessibility to food in the HH	Availability of food in the local market	FAO (2000)
1.1-7	Accessibility to food in the HH	Socio economic status	FAO (2000)
1.2-9	Availability of food in the local market	Socio economic status	FAO (2000)
2-4	Caring practices	Food belief & taboo	Engle, 2000
2-5	Caring practices	Other resources of care	Engle, 2000
3-3.2	Disease	Health services	UNICEF, 1992
3-3.3	Disease	Environment condition	UNICEF, 1992
3.1-7	Health resources	Socio economic	UNICEF, 1992
4-6	Knowledge on infant feeding practices	Food belief & taboo	Engle, 1999
6-7	Socio economic	Knowledge on infant feeding practices	UNICEF, 1992

CHAPTER 2 LITERATURE REVIEW

2.1 Complementary Feeding

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. The target age range for complementary feeding is generally taken to be 6 to 24 months of age, even though breastfeeding may continue beyond two years (Dewey, 2001).

Complementary feeding should be *timely*, meaning that all infants should start receiving foods in addition to breast milk from 6 months onwards. Harper (2006) found that 87% of infants in East Lombok consumed foods before 6 months, a finding comparable to a 2002 survey on Lombok which found that 84% of infants had consumed solid foods early. The majority of mothers (80%), reported introducing solid foods into their infant's diet after 4 months of age, while only 13% waited until 6 months before introducing foods. Continued breastfeeding after the introduction of solid foods is commonly practiced in East Lombok.

It should be *adequate*, meaning that the nutritional value of complementary foods should parallel at least that of breast milk. Foods should be prepared and given in a safe manner, meaning that measures are taken to minimize the risk of contamination with pathogens. And they should be given in a way that is *appropriate*, meaning that foods are of appropriate texture and given in sufficient quantity (www.who.int).

The adequacy of complementary feeding (adequacy in short for timely, adequate, safe and appropriate) not only depends on the availability of a variety of foods in the household, but also on the feeding practices of caregivers. Feeding young infants requires active care and stimulation, where the caregiver is responsive to the child clues for hunger and also encourages the child to eat. This is also referred to as active or responsive feeding (www.who.int).

Energy requirements

The total energy requirements of healthy, breastfed infants are approximately 615 kcal/d at 6-8 months, 686 kcal/d at 9-11 months, and 894 kcal/d at 12-23 months of age (Dewey and Brown, 2002). Energy needs from complementary foods are estimated by subtracting average breast milk energy intake from total energy requirements at each age. Among breastfed children in developing countries, average breast milk energy intake is 413, 379 and 346 kcal/d at 6-8, 9-11 and 12-23 months, respectively (WHO/UNICEF, 1998). The equivalent values for industrialized countries (for breastfed children only) are 486, 375 and 313 kcal/d, respectively (Dewey, 2001).

The above guideline is based on children receiving average amounts of breast milk at each age. If an infant is consuming more or less breast milk than the average, the amount needed from complementary foods will differ accordingly. In practice, caregivers will not know the precise amount of breast milk consumed, nor will they be measuring the energy content of complementary foods to be offered. Thus, the amount of food to be offered should be based on the principles of responsive feeding, while assuring that energy density and meal frequency are adequate to meet the child's needs. With the sample diets shown in the document *Complementary feeding: family foods for breastfed children* (WHO, 2000), which have a composite energy density ranging from 1.07 to 1.46 kcal/g, the approximate quantity of complementary foods that would meet the energy needs described above is 137-187 g/d at 6-8 months, 206-281 g/d at 9-11 months, and 378-515 g/d at 12-23 months. It should be noted, however, that these diets will not always satisfy micronutrient requirements. Recommended intakes of iron, and to a lesser extent zinc, are unlikely to be provided by these diets. It is important not to be overly prescriptive about the amount of complementary foods to be consumed, recognizing that each child's need will vary due to differences in breast milk intake and variability in growth rate. Furthermore, children recovering from illness or living in environments where energy expenditure is high may require more energy than the average quantities listed here (Dewey, 2001).

Food consistency

The neuromuscular development of infants dictates the minimum age at which they can ingest particular types of foods (WHO/UNICEF, 1998). Semi-solid or pureed foods are needed at first, until the ability for “munching” (up and down mandibular movements) or chewing (use of teeth) appears. The ages listed above represent the usual capabilities of normal, healthy infants. When foods of inappropriate consistency are offered, the child may be unable to consume more than a trivial amount, or may take so long to eat that food intake is compromised. Evidence from several sources (Dewey and Brown, 2002) indicates that by 12 months, most infants are able to consume “family foods” of a solid consistency, although many are still offered semi-solid foods (presumably because they can ingest them more efficiently, and thus less time for feeding is required of the caregiver). There is suggestive evidence of a “critical window” for introducing “lumpy” solid foods: if these are delayed beyond 10 months of age, it may increase the risk of feeding difficulties later on (Northstone et al., 2001). Thus, although it may save time to continue feeding semi-solid foods, for optimal child development it is advisable to gradually increase food consistency with age (Dewey, 2001).

Meal frequency and energy density

The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals-usually self-fed, convenient and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required (Dewey, 2001).

The above guideline is based on theoretical estimates of the number of feedings required, calculated from the energy needs from complementary foods, and assuming a gastric capacity of 30 g/kg body weight/d and a minimum energy

density of complementary foods of 0.8 kcal/g (Dewey and Brown, 2002). To calculate the minimum meal frequencies shown above (2 at 6-8 months and 3 thereafter), the energy needs from complementary foods were based on age-specific total daily energy requirements plus 2 SD (to meet the needs of almost all children) minus the average intake of energy from breast milk by children in developing countries. Infants with low intakes of breast milk would require the higher meal frequencies shown above (3 at 6-8 months and 4 thereafter) (Dewey, 2001).

When energy density of the usual complementary foods was less than 0.8 kcal/gr, or infants typically consume amounts that are less than the assumed gastric capacity at each meal, meal frequency would need to be higher than the values shown above (Dewey, 2001).

A meal frequency that is greater than necessary may lead to excessive displacement of breast milk. In Guatemala, a social marketing campaign to promote feeding complementary foods five times per day had the unintended consequence of reducing breastfeeding frequency in children 19-24 months of age (from an average of 6.9 daytime feedings prior to the intervention, to 3.7 daytime feedings after the intervention, $p=0.01$; Rivera et al., 1998). In addition, preparing and feeding five meals per day requires a considerable amount of time and effort by caregivers, which may prompt them to hold prepared food over from one meal to the next, thereby potential increasing the risk of microbial contamination. These considerations should be borne in mind when developing messages regarding meal frequency. The use of 1 to 2 nutritious snacks per day, such as a piece of fruit or a piece of bread or chapatti with nut paste, will not require time for preparation and may also be less likely to displace breast milk (Dewey, 2001).

2.2 Common Feeding Problems

Frequency of feeding, especially for children from nine to 11 months becomes an important concern once the child has become accustomed to new foods and is beginning to need more food to supplement breastfeeding. Because most staple foods are bulky, children need to eat more frequently than the standard two to three times per day of the adult. Additional problems during this

period are the continuation of liquid feeds (low energy and nutrient density) and a **lack of variety** resulting in a diet deficient in protein, iron, vitamin A, and other micronutrients (Dickins, Brown & Piwoz, 1997).

Young children in Cameroon at around a year of age receive boule, a bulky staple made from millet or sorghum, served with very little of the more nutritious sauce, making it hard for them to eat enough in a day to meet their nutrient needs (Dickins, Brown & Piwoz, 1997).

During childhood illness, reduced food intake contributes significantly to poor growth and malnutrition in young children. The problem is that there is often *no understanding of the need to feed sick children frequently* and resistance from the children themselves. Also, the concept that following illness young children need more food to recover usually is absent. Here health workers and families may share beliefs about the need to reduce food intake or avoid certain foods during and following acute illness (Dickins, Brown & Piwoz, 1997).

Throughout the first two years, an additional common problem is lack of supervision of children's meals and lack of persistence in encouraging children to eat enough of the appropriate foods, especially when appetite is poor. A child may have a poor appetite because of illness, under nutrition, or the monotony of the diet; may fill up quickly when consuming dilute or bulky foods; or have a greater interest in playing than eating. Many mothers have passive feeding styles, leaving decisions about how often, how much, and what to eat up to the child. This passivity may reflect other issues, such as a lack of maternal self-confidence, cultural perceptions about the roles of women in initiating action and making decisions, a belief that children will demand as much as they need, or a lack of time and energy to devote to coaxing a fussy child to eat (Dickins, Brown & Piwoz, 1997).

2.3 Indonesian recommendation of complementary feeding

Indonesian government through the Ministry of Health has released the Book of Children and Mothers Health that included the guideline on the complementary feeding. For 9-11 mo infants it recommended to continue breastfeeding and give more solid complementary foods, such as rice porridge,

and soft rice. The recommendation for frequency of meals was 3 times a day. For 9 mo infants the recommendation for one day was 9 spoonful of rice porridge, for 10 mo infants was 10 spoonful and 11 mo infants was 11 mo (Depkes, 1997).

The recommendation also endorsed consumption variety of foods, such as animal protein (egg, chicken, fish and beef), plant protein (tempe, mung bean and tofu), vegetables (carrot & spinach), coconut milk, oil and fruits also snacks consumption. Hygiene practices also become one of the recommendations (Depkes, 1997).

There were 3 kinds of complementary food recipes provided in the book, consist of meal recipes for 6-9 mo infants (milk porridge) and 9-11 mo infants ("*nasi tim*") and 1 snack recipe (pancake) (Depkes, 1997). Regarding complementary food recipes, specifically, in 2006, The Ministry of Health had endorsed the important of local complementary foods with designing local complementary foods program that applied in all provinces in Indonesia. The local complementary food recipes were developed through a series of activities, including:

- a. Collecting information on habitual foods consumed by the 6-24 mo children from 27 provinces in Indonesia
- b. Formulating the ingredients and nutrient composition based on the complementary foods nutrient requirements
- c. Cooking trial, organoleptic test, physical, chemical and biological quality in food laboratory (Center of Food and Nutrition Research and Development)
- d. Acceptability trial for 3 month in the family with 6 mo infants (Depkes, 2006).

Characteristics of local complementary foods were: availability of ingredients, easy to prepare, affordable by the community, good acceptance by the children, fulfilling nutrient requirements for the children, free from dangerous food additives and culturally acceptable (Depkes, 2006).

Those recipes were basically intended for the poor family that have under two children, so that they can improve the nutritional status of their children. The provision of the local complementary food recipes was through Posyandu for 90

days. With using Posyandu as the channel for the provision of the foods, this program was also intended to revitalized the Posyandu (Depkes, 2006).

2.4 Processing complementary food

Preparation of special transitional foods for young children involves three major steps. First, the recipe, product, or mixed diet must be formulated according to the nutritional principles and cultural concerns. Raw materials should be chosen according to local availability, cost, nutrient content and safety. Second, these raw materials must be processed to improve storage conditions, microbiological safety, nutrient content and bioavailability, and organoleptic characteristics, also preliminary testing of product acceptability. Third, the final products themselves must be prepared by mixing and cooking, either in the home or the community (WHO, 1998).

Michaelsen et al (2009) mentioned, the reasons for processing food include preservation of foods for use in times of shortage; increasing shelf-life; removal of toxins; removal of anti nutrients, which will improve digestibility and availability of nutrients; and improvement of palatability. Food preservation is done in order to reduce the contents of microorganisms and enzymes or to decrease their activity, which can be done by heating, removing water, or adding a preservative such as acid, sugar or salt.

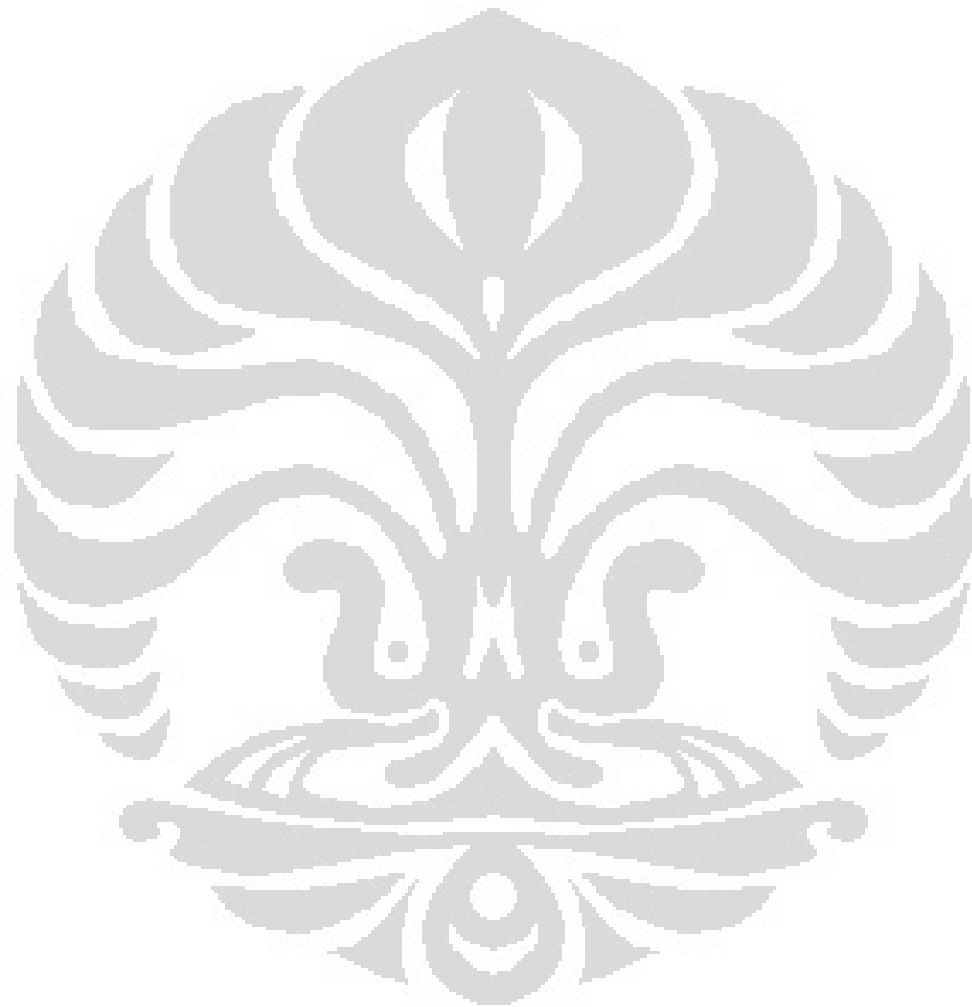
As processing will also decrease the contents of some anti nutrients, it will have a positive effect on the availability of vitamin and minerals. Different food processes can have different effects on a number of nutritional qualities (Michaelsen et al., 2009).

2.4.1 Household food preparation technologies

There are various technologies that are available for food preparation at the household level. However, in this chapter only drying that will be discussed as it related to the development of the modified local nutrient-dense recipes.

2.4.1.1 Heat processing

Heat can increase the digestibility of protein, carbohydrates and other nutrients, thereby enhancing the nutritive value of the foods. It can also inactivate



some of the naturally occurring enzymes, such as pectinase and lipoxygenase, in fruits and vegetables, thereby protecting against off flavors, loss of color and poor texture in the food product. The heat can release vitamins such as vitamin B6, niacin, folacin, and certain carotenoids from poorly digested complexes and thereby enhance the bioavailability of these vitamins. Another advantages of thermal processing is inactivation of anti nutrients in certain foods (Michaelsen, 2009).

However, thermal processing also has several adverse effects. During thermal processing and subsequent storage, thiamine and ascorbic acid are specially susceptible to depletion due to leaching and thermal degradation (Michaelsen, 2009).

2.4.1.2 Drying

Food preservation by drying is commonly practiced in tropical countries to ensure the stability and quality of the product during storage and it's availability throughout the year. According to Muchtadi (1997), there are several technique for drying. Natural and artificial drying. Natural drying is using traditional sun drying, although cheap, is associated with a number of problems, such as poor quality of the products; lack of control over the drying process; possible contamination by dirt, animals and rodents; infestation with insects and mold if the food is dried slowly; and exposure to rain and wind causing repeated wetting and drying (Mensah & Tomkins, 2003). Artificial drying is using instrument to dry the foods. Isothermal drying is drying process where the foods that want to be dried directly related with the hot plate.

Generally, dried foods have lower nutrient content than the fresh one. During drying there would be also changes in color, texture and others, even though the changes can be minimized with preliminary treatment to the foods before it's dried. With reducing water content, foods will contain protein, carbohydrate and mineral higher, however the vitamins and color substance will be broken or reduce. Generally, the color of foods that dried will be change into brown. This was happen because of the browning process, enzymatic or non enzymatic (Muchtadi, 1997).

2.4.2 Relevant foods and ingredients

2.4.2.1 Vegetables

A vegetable is not botanically defined, as it may be any edible part of a plant, such as the root, stem, leaves or fruits. Many vegetables, such as carrots, onion, tomatoes, pumpkins, and green peas, can be valuable ingredients in diets for children with moderate malnutrition. In addition to the energy and nutrients they provide, they bring taste, color and variability in the diet. Although vegetables typically shrink when cooked, they are often not very energy dense and can contribute to the bulkiness of the meal. Many vegetables contain important amounts of micronutrients, especially provitamin A, vitamin C and iron. Although the bioavailability of minerals in vegetables can be low because of antinutrients, the high amounts of vitamin C may improve the mineral bioavailability of the whole meal (Michaelsen, 2009).

2.4.2.2 Green leafy vegetables

Dark-green leafy vegetables such as kale, spinach, and leaves of cassava are widely available and are consumed as part of the normal diet in many populations. Green leafy vegetables are rich sources of provitamin A, vitamin C, iron and calcium. They are almost always cooked before consumption, which causes them to shrink in volume and become more nutrient dense. However, cooking may affect the bioavailability and activity of the nutrients. Cooking destroys 50% to 80% of vitamin C but improves the bioavailability of β -carotene. Since green leafy vegetables can be grown at home at low cost, they may serve as a reasonable alternative to vitamin A-rich animal-source foods (Michaelsen, 2009).

The iron content of most green leafy vegetables is relatively high, although the bioavailability of iron is compromised by a high content of tannins and oxalates. Overall, consumption of green leafy vegetables improves the nutrient quality of cereal-based diets, although the bioavailability of vitamin A as well as that iron is low (Michaelsen, 2009).

2.4.2.3 Animal-source foods

Animal products, such as meat, fish, eggs and dairy products are energy dense, excellent sources of high quality and readily digested protein and

micronutrients, and they contain virtually no anti nutrients. The most important micronutrients in animal products are iron, zinc, calcium, riboflavin, vitamin A and vitamin B12. It has been concluded that “relatively small amounts of these foods, added to a vegetarian diet, can substantially increase nutrient adequacy (Murphy, 2003 in Michaelsen, 2009).

All fish are a rich source of high-quality protein and provide a range of other important nutrients, depending on species and processing. Fatty fish are a valuable source of n-3 LCPUFAs. Small, soft-boned fish that are eaten with bones are an excellent source of calcium and phosphorus. Furthermore, fish is a good source of zinc and bioavailable iron, and fish enhances nonheme iron absorption due to the “meat-factor” effect (Michaelsen, 2009).

2.5 Breastfeeding Practices

In May, 2001 the 54th World Health Assembly urged Member States to promote exclusive breastfeeding for six months as a global public health recommendation (World Health Assembly, 2001). This recommendation followed a report by a WHO Expert Consultation on the Optimal Duration of Exclusive Breastfeeding (WHO, 2001), which considered the results of a systematic review of the evidence (Kramer and Kakuma, 2002) and concluded that exclusive breastfeeding for six months confers several benefits on the infant and the mother. Chief among these is the protective effect against infant gastrointestinal infections, which is observed not only in developing country settings but also in industrialized countries (Kramer et al., 2001). There is some evidence that motor development is enhanced by exclusive breastfeeding for six months (Dewey et al., 2001), but more research is needed to confirm this (Dewey, 2001).

WHO (1998) stated that the current recommendation of the WHO is that, after the initial period of exclusive breast-feeding, children should continue to be breastfed for up to two years of age beyond, while receiving nutritionally adequate and safe complementary foods. Breast milk continues to make an important nutritional contribution well beyond the first year of life. Depending on the population, breast milk provides roughly one-third to two-thirds of average total energy intake towards the ends of the first year (Prentice, 1991; Heinig et al.,

1993a). Because it is relatively high in fat compared to most complementary foods, breast milk is a key source of both energy and essential fatty acids. When complementary foods available are low in fat, breast milk fat may be critical for utilization of pro-vitamin A carotenoids from foods. Likewise, the contribution of certain micronutrients from breast milk may be substantial. The nutritional impact of breast feeding is likely to be most important during periods of illness. Breast milk intake is usually maintained during episodes of diarrhea and fever whereas the infants appetite for other foods diminishes (Brown et al, 1990; Brown, Kanashiro & Dewey, 1995).

2.6 Caring Practices

Care as it has come to be defined over the past 10 years refers to the behaviors and practices of caregivers (mothers, siblings, fathers and childcare providers) that provide the food, health care, stimulation and emotional support necessary for children's healthy growth and development. These practices translate food security and health care into a child's well-being. Not only the practices themselves, but also the ways they are performed (with affection and with responsiveness to children) are critical to children's survival, growth and development. It is impossible for caregivers to provide this care without sufficient resources, such as time and energy (Engle *et al.* 1997b) (Engle, 2000).

The Care Initiative manual (Engle *et al.* 1997b) now lists six care practices, with subcategories, and three kinds of resources needed for good care. Throughout the Care Initiative manual, the term 'caregiver' rather than 'mother' is used, in order to emphasize that in many cases it is not the mother who performs all these functions. Siblings, grandparents, a childcare centre, or even one of the men in the family can also provide care. Programming is probably more effective if caregivers are recognized and supported for their positive practices, as well as being guided to adopt improved practices. These care practices and resources for care are not only important for children's good nutritional status, but also for their growth and development. In fact, they have now been recognized as the building blocks of Early Childhood Care for Survival, Growth and Development, UNICEF's integrated approach to young children. The six care practices will be

described relatively briefly, and then the care practices in complementary feeding will be described in greater detail. The reader is referred to the Care Initiative manual (Engle *et al.* 1997b) for a complete description of all practices and resources (Engle, 2000).

First, care for women represents a number of behaviors on the part of the family to support women, including making sure that they receive adequate prenatal care and safe birthing, and have equal access to education. *Second, food preparation* takes enormous amounts of the caregiver's time and effort. Adequate stoves prevent women's exposure to indoor air pollution. *Third, hygiene practices* have long been recognized as critical for child nutrition. *Fourth, home health practices* include diagnosing illness in the home, use of preventative health care and protection from pests and accidents. *Fifth, good psychosocial care*, including warmth, verbal interaction and encouragement of learning causes improved cognitive development of children, and is related to complementary feeding styles. Feeding, including both *breast-feeding and complementary feeding*, is the *sixth care practice* (Engle, 2000).

2.7 Consultative research

Consultative research is:

- A systematic approach for working with families to identify household child feeding and caring practices that affect child nutrition and find practical ways to improve these.
- A mutual planning and collaborative process that involves stakeholders and enables caregivers to participate and learn better ways to improve child feeding and caring practices.
- A type of formative or planning research that guides the development of effective program strategies to improve child feeding practices

(Dickins *et.al*, 1997)

The consultative research approach offers : in-depth understanding of child feeding practices, adaptation of feeding recommendation to specific situations, understanding of the motivations and constraints to change behavior, flexibility,

quick and inexpensive field research, a bridge between the nutrition program and the family and community, training in nutrition counseling (Dickins et.al, 1997).

To date, consultative research has been carried out in Asia (Bangladesh, **Indonesia**, Pakistan, the Philippines, and Thailand) in projects funded by USAID, the World Health Organization, The World Bank, UNICEF, and national governments (Dickins et.al, 1997). The methods described in this manual can be adapted easily to other public health and development applications that seek to promote behavior change at the household level (Dickins et.al, 1997).

WHO (1998) had recommended the need of a participatory or consultative approach, by which investigators interact extensively with potential beneficiaries, was essential for the latter objective.

2.8 Trial of Improved Practices (TIPs) Protocols

The core method in consultative research is Trial of Improved Practices (TIPs). The advantage of TIPs, particularly for refining feeding recommendations, is that mothers or primary caregivers are given a *choice* of recommendations to act on, questioned about their reasons for that choice, and then followed up to see what actually happened. Did they try the new practice, and if so, how did they feel about it? Did they modify it? Or if they didn't try it, why not? In this way the proposed recommendations are tested in a real environment, and information is gathered on their acceptability. This information helps program planners to set priorities among the many seemingly important feeding practices and messages. Through TIPs, researchers and/or nutrition counselors discover:

- The relative ease or difficulty of communicating various recommended practices;
- Modifications that make the recommendations more acceptable;
- Unanticipated resistance points that limit behavior change;
- Ways in which recommendations are undermined by practices such as dilution, replacement, or children's resistance to new foods; and
- The approximate proportion of families who are and are not able to modify feeding practices and improve nutrition without additional resources.

This method, also known as household trials, involves a series of visits to selected homes to test new behaviors to improve child nutrition. The basic process is:

1. An initial home visit to gather background information and interview the mother (or other primary caregiver) about the diet of her young child.
2. Analysis of the dietary and feeding practice data to identify problems with the child's diet and usual feeding practices.
3. Preparation for counseling by identifying a short list of recommended behavior changes that would help to address the specific problems and that would likely be feasible for the mother. An assessment and counseling guide is used to identify appropriate recommendations.
4. A counseling visit with the mother to present several options for improving her child's feeding, to record her reactions to the options, and to negotiate with her to choose one or more options that she is willing to try during the following week.
5. A follow-up visit to find out whether the mother tried the new practice(s), what happened when she did, whether she is willing to continue the practice, and why or why not.

TIPs have been tested and refined in many situations, including programs to improve breastfeeding and complementary feeding practices, food hygiene, micronutrient malnutrition, management of diarrhea and acute respiratory infections, and maternal health. Results have been used to design successful program strategies and educational materials. The use of TIPs is also suggested for developing locally appropriate nutrition messages for the integrated management of childhood illness (IMCI). TIPs also may be used with participatory and rapid appraisal studies (PRA) (Dickins, Griffiths and Piwoz, 1997).

The Weaning Project in Indonesia (Proyek Pola Makanan Pendamping ASI or PMPA), one of the project adopted TIPs protocol, was a pilot effort to examine the role that enhanced communication could play in strengthening the impact of the national nutrition program (UPGK) to improve child feeding practices at home. The purpose of the project was to help reduce infant mortality

through improvements in the nutritional status of infants and young children by assisting in the development of an infant feeding policy. The project utilized existing programs to promote low-cost, sustainable solutions to problems faced in feeding the weaning-age child in different ecological and socio-economic-situations(www.manoffgroups.com).

The project developed and tested a methodology to assess weaning practices and explore alternatives that could be applied in existing programs. The project also produced information and analysis on weaning practices, the variables affecting these practices and the potential for changing detrimental practices. Province-specific strategies were formulated, implemented and evaluation in East Java and Nusa Tenggara (www.manoffgroups.com).

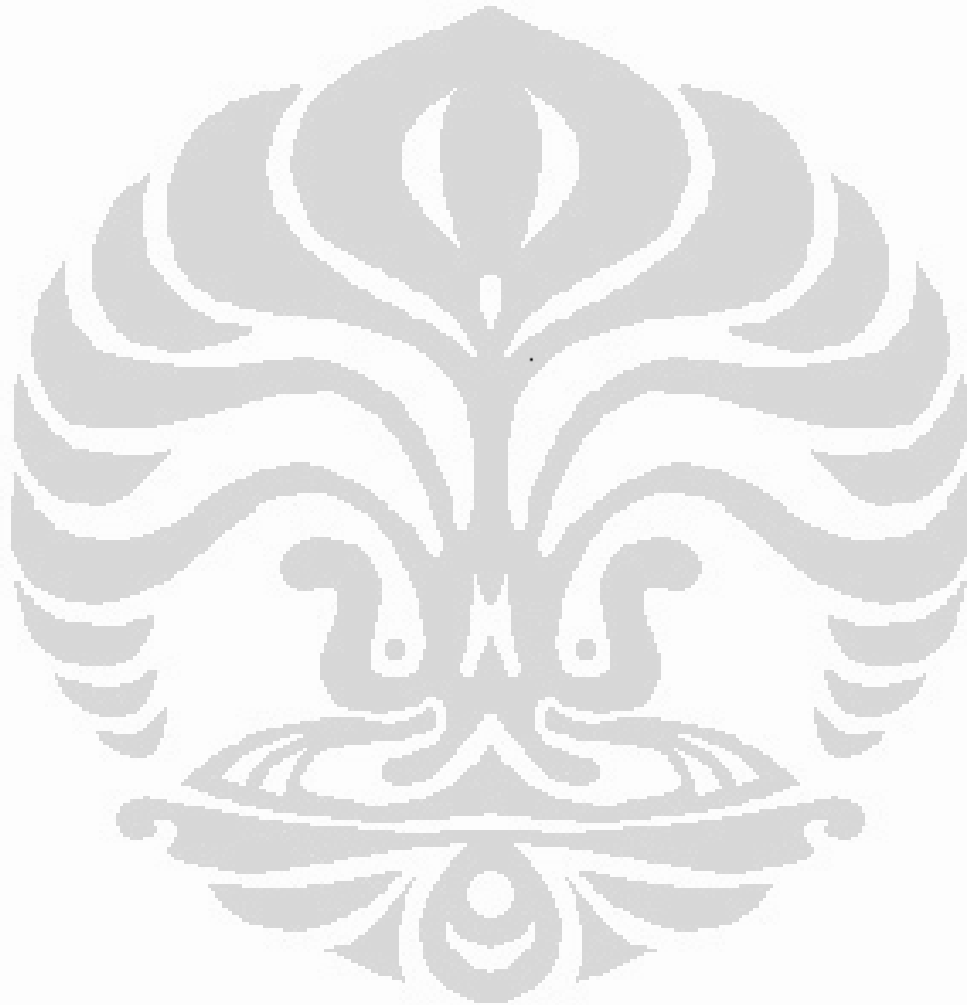
Almost any program aimed at improving child feeding will include messages that ask mothers or other family members to change their behavior. Such **recommendations must be tested**, and for this reason, TIPS are considered to be an *essential* step that cannot be skipped (Dickins, Griffiths and Piwoz, 1997).

Although it may seem difficult to ask mothers to change practices, at least in the households where rapport is established, families usually are delighted to see the field worker return and often view this counseling as a reward for their earlier participation. Families *generally are eager* to try new practices that seem feasible when they understand how they can benefit the child (Dickins, Griffiths and Piwoz, 1997).

In Ecuador the counseling visit produced surprises (Dickins, Griffiths and Piwoz, 1997):

- Most mothers, even in the poorest areas, were willing and able to make at least small changes in their feeding practices. Many welcomed the recommendations, especially the weaning recipes, because they were interested in finding new ways to vary their children's diets.
- Mothers were surprised at how much their children actually could consume at any one sitting and throughout the day. During the in-depth interviews mothers had very little awareness about food quantity, in terms of how much a child required and how much was eaten in a single day. Investigators stayed with the mother and actually helped her feed her child.

Each time, after a child consumed as much as he or she “wanted,” the investigator encouraged the mother to feed more. Usually, to the mother’s great surprise, the children happily continued eating, drawing attention to the idea of food quantity and to children’s willingness to eat more when encouraged.



CHAPTER 3 RESEARCH METHODOLOGY

3.1 Variable Indicator Matrix

Table 3.1 presented the variable and indicators that were investigated in this study.

Table 3.1. Variable-Indicator Matrix (VIM)

Variable	Indicator	Method	Reference (s)
Dietary intake	<ul style="list-style-type: none"> • Energy and nutrient adequacy • Weekly food frequency • Average, minimum and maximum portion size of food consumed 	<ul style="list-style-type: none"> • Interview (Single 24hr recall) • Interview (FFQ) • GI with caregivers 	Gibson, 1990 FAO, 1996
Child's food basket	<ul style="list-style-type: none"> • Type of food consumed by infants • Developed modified nutrient-dense CF recipes 	<ul style="list-style-type: none"> GI with caregivers Trial and error method 	FAO, 1996 Rozanna, 2001
Accessibility to food in the HH	<ul style="list-style-type: none"> • Constraints in the HH (distance, transportation, and purchasing power) • Food production at HH level • Food donation • Weekly food expenditure 	GI of caregivers	Usfar, 2002 UNICEF, 1992
Availability of food in the local market	<ul style="list-style-type: none"> • Type of food available in the market • Price of food in the market 	Market survey	Usfar, 2002
Acceptability of infants on modified nutrient-dense foods	Infants response to the recipes based on mothers	Interview of mothers	Dickins, Griffith and Piwoz, 1997

Table 3.1. (continue)

Variable	Indicator	Method	Reference (s)
Acceptability of mothers on modified nutrient-dense foods	<ul style="list-style-type: none"> No. of mother try the recipes Response of mothers towards the recipes Motivation to try the recipes Constraints on trying the recipes 	Interview of mothers	Dickins, Griffith and Piwoz, 1997
Complementary feeding practices	<ul style="list-style-type: none"> Age of introduction of solid, semi solid and soft food Meal frequency Strategies when child refuse to eat Situation of feeding Feeding during illness 	GI of caregivers	WHO, 2007, Engle, 2000
Breastfeeding practices	<ul style="list-style-type: none"> Initiate breastfeeding within hour after delivery Length of exclusive breastfeeding practice Pre lacteal feeding Breastfeeding on demand 	GI of caregivers	Engle, 2000 WHO, 2007 WHO, 2001
Safe preparation and storage of complementary food	<ul style="list-style-type: none"> Washing raw food material before cooking Utilization of clean cooking and eating utensils for CF 	Observation	WHO, 2001 Engle, 1999
Hygiene practice	<ul style="list-style-type: none"> Utilization of boiled drinking water Washing hands practices 	<ul style="list-style-type: none"> GI of caregivers Interview of mothers 	Engle, 1999 UNICEF, 1992
Food belief/taboo	Type of food taboo/belief related to child feeding practices	<ul style="list-style-type: none"> GI of caregivers GI of cadres 	Engle, 2000
Caregiver's workload/time	Caregivers time allocation	Interview of mothers	Engle, 2000

Table 3.1. (continue)

Variable	Indicator	Method	Reference (s)
Disease	<ul style="list-style-type: none"> Morbidity status * in the day of interview * 2 weeks before interview 	Interview of mothers	Gross et al, 2001
Environment condition	<ul style="list-style-type: none"> Drinking water source Housing condition 	Observation	UNICEF, 1992
Knowledge of mothers on infant feeding practices	<ul style="list-style-type: none"> Knowledge of mothers on : <ul style="list-style-type: none"> * healthy foods * benefit of colostrums * length of EBF * length of breastfeeding * age of introduction of CF * frequency of meals a day * introduction of family foods * good snacks for infants 	Interview of mothers	Gross et al, 2001
Socio economic status	<ul style="list-style-type: none"> Parents education Parents occupation 	<ul style="list-style-type: none"> GI of caregivers Interview of mothers 	Gross et al, 2001

3.2 STUDY DESIGN

This was a cross-sectional study. The data collection was conducted in February 2010 (*during rainy season*). Method used in this study adopted the method used in consultative research, which were basically qualitative. Quantitative data were done to help the researcher and participants assess the significance of the qualitative information.

3.3 STUDY POPULATION AND AREAS OF THE STUDY

The criteria for the subjects in the RAP (GI with caregivers) and recipe trials were: mothers of infants aged 9-11 months on the day of the study recruitment), breastfed, apparently healthy (did not suffer from illness that may changes their food intake), and willing to join the study while the exclusion criterion was severe undernourished.

The inclusion criteria for the subjects in the household trial were: aged 9-11 months on the day of the study recruitment), breastfed, apparently healthy (did not suffer from illness that may changes their food intake), literate mother and willing to join the study while the exclusion criteria were severe undernourished, food insecure with severe hunger (FSSM score <13) and have food taboo or allergic with fish, chicken liver and dried anchovy. Cadres that participated in the study were cadres in each hamlet (Posyandu) that were available in the day of group interview.

This study was done in Pringgabaya sub district, East Lombok, West Nusa Tenggara. Based on East Lombok Board Center of Statistic, Pringgabaya is the sub-district with the largest plantation in East Lombok. In 2008, it was the second largest producers of coconut. It was also a good producer of cashew nut. In agriculture, it's also has variety of agriculture products. In 2008, it was the first producers of chili, third largest producers of peanut and egg plant. The other products are sweet potato, mung bean, longbean, cucumber etc. It was also a producer of some fruits, like banana, water apple, sawo, mango, orange and jackfruit. Besides agriculture and plantation products, Pringgabaya also has variety of livestock products, such as cows, buffalos, goat, sheep and birds. East Lombok district has large enough natural resources (marine and fisheries). East Lombok sea has the potential of fish resources sustainable (MSY) of 18242.0 tons / year which consists of pelagic fish resource potential of 7752.8 tons / year and the potential of demersal fish resources 10489.2 tons / year. While the beaches of East Lombok length is 220 km. Pringgabaya is one of the sub-district that bordered by the sea, so it has also the marine and fisheries production.

Since 2009, Pringgabaya was having expansion in term of governance structures. Previously it was only has 7 villages and 62 hamlets and now it becomes 10 villages and 65 hamlets.

3.4 SAMPLE SIZE AND SAMPLING PROCEDURE

3.4.1 Sample size

There are no definitive rules for calculating sample sizes in qualitative research, but including at least two or three individuals per participant category in each population unit is recommended. The summary of sample size used in this study will be presented in Table 3.2

3.4.1a Rapid Assessment Procedure

In the RAP, four GI with cadres were conducted in near and far market hamlets (each group consist of 2-6 informants) and four GI with the caregivers were conducted in the two randomly selected near and far-market hamlets (each group consist of 2-6 informants). According to Glesne and Peshkin (1992) and Brown (2004) at least two persons are needed in the Group Interview.

3.4.1b Recipe trial

According to Dickins, Griffith and Piwoz (1997), only one, or at most two, recipe trials are required with any given population segment. The 1st recipe trial, was conducted one time in one near-market hamlet with the justification that based on the RAP results this hamlet has most CF local recipes. Second recipe trials were conducted two times in near and far-market hamlets.

The recipe trials conducted in different communities that scheduled for the TIPs. The number of caregivers participating in the 1st recipe trial was 6 because they were expected to cook. While in the 2nd recipe trial the number of caregivers was 6 in near-market hamlet and 4 in far-market hamlet.

3.4.1c TIPs (Trial of Improved Practices)

For TIPs, the sample should include *two to three* children in each age group per site (Dickins, Griffith and Piwoz, 1997). In this study, there was 2 groups, near and far-market hamlet. Seven babies from near-market hamlet and 5 babies from far-market hamlet were joining the household trial.

Table 3.2 Summary of sample size used in this study

Data collection method	Actual sample size (no. of informants)	Sample size recommended (no. of informants)	References
GI cadres/caregivers	2-6	> 2 in 1 group	Glesne and Peshkin (1992), Brown (2004)
1 st recipe trial	6	5-6	Dickins, Griffith & Piwoz (1997)
2 nd recipe trial	10 in 2 groups	6-10	Dickins, Griffith & Piwoz (1997)
Acceptability trial (TIPs)	12 in 2 groups	Min. 2 at each group	Dickins, Griffith & Piwoz (1997)

Detailed number of respondents in each of activity of the study was presented in the appendix.

3.4.2 Sampling procedures

West Nusa Tenggara province was purposively chosen because of it has high under nutrition prevalence among under five children compare to the National prevalence. East Lombok district is also purposively chosen because high under nutrition prevalence among under five. Pringgabaya sub district was chosen because this district has typically similar characteristics with East Lombok district in term of population density (649 people/km²) and poverty condition (35% of sub welfare family) in 2005. Besides that, this study is the continuation of the previous study of CFRs among 6-11 month old infants (Fitriyanti, 2005). Based on the previous study conducted by Fitriyani (2005), the local governments in Pringgabaya sub district were keen to implement a nutrition strategy into the area and had the infra-structure to do so. It will really important for the intervention study that will be conducted after this study.

For the RAP and recipe trials, two out of 36 near-market hamlet and two out of 29 far-market hamlet were randomly selected. Two hamlets in each category (near or far-market) were chosen because according to Piwoz (2004), in the formative research minimally 2 FGDs are required to obtain the infant feeding

practices in relatively homogenous population. Hamlets were assumed to be homogenous population. Summary of sampling method was presented in Figure 3.1.

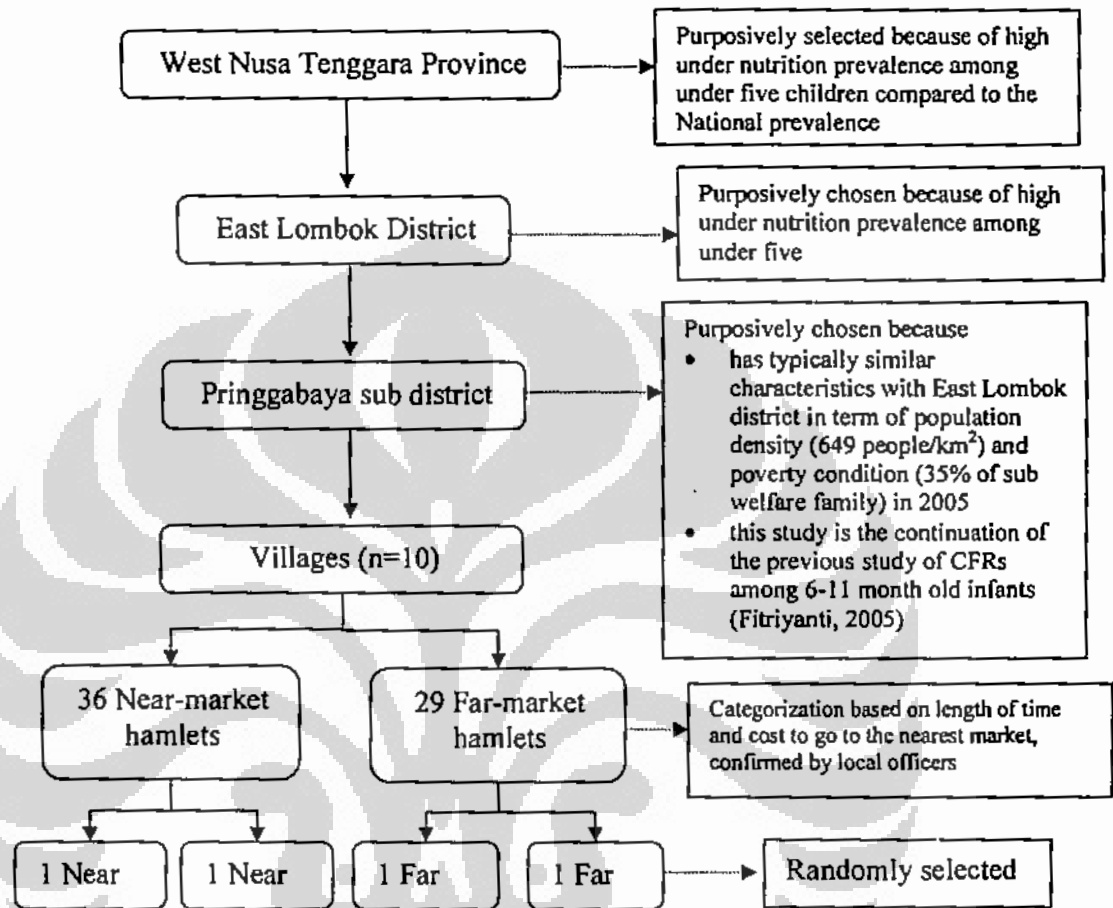


Figure 3.1 Sampling method in the study

3.5 DATA COLLECTION PROCEDURES

The flow of the study is presented in Figure 3.2.

3.5.1 Rapid Assessment Procedure (RAP)

The objective of the RAP in this study is to confirm the type of foods consumed by the 9-11 month old infants including local CF recipes exist and their habitual food consumption pattern that already gathered from the previous studies, to explore the information on infant feeding practices.

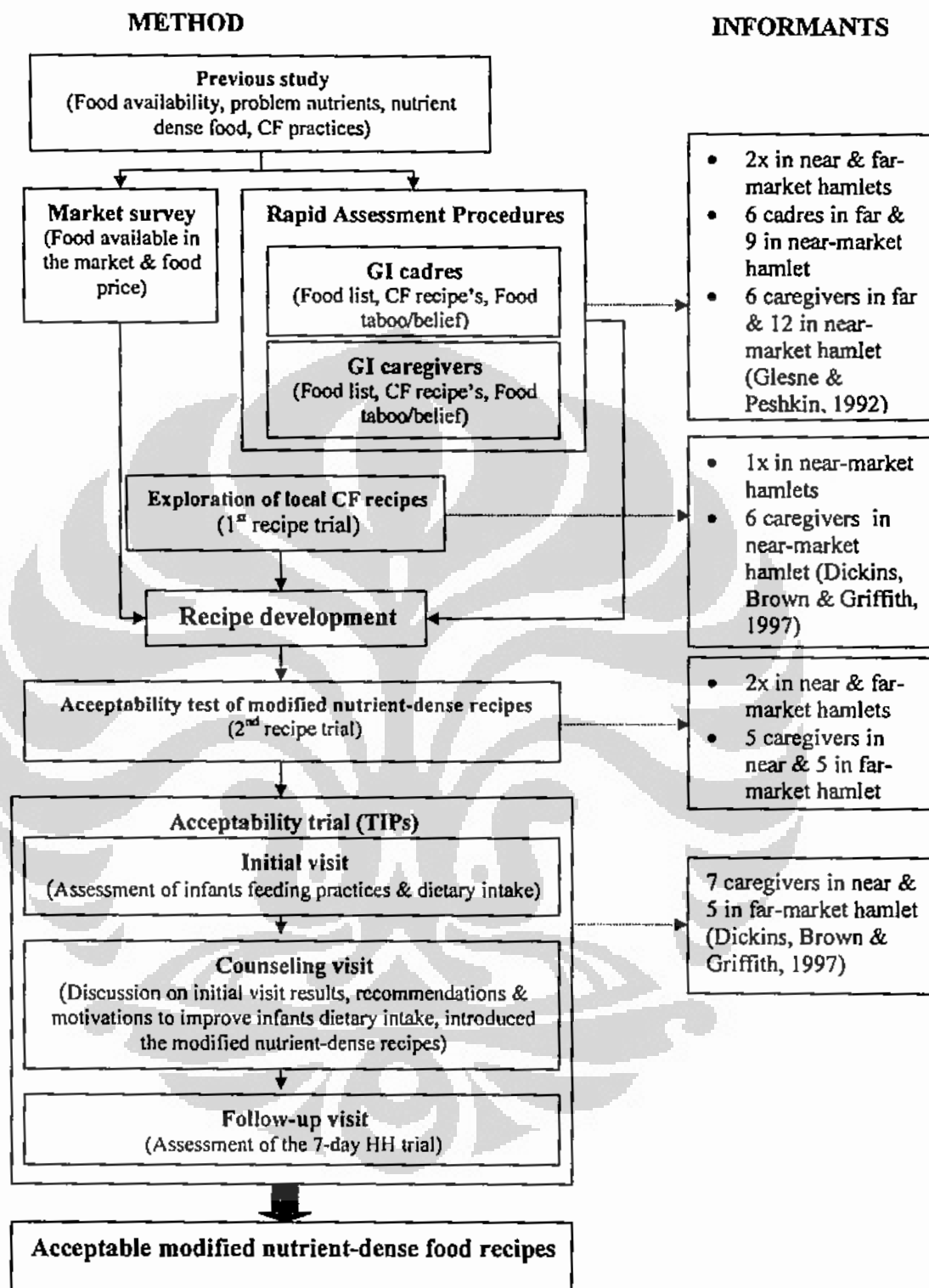


Figure 3.2. Flow and the informants in the study

3.5.1a Group Interview (GI) with the cadres

Group interviews among the cadres were conducted 2 times in near-market hamlets and 2 times in far-market hamlets. The GI was done in convenient place, in cadres or in community leader house ("*Kepala Dusun*"). One research assistant moderated the discussion. All discussion in the GI was recorded using tape recorder. Permission for recording the GI was obtained prior to each GI.

In the GI with the cadres, the cadres asked about the foods usually consumed by the infant's 9-11 mo in that area based on their experience and observations. Besides obtaining the foods that usually consumed by the infants, GI with the cadres also done to obtain the local CF recipes exist among 9-11 mo in the area and the favorite recipe based on them. GI with the cadres also conducted to gather the information on the food pattern and food taboo/belief in population. The information on the food belief/taboo assisted in the developing the appropriate local CF recipe's.

3.5.1b GI with caregivers

Similar with GI with cadres, GI with caregivers were conducted 2 times in randomly selected near-market hamlets and 2 times in far market hamlets. The GI was done in convenient place, in cadres or in community leader house ("*Kepala Dusun*"). The group interview of the caregivers facilitated with one facilitator. All information obtained from this activity were documented and recorded by the researcher. Permission for recording the group interview was obtained prior to each group interview.

The purpose of the group interview with the caregivers was to explore the information on existing infant feeding practices. Group interview with the caregivers were also done to obtain the food list (food usually consumed and portion size) to confirm the similar information from previous study. Food list and food portion of the infants were obtained by individual interview with the caregivers and weighted the food by the portion usually consumed by the infants.

The other information obtained from the GI with the caregivers was food belief/taboo of infants 9-11 month old. In addition GI with caregivers also

conducted to gather the information on existing recipes and the opportunities to introduce the modified recipes.

3.5.2 Market survey

Market survey was done to collect information on the food available in the market and to determine the cost of each foods. Market survey also done to confirm the availability of nutrient-dense foods identified from previous study. The market survey was done in the 4 market in East Lombok, which were Apitaik, Pringgabaya, Pohgading and Labuan lombok,. One samples of each food were collected and cost every foods per 100 gram was counted. This information was used in determining the cost of modified local nutrient-dense complementary food recipes.

3.5.3 Recipe trials

The 1st recipe trial was held in order to have information on the existing recipes or how the caregivers developed recipes based on her usual practices (exploration on existing CF recipes). The 1st recipe trial was done with cooking competition among mothers in 1 near-market hamlet (Apitaik hamlet). The hamlet was chosen because from the RAP results, GI with cadres and caregivers shown that this hamlet has more variety of recipes. There were 3 groups in the competition, each consist of 2 mothers of 9-11 mo infants. The instructions during the competition were: they have to cook 2 kinds of recipes (one meal and one snack) with the available ingredients, usually given and acceptable to their infants and practical (didn't require much time).

While, the 2nd recipe trial was held to introduce the modified recipes and to choose the most popular recipes which were used for the TIPs (household trial). The assessment of the recipes acceptability used a structured form to score responses on taste by mothers and infants, availability of items, willingness to give the recipes when the infants were ill, time of preparation and willingness to prepare. This was done so that the recipes can be ranked according to their popularity.

The 2nd recipe trials were done 2 times (4 days) in near and far-market hamlets. Each of the recipe was introduced and assessed its acceptance among infants and the mothers in the infants meals time. So, the research team stayed in each hamlet for two full days to introduce 6 recipes.

3.5.4 Recipe development

Basically, the recipes developed were based on the local complementary food exist in the study area. The information of food available for the recipes ingredients and complementary recipes exist in the area was based on the previous study by Harper (2006) and Fitriyani (2005). This information also validated by this study in RAP (GI with cadres and caregivers), market survey and 1st recipe trial.

Those recipes found were modified to reach the desired outcome, which was to make the nutrient-dense recipes for the 9-11 mo infants with the attention on 3 problem nutrients, calcium, iron and zinc. The process of recipe development was done using *trial and error* method. The trial of food processing was done with the consideration of the energy and nutrient density to fulfill the requirements. The way of preparation and cooking method was also following the local recipes preparation using simple home food technologies.

3.5.5 Recipe acceptability trial

The community acceptability of the recipes was tested by using the Trial of Improved Practices (TIPs) Protocols (Dickins, Griffith and Piwoz, 1997). The objectives of the TIPs were:

1. To test the mother's responses on the set of recommendations including the modified local nutrient-dense recipes and determine which are most feasible and acceptable.
2. To investigate the constraints on mothers in making the recipes and giving it to the infants.

3.5.5a Initial visit

During the initial visit, field workers collect background information and conduct dietary assessments based on the prepared 24-hour recall and food frequency forms. Field workers also asked about child appetite, feeding styles, and preparation practices (Dickins, Brown & Piwoz, 1997).

3.5.5b Counseling visit

During the counseling visit, the interviewer discusses the child's positive feeding practices and feeding problems. The *modified recipes* then introduced through cooking demonstration. During the counseling session, the researcher discussed the recommendations related to the infant feeding problems including the modified recipes formulated (it's acceptability, feasibility of cooking in home and the willingness of the caregivers to give the recipe to the infants).

Through a process of negotiation, the researcher and caregivers agreed on practices/set of recommendations that the caregivers would carry out for the next several days, until the scheduled follow-up visit. The follow-up visit will be carried seven days after counseling visit.

3.5.5c Follow-up visit

After seven-day trial of the modified recipes, researcher conducted follow-up visit to respondents home. During this visit, the researcher finds out if there were any significant changes in the home or in the child's health since the previous visit. A second 24-hour food recall was conducted, and the mothers were interviewed about her reaction to the agreed-on practices. These discussions include the mother's experience with the new practice(s), the child's response, the mother's willingness to continue the practice in the future, and any modifications of the recommendations.

Detailed questions are available in the appendix.

3.5.6 Anthropometric measurements

Anthropometric measurements were done to screen the subjects. It performed by measuring the body weight of the infants. Body weight of the infants was measured by using electric weigh scale SECA. The scale must be positioned in flat surface and the starting point should be on zero. The respondents were asked to stand in the center of the platform (the two feet should be on the rubber mat of the scale) with upright position (looking straight ahead). Mother's weight was measured first. While the mother still standing on the weighing scale, the scale was set on zero point and then the child was passed to the mother, to put on the mother's arms. During the weighing measurements, the respondent should not wear any slipper/shoes, hat, etc and should wear minimum clothing as possible. The body weight recorded to the nearest 0.1 kg. The measurements were done twice for every subject, and the end result was the average of two measurements.

3.6 DATA ANALYSIS

The Group interview with cadres and caregivers were transcribed verbatim and translated into Indonesian (when the interviews are in local language). Initial matrixes were made to transfer all information from the verbatim of each GI according to each indicator. A summary of initial matrixes was made for the data's presentation. Analysis was done by making contrast, comparison or themes emerged from the data.

The Z-scores for weight-for-age of infants surveyed were analyzed using WHO 2006. Underweight defined as a Z-score < -2 SD while Normal nutritional status was defined as Z-score -2 SD- 2 SD.

Energy and nutrient contents of the food obtained from Indonesian Food Composition database available in Nutri Survey for Windows, version 2004. To calculate the daily energy and nutrient intakes of the infants, the intakes from complementary foods obtained from single 24hr recall were added by the average breast milk intake (Dewey and Brown, 2003). Adequacy of energy and nutrient intake was analyzed with comparing the infants' intake from single 24hr recall with the Indonesian Recommended Nutrient Intake (RNI) for infants 6-12 mo (WKNPG, 2004) and then multiply by 100%. The list of Indonesian RNI for infants 6-12 mo was presented in Table 3.3 below.

Table 3.3 Indonesia RNI for infants 6-12 mo (WKNPG, 2004)

Energy and Nutrients	Recommended Intakes
Energy (Kal)	650
Protein (g)	16
Vitamin A (RE)	400
Thiamin (mg)	0.4
Riboflavin (mg)	0.4
Niacin (mg)	4
Folic acid (mg)	80
Vitamin B12 (mg)	0.5
Vitamin C (mg)	40
Calcium (mg)	400
Iron (mg)	7
Zinc (mg)	7.5

Score of acceptability test in the 2nd recipe trial was calculated for each parameter and presented below. The **individual score** of each parameter was

5 = very likeable, 4 = likeable, 3 = acceptable, 2 = less acceptable, and 1 = unacceptable.

Table 3.4 List of parameters and score calculated for food products in 2nd recipe trial

Parameters	Score calculated
1. Taste by mothers	Score of each parameter
2. Taste by child	$= (n_1 * 1) + (n_2 * 2) + (n_3 * 3) + (n_4 * 4) + (n_5 * 5)$
3. Feed to sick	
4. Availability of items	Notes : n_1 = number of respondent that give
5. Preparation time	1 in individual score, n_n = number of
6. Willing to prepare	respondent that give n in individual score

The total score of a food product was calculated by summing up score of each parameter. So, the highest the score it means that the food products were more acceptable. While, the rank of each parameter was gathered by listed the score in each parameter. The highest score means it has the highest rank in each parameter. The total rank was calculated by summing up rank of each parameter. So, the more acceptable the food products the higher the rank (or lowest in number).

The proximat and micro nutrient content of the food products (except cap cay) were analyzed in Food Laboratory (*Balai Besar Industri Agro, Bogor*).

The population-descriptive statistics were analyzed using SPSS for Windows, version 15.0. The adequacy of energy and nutrient intake before and after trial between infants who consumed recipes and who didn't consume recipes was analyzed using *Wilcoxon Signed Ranks test*, while *Mann Whitney test* used to analyze within-group difference before and after trial.

CHAPTER 4 RESULTS

4.1 Characteristics of study subjects

Based on Table 4.1, for the group interview with the caregivers there were 18 respondents which came from 2 near-market hamlet and 2 far-market hamlet. The composition between male and female infants was equal (9:9). One respondent was categorized as underweight while the others were normal. Most of the mothers were graduated from primary school. All of mothers in far-market hamlet were involve in family income generation. In contrast, most of mothers in near-market hamlets were housewife. The youngest mother was 16 years old and the oldest was 32 years old. While the fathers, more than half of them work as the migrant worker, the others were driver, farmer or laborer.

Table 4.1. Characteristics of study subjects in Group Interview with the caregivers

Characteristic	Groups			
	Far ^a		Near ^a	
	A	B	C	D
Number of participant (n)				
Based on:				
N total	4	2	6	6
Child's sex				
Female	3	1	3	2
Male	1	1	3	4
Child's weight for age z score (WAZ)				
< -2 SD	0	0	1	0
-2 SD up to 2 SD	4	2	5	6
Mother's last education				
Primary school	3	2	5	4
Junior high school	1	0	0	1
Senior high school	0	0	1	1
Mother's occupation				
Farmer	4	1	0	3
Housewife	0	0	6	3
Other	0	1	0	0
Father's occupation				
Farmer	0	0	1	2
Migrant worker	4	0	0	4
Other labor	0	0	1	0
Driver	0	2	2	0
Other (entrepreneur)	0	0	1	0
Not working	0	0	1	0
Caregiver's age in years (min-max)	(20-26)	(26-28)	(22-32)	(16-30)

^a name of hamlets; A=Sukamulya, B=Sanggar, C=Dusun Pernck, D=Bubur Gadong

Based on Table 4.2 on the household trials there were 5 respondents from far-market hamlet and 7 respondents from near-market hamlet, so in total there were 12 respondents join the 7-day household trial. The composition between male and female infants was also equal (6:6). Four respondents were categorized as underweight and the others were well nourished. The level of education of the mothers was varied from not graduated from primary school until bachelor degree. While 5 from 12 the fathers were graduated from high school. More than half of the mothers were housewife while the occupation of the fathers was varied, 4 of them were entrepreneur, 2 were migrant workers and other labor and the other were farmer, government employee and driver. From the demographic data there was similarity between household in far and near-market hamlet in term of the median of number of household, number of under five in the family and number of unproductive age in the family. However, the near-market hamlet has bigger maximal number of those demographic characteristics.

Table 4.2. Characteristics of study subjects in household trial (TIPs)

Characteristics	Groups	
	Far (n=5)	Near (n=7)
Number of participant (n)		
Child's sex		
Female	2	4
Male	3	3
Demographic data		
Number of household member, <i>median (min-max)</i>	5 (3-6)	5 (3-9)
Number of under five in the family, <i>median (min-max)</i>	1 (1-1)	1 (1-2)
Number of unproductive age in the family, <i>median (min-max)</i>	2 (1-3)	2 (1-4)
Socio economic status		
Mother's last education, n		
Primary school not graduated	1	2
Primary school graduated	1	1
Junior high school graduated	1	2
Senior high school graduated	1	1
Bachelor degree	1	1
Father's last education, n		
Primary school not graduated	0	1
Primary school graduated	0	2
Junior high school graduated	1	2
Senior high school graduated	4	1
Bachelor degree	0	1

Table 4.2 (continue)

Characteristics	Groups	
	Far (n=5)	Near (n=7)
Mother's occupation, n		
Farmer (land owner)	0	2
Housewife	4	4
Entrepreneur	1	0
Government employee	0	1
Father's occupation, n		
Farm labor	1	0
Farmer (land owner)	0	1
Migrant worker	2	0
Government employee	0	1
Other labor	1	1
Driver	0	1
Entrepreneur	1	3
Daily food expenditure for family (IDR), median (min-max)*	26,714 (20,143-38,786)	19,571 (10,696-50,036)
Daily food expenditure for child (IDR)		
Meal, min-max ^a	4,029-7,757	2,139-10,007
Snacks, median (min-max)*	2,000 (1,000-3,000)	2,143(1,000-4,857)
Nutritional status of the child (WAZ), n		
< -2 SD	2	2
-2 SD up to 2 SD	3	5

^a daily food expenditure for family divided by median number of household member

*not significant using *mann whitney test*

Based on Table 4.2, the median of daily food expenditure for family in far-market hamlets was higher than in near-market hamlet. The daily meal expenditure for the infants in far-market hamlet was range between 4.029-7.757 (IDR), while in near-market hamlet the range was between 2.139-10.007 (IDR). In term of median daily snacks expenditure for the child, the near-market hamlets household had slightly higher expenditure than far-market hamlet, which was 2.143 (IDR),- compared to 2.000 (IDR). However, the difference between daily food expenditure for family and child was not significantly different.

Characteristics of the cadres that join the group interview were presented in Table 4.3. Most of the cadres had been cadres for 3-6 years. Most of the cadres were graduated from junior high school. The level of education of the cadres in near-market hamlets was higher than in far-market hamlets. In far-market hamlets there were still cadres that only graduated from primary school. Sixteen cadres were housewife, four were entrepreneurs and three were unemployed.

Table 4.3 Characteristics of cadres participating in group interview

Characteristics	Groups	
	Far (n=6)	Near (n=9)
Length of time being cadre, <i>n</i>		
< 3 years	2	2
3-6 years	4	5
> 6 years	0	2
Level of education, <i>n</i>		
Primary school graduated	2	0
Junior high school graduated	4	4
Senior high school graduated	0	4
Bachelor degree	0	1
Occupation, <i>n</i>		
Unemployed	0	3
Housewife	3	3
Entrepreneur	1	3
Farmer	1	0
Other	1	0

4.2 Local food availability

The result of local food availability that was based on the market survey from 4 nearest market in East Lombok was presented in the appendix. Based on the results, every food groups was available (consist of staple food, animal protein, plant protein, vegetables, fruits and snacks). Similar with the previous study, the nutrient-dense foods (chicken liver, anchovy and fish) were still found. The price of most of the foods was increase. Interestingly, the price of some foods was decrease, namely chicken egg, duck egg and chicken liver. Among nutrient-dense foods, fish (tuna) price was not really different from previous study. While anchovy price was increase almost 70%.

Based on GI with cadres presented in Table 4.5, *seasonal influence* on the food availability were applied to **sweet potato** which will be easy to get 3-4 month after rainy season. Sweet potato was actually a good source of vitamin A. However, our study that was done in rainy season, found small number of sweet potato in the market. Besides that, other vitamin A source foods were available in the whole year, including carrot and tomatoes. In the rainy season, the **vegetables** will be easier to get. However, for the near-market hamlet they admitted that vegetables were provided in the whole year because they were close to the market. Consequently with the vegetables, rice price will be up in the rainy season. Price fluctuation was also applied to **fish**, where in the full moon, that happen about one week every month the fish price will increase, this happen because in the full

moon the fish were more difficult to find, so less fisheries go to the sea to find the fish. However, according to the mothers even though the price increases they still bought fish almost everyday. Similar with fish, price fluctuation was also applied to **dried anchovy**, in the full moon the dried anchovy's price will increase. **Chicken liver** was not influenced by the season.

4.3 HH food accessibility

Based on Table 4.4, from the group interview with the caregivers, in term of distance and cost to go to the nearest market there were differences between near and far-market hamlet, but in terms of purchasing power, there was similarity, which most of them said that if the price of foods increase it will affect their purchase.

Some of the caregivers from far-market hamlets still had food production in their house while less in near-market hamlets still produced foods from their house. None of the caregivers receive the food donation. Far-market hamlets family had higher weekly foods expenditure, both for the family and also for the child.

4.4 Infant feeding practices (GI caregivers and cadres)

Based on the group interview with caregivers, there were *similarities of infant feeding practices in far and near-market hamlet*. Half of the mothers in both far and near-market hamlet didn't practiced early initiation of breastfeeding; usually the reason was because the breast milk hasn't come out yet. Most of them also didn't practiced exclusive breastfeeding for sixth month. Some of them still practiced the previous exclusive breastfeeding recommendation, which was for 4th month. There was also some who already practiced the new recommendation, for sixth month. In contrast, some of them only practices exclusive breastfeeding as early as 2 month, and the worst was one of them directly gave the food after the baby was born. Pre lacteal feeding used in the far and near-market hamlet were also similar. They use formula milk, honey and coconut flesh. However, there was difference in the belief of using coconut flesh, where in far-market hamlet they said "*it the representative of the young babies born*". While, in near-market

hamlet they said *"it will make the babies growth more fertile"*. All mothers were practiced breastfeeding on demand.

The introduction of complementary foods, was begin as early as 2nd month in far-market hamlet, while in near-market hamlet it started as early as directly after birth. Usually they gave pre-masticated rice to the infants, so that the infants will be calm. As the soft foods introduced early, so the other consistency of foods also introduced early. Almost all infants in this age were given pre-masticated foods by the mothers. Some said because it already a habit, some also said they didn't have time to make special foods like porridge for the babies, so giving pre masticated foods will reduce their time for preparation of infants foods. They already stop to make special food for the babies, usually until 6th month. After that they gave the family food but pre-masticated. The mothers usually gave meals in a day 2-3 times in both and near-market hamlet, while in near-market hamlet they have more frequency on eating snacks in a day. When the infants refused to eat, in near-market hamlet there were some said gave the infants vitamin, while the others strategies were similar, like persuade and gave favorite foods. However, in far-market hamlet there were also mothers that do nothing when the infants refuse to eat. She said, *"If he didn't want to eat, I will let him until he ask for it..."*. The situation of feeding was also similar between far and near-market hamlet. One mother said *"Sometimes inside the house or outside the house, while holding in my arm..."*. When the infants were ill, most of them only gave breast milk, because usually the infants didn't want to eat. However, in far-market hamlet, there were some mothers still try to give the foods to the child. The infant feeding practices were summarized in Table 4.4.

Table 4.4 Summary of HH food accessibility and infant feeding practices based on group interview with caregivers and cadres

ISSUE	Far-market hamlet (n=6)	Near-market hamlet (n=12)
Constraints in the HH (distance, transportation to nearest market, and purchasing power)	Rp.4.000 (back and forth to go to the market). if the food price increase, most of them said it will affect their purchase	can be reached by walk, or use "becak" Rp.1.000 (back and forth), if the food price increase, most of them said it will affect their purchase
Food production at HH level	Some HH plant fruits	Only one plant fruit

Table 4.4 (continue)

ISSUE	Far-market hamlet (n=6)	Near-market hamlet (n=12)
Food donation for child	No donation	
Weekly food expenditure	For family: 70,000-175,000 (IDR) For babies: 7,000-28,000 (IDR)	For family: 56,000-175,000 (IDR) For babies: 7,000-21,000 (IDR)
Breastfeeding practices		
Initiate of breastfeeding within hour after delivery	Half of the mothers didn't practiced	
Length of exclusive breastfeeding practice	As early as 2nd mo, 4th and 6th mo	As early as directly after birth, 4th mo, 5th and 6th mo
Pre lacteal feeding	Formula milk Honey Young coconut flesh	
Breastfeeding on demand	All practiced	
Complementary feeding practices		
Age of introduction of solid, semi solid and soft food	Soft food: As early as 2nd mo, 4th and 6th mo Semi solid: 6-8th mo, pre masticated rice/foods Solid food: as early at 10th but most has already introduced in term of snacks (biscuits etc)	Soft food: As early as directly after birth, 4th mo, 5th and 6th mo Semi solid: 6-8th mo, pre masticated rice/foods, rice porridge Solid food: as early at 8th, 9th and 10th mo
Meal frequency	2-3 times meal, 1-4 times snacks	2-3 times meal, 1-5 times snacks
Strategies when child refuse to eat	Persuade, favorite foods, do nothing	Persuade, favorite foods, Vitamin
Situation of feeding	Inside or outside the house, while holding the baby in her arm, sometimes use spoon or hands (when give dry foods or pre masticated foods)	
Feeding during illness	Give only breast milk Try to give the food	Give only breast milk
Hygiene practice		
Utilization of boiled drinking water	Almost all use boiled or mineral water	Almost all use unboiled water

Hygiene practice, especially the utilization of boiled drinking water still become a problem in East Lombok, where there was still a habit to use unboiled drinking water ("air nyet") including for the infants. Almost all mothers in near-

market hamlet use unboiled drinking water. They said it will make the infants more healthy and strong. Some said, in the rainy day they will boil the water. *One mother said, "because in the rainy season there were some germ in the well water and I'm afraid it can make us sick, so we boiled it..."*. However, in the dry season, they will continue their habit to use unboiled drinking water. They also said they done the practice for the efficiency of their family expenses. While in far-market hamlet almost all use boiled drinking water or mineral water. Some of them said the well water was no longer clean, so they were afraid to drink it without boiling it first. However, they admitted that still many mothers in their neighborhood used unboiled drinking water for their infants.

4.5 Development of modified local nutrient-dense recipes

The development of modified local nutrient-dense recipes were based on the previous studies by Harper (2006) and Fitriyanti (2005) and the exploration on complementary foods and complementary food recipes exist among 9-11 mo infants in East lombok. The information was also confirmed with the market survey for the food available in the market and also the price of each foods (presented in the appendix).

4.5.1 Review from previous studies

Even with adherence to the Complementary Feeding Recommendations (CFR's), Harper (2006) found that the requirements of some nutrients, namely iron, zinc, calcium and niacin, cannot be met by local foods alone in quantities currently consumed. Fitriyani (2005) found the possible food item as the source of iron was chicken liver and the possible food item as the source of iron was dried anchovy, while zinc can be fulfilled by fish consumption. Based on these results, *the possible foods for the recipes were chicken liver, dried anchovy and fish*. However, results from Fitriyani (2005) showed that some mothers in far-market hamlets found it difficult to provide chicken liver once a week due to accessibility constraint. Moreover, dried anchovy was still rarely consumed due to its texture, however one mother has ever tried to make in into powder before gave to the infants.

From the results of previous studies in East Lombok (Harper (2006) & Fitriyani (2005)), there was not many complementary food recipe's identified for this age group. Only mungbean flour porridge identified (mungbean flour : dry rice, 1:2). According Fitriyanti (2005) many of 9-11 month old infants were no longer fed flour porridge and were only given steamed rice. Food list identified for 9-11 month old infants (Harper, 2006) was presented in the appendix to give preliminary description of what foods usually consumed by the infants.

4.5.2 Exploration on complementary foods and complementary food recipes exist among 9-11 mo infants

4.5.2a Results from group interview (cadres and caregivers)

Based on the group interview with cadres and mothers, most of the mothers no longer cooked special foods for the infants. They already gave the infants the same foods with the family, even though they still avoided spicy foods for the infants. Based on Table 4.5 and the food list of animal protein sources presented in the appendix, **chicken liver** was usually consumed in near-market hamlet, because usually the chicken liver was only available in the market, so re-confirmed the same constraint found in the previous studies for the availability of chicken liver in the far-market hamlets. In this case, there was a challenge to make **chicken liver** more *durable*.

Anchovy was already consumed by almost half of the infants. However, two infants from one far-market hamlet were not used to consuming it. It was because of the hard texture, that also make all of the infants usually consume it in pre-masticated. Based on this, there was a challenge to make the texture more acceptable (*softer*). The portion consumed was also still so small, in average only 4.1 gram.

From the group interview with the cadres and mothers, some still consider fish as one of the food that was avoided because it can make the faeces smells bad. However, contrastingly, individual interview with the mothers found almost all infants consumed **fish**. Moreover, from the group interview with the mothers,

they usually gave their infants fish, in far-market hamlet they admitted only fish that usually consumed by their infants as animal protein.

SUN, as one of fortified foods was only consumed by small number of infants in near-market hamlets, whereas they usually had stopped to give SUN or fortified porridge when the infants were 8th mo. However, fortified foods were mostly consumed by the infants in the form of snacks.

Table 4.5. Summary of group interview with caregivers and cadres on complementary foods and complementary food recipes exist

ISSUE	Far-market hamlet (n=6)	Near-market hamlet (n=12)
By cadres		
Type of foods usually consumed	Staple Rice, mix rice flour porridge, instant noodle, rice+salt Animal protein Fish (small, salty or fresh) Vegetables Carrot, sweet potato, spinach, cassava leave, pumpkin Fruits (including snacks) Banana, rambutan, mangosteen, mango, papaya, orange, biscuit, jelly, sukro, tic tac	Staple Rice, mix rice porridge, instant noodle, SUN, rice porridge Animal protein Fish (fresh, small), chicken liver, egg (quail, chicken), chicken Vegetables Sweet potato, carrot, spinach, <i>kelor</i> , long bean, <i>turi</i> , potato Fruits (including snacks) Apple, rambutan, banana, papaya, mango, biskuat
CF recipe's exist	Mix rice flour porridge Mungbean porridge	Mungbean flour porridge Mungbean porridge Mix rice porridge Pudding
Favorite CF recipes	Mungbean porridge	Mungbean porridge Mix rice porridge (with vegetabes)
Food taboo/belief related to infant feeding practice	Fish head, make the babies smart Coconut milk, can make diarrhea Fish, can make the faeces smell's bad Corn, can cause cough Mungbean, can make itchy skin Soda, can make stomach problems	Fish head, make the babies smart Coconut milk, can make diarrhea
Season influence on food availability	Full moon, fish price increase, in rainy season vegetables easy to get, 3 or 4 month after rainy season sweet potato will be easy to get	Full moon, fish price increase, rainy season, vegetables easy to get, however, vegetables are provided in the whole year because they were close to market, rainy season, rice price go up
ISSUE	Far-market hamlet (n=6)	Near-market hamlet (n=12)
By caregivers		
CF recipes exist	Rice flour porridge	Mix rice porridge Cake Sticky rice porridge
Food belief/taboo		
Type of food taboo/belief related to child feeding practices	Too much Coconut milk Fish Some said there is no food taboo	Too much coconut milk

Table 4.5 (continue)

ISSUE By cadres	Far-market hamlet (n=6)	Near-market hamlet (n=12)
Input for Recipe's		
Texture	Semi solid	Solid, semi solid
Taste	Not too sweet	Not too sweet, not too tasty
Ingredient including fish, anchovy and chicken liver	Agree to try the fish product, interest to try anchovy if the texture more soft, interest to try the chicken liver product, especially because they hardly found it in the nearest shop	Firstly almost all refuse to use anchovy, but after the explanation that we will use another kind of cooking they interest to try

In term of *local complementary food recipes*, there were more varieties in *near-market hamlet*. They have recipes of mungbean porridge, mungbean flour porridge, mix rice porridge and pudding. While in far-market hamlet according to the cadres they only have mungbean porridge and mix rice flour porridge as the local CF recipe's. However, for the favorite recipe, there was a similarity between near and far-market hamlet, where both of them were like mungbean porridge. From GI with caregivers there was another local CF recipe's, which was rice flour porridge from far-market hamlet and cake and sticky rice porridge from near-market hamlet. The summary of group interview on complementary foods and recipes was presented in Table 4.5.

Based on group interview with cadres, some of the mothers still practice food taboo/belief for particular foods. *Mothers on the far-market hamlet had more taboo/belief* than mothers in near-market hamlet. Some of mothers in far-market hamlet still believed that fish can make the faeces smell bad, coconut milk can make diarrhea, corn can cause cough, mungbean can make itchy skin, and soda can make stomach problem. While in near-market hamlet they only avoided coconut milk. Besides that, fish head was believed to make the babies smart and this belief was found in near or far-market hamlet. On the other hand, in the group interview with mothers they only said too much coconut milk was not good because it caused diarrhea, this was found in both near and far-market hamlet. One mother in far-market hamlet said some still avoided giving fish because it made the faeces smells bad. However, most of the mothers, in near and far-market hamlet said there were no avoidance of a particular foods.

The mothers response on the modified recipes were presented in Table 4.5 For the consistency they want it semi solid or solid foods. Their input for the taste was not too sweet and not too tasty. Anchovy still have low acceptability among the infants, especially due to its texture, but if the texture was softened the mothers were willing to try. *In far-market hamlet* mothers were interested to try the recipes with chicken liver because chicken liver was hardly found.

4.5.2b 1st recipe trial

The recipes identified from 1st recipe trial were presented below. There were 7 recipes, *Sayur bening*, mix rice porridge A & B, *cap cay*, mungbean flour porridge, banana pudding and biscuit pudding.



Figure 4.1. The local complementary food recipes results from 1st recipe trial

The complete descriptions (ingredients and nutrient content) and also response from the mothers of each recipes were presented in the appendix. Based on the 1st recipe trial results, *cap cay* will be promoted because it can convey many items to increase the variability of infant's diet and also because it can be vehicle of the nutrient-dense foods.

According to WHO (1998) to fill the iron requirements a day, an infants 9-11 mo should consume 108 gram of chicken liver. While the anchovy should be consumed 21 gram a day to fill the calcium requirement and fish should be consumed at least 100 gram to fill the zinc requirement. Based on this study, the maximal chicken liver could be consumed by the infant was 19 gram, fish was 21

gram and anchovy was only 5 gram. There were still gap between the requirements and actual intake of the infants, so the modified local complementary food recipes should have higher nutrient-density.

Abon was one of the food products available in the community based on the exploration. However, the abon was usually made from beef or fish. Based on the group interview with the cadres, abon was commonly consumed by infants from higher socio economic status. Therefore, we consider abon as local complementary foods to be promoted because of its durability, acceptable texture and higher nutrient-density. We then developed the **chicken liver and fish into abon and anchovy into powder**.

From observation and individual interview with the mothers known that meatballs were the usual snacks among the people in the community, including the infants. However, the meatballs sold in the community usually used "beef or chicken" but more dominated by flour. Based on this, we decided to insert one of nutrient-dense foods (fish) into meatballs and developed **fish meatballs**.

The description of the recipes (nutrient profile, cost and time for preparation of modified nutrient-dense foods recipes) was presented in Table 4.6. The chicken liver abon can met the desired Fe and Zn density while anchovy powder can met the desired Ca and Zn density. However, the fish products (fish meatballs, cucut and tuna abon) that intended to have high Zn density can not met the desired Zn density.

The cost analysis per portion of each recipe was also presented in Table 4.6. Because the cost analysis was done per portion consumed, the cost of each recipe depends on the portion consumed besides its ingredients. The lowest cost was for anchovy powder and the highest was cap cay.

In term of time for preparation, the longest time was needed to prepare fish abon (55 minutes) while the shortest time was needed to prepare cap cay.

Table 4.6. Nutrient profile, cost and time for preparation of modified nutrient-dense foods recipes

Recipes	Ingredients	Nutrient value per 100 gram	Nutrient-density (mg/100kcal)	Cost per average portion (IDR)	Time for preparation (minutes)
Cucut abon ^a	Cucut, Vegetable oil,spices	E : 486 kkal P : 48.8 g F : 24.9 g Ca : 123 mg Fe : 3.34 mg Zn : 2.88 mg	Fe : 0.7 Ca : 25.3 Zn : 0.6	240	55
Tuna abon ^a	Tuna, Vegetable oil,spices	E : 361 kkal P : 50.2 g F : 11.2 g Ca : 224 mg Fe : 5.09 mg Zn : 2.11 mg	Fe : 1.4 Ca : 62.0 Zn : 0.6	160	55
Chicken liver abon ^a	Chicken liver abon, Vegetable oil,spices	E : 412 kkal P : 33 g F : 22.5 g Ca : 23.9 mg Fe : 16.9 mg Zn : 6.32 mg	Fe : 4.1 Ca : 5.8 Zn : 1.5	331	30
Anchovy powder ^a	Anchovy, oil, spices	E : 492 kkal P : 57.1 g F : 27.4 g Ca : 2440 mg Fe : 4.79 mg Zn : 5.81 mg	Fe : 1.0 Ca : 495.9 Zn : 1.2	39	10
Cap cay ^b	Tofu, vegetables, meatballs, egg	E : 150.9 kkal P : 5.2 g F : 12.2 g Ca : 51.4 mg Fe : 2.4 mg Zn : 0.6 mg	Fe : 1.6 Ca : 34.1 Zn : 0.4	536	15
Fish meatballs ^a	Fish, cassava flour, flour, spices	E : 170 kkal P : 9.96 g F : 1.61 g Ca : 58.2 mg Fe : 1.34 mg Zn : 0.95 mg	Fe : 0.8 Ca : 34.2 Zn : 0.6	337	25

^a analysed in food laboratory (BBIA); ^b analysed in Nutri survey (2004); desired density per 100kcal of Fe = 3 mg, Ca = 74 mg & Zn = 1.1 mg

4.5.2c 2nd recipe trial

Six recipes were developed and modified. They were (cucut, tuna and chicken liver) abon, anchovy powder, cap cay and fish meatball. Based on the acceptability test on Table 4.6, the recipes that have highest score was cap cay, and the lowest score was anchovy powder. Meanwhile, the recipes that have the lowest rank, which mean a better rank was also cap cay and the highest rank,

which mean the lowest rank was anchovy powder. Moreover, anchovy powder was also the least consumed compared to the other powder-kind of foods.

Table 4.7. Results of acceptability test in the 2nd recipe trial (near and far-market hamlets, n=10)

Acceptability parameters	Score and rank of food products											
	Cap cay		Fish meatballs		Chicken liver abon		Cucut abon		Tuna abon		Anchovy powder	
	Score	rank	Score	rank	score	rank	score	rank	score	rank	score	rank
Taste by mother	45	1	39	4	40	3	43	2	29	6	32	5
Taste by child	45	1	42	3	41	4	42	2	31	6	33	5
Feed to sick	28	1	20	3	24	2	19	4	16	5	16	5
Availability of items	34	2	33	3	32	4	32	5	36	1	29	6
Preparation time	33	2	34	1	28	3	27	4	24	5	24	5
Willing to prepare	34	1	32	3	33	2	28	5	28	4	26	6
Total	219	8	200	17	198	18	191	22	164	27	160	32
Amount consumed (gr)	55		17.4		2.3		2.9		2.5		1.8	

After separate analysis between near dan far-market hamlet was done, the same results were similar in near-market hamlets, where the cap cay was the most acceptable by the infants and their mothers while anchovy powder was the least acceptable by them.

Table 4.8. Results of acceptability test in the 2nd recipe trial (near-market hamlets, n=6)

Acceptability parameters	Score and rank of food products											
	Cap cay		Fish meatballs		Chicken liver abon		Cucut abon		Tuna abon		Anchovy powder	
	Score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
Taste by mother	25	1	25	1	23	2	23	3	13	5	19	4
Taste by child	25	2	26	1	21	4	22	3	18	5	18	6
Feed to sick	18	1	12	3	15	2	10	5	11	4	7	6
Availability of items	22	4	23	3	23	2	20	5	23	1	17	6
Preparation time	21	1	19	3	19	2	15	3	14	4	13	5
Willing to prepare	22	1	19	3	21	2	16	4	16	4	15	5
Total	133	10	124	14	122	14	106	23	95	23	84	32
Amount consumed (gr)	56.3		18		3		4		3.5		3	

In far-market hamlets, slightly different result was found, where the less preferred recipe was tuna abon. However, the score of anchovy powder was only slightly different with the tuna abon while the amount of anchovy powder consumed was half below the tuna abon.

Table 4.9 Results of acceptability test in the 2nd recipe trial (far-market hamlets, n=4)

Acceptability parameters	Score and rank of food products											
	Cap cay		Cucut abon		Fish meatballs		Chicken liver abon		Anchovy powder		Tuna abon	
	Score	rank	score	rank	score	rank	score	rank	score	rank	score	rank
Taste by mother	20	1	20	1	14	4	17	2	13	5	16	3
Taste by child	20	1	20	1	16	2	20	1	15	3	13	4
Feed to sick	10	1	9	2	8	3	9	2	9	2	5	4
Availability of items	12	2	12	2	13	1	9	3	12	2	13	1
Preparation time	12	2	12	2	13	1	9	5	11	3	10	4
Willing to prepare	12	2	12	2	13	1	12	2	11	3	12	2
Total	86	9	85	10	77	12	76	15	71	18	69	18
Amount consumed	53		3.3		16.4		2.8		1.5		3	

Based on the results of separate analysis (near or far-market hamlet) and combine analysis (near plus far-market hamlets), anchovy powder was consistently being the least consumed product compared to other powder-kind of products. It was also the least acceptable than the other products in the combined analysis and in near-market hamlets. Although in far-market hamlet anchovy powder was more acceptable than tuna abon, the amount consumed was half below the tuna abon. From this results, anchovy powder was considered as the least preferred product and thus was not included in the next step, which was to test it's acceptability in the 7-day household trial.

Actually there was another recipe of anchovy which was anchovy abon. This recipe was obtained from one of the cadre in near market hamlets. However, it had low acceptability score, therefore the acceptability test of this recipe was only tested in one hamlet and didn't continue to acceptability trial.

4.6 Acceptability trial (TIPs)

4.6.1 Initial visit

Based on Table 4.10 on knowledge of caregivers on infant feeding practices, more than half of the respondents had adequate knowledge on infant feeding practices. Almost all understood the length of exclusive breastfeeding and length of breastfeeding. Interestingly, 9 out of 12 mothers (more than half) knew about the age of introduction of CF and frequency of meals a day.

Table 4.10. Number of respondents based on knowledge of mothers/caregivers on infant feeding practices

Variables	Total (n=12)
Knowledge on healthy food	
Mention source of carbohydrate	9
Mention source of animal protein	9
Mention source of plant protein	7
Mention source of vegetables	10
Mention source of fruits	10
Mention milk	7
Mention others	2
Knowledge on benefit of colostrum	9
Knowledge of length of exclusive breast feeding	11
Knowledge on length of breastfeeding	11
Knowledge on age of introduction of CF	9
Knowledge on frequency of meals a day	9
Knowledge on age of introduction to family food	7
Knowledge on good snacks for babies	9

Two from twelve infants had diarrhea and three had acute respiratory infections in the day of initial visit. However, according to them it was not affecting their food intake.

Table 4.11. Number of respondents based on morbidity status of the child

Variables	Total (n=12)
Diarrhea	
In the day of interview	2
2 weeks before interview	3
ISPA	
In the day of interview	3
2 weeks before interview	8

Based on the individual interview conducted in the initial visit (Table 4.12), it was known that the age of introduction of complementary foods was earlier than the recommendation. Soft foods that has to be introduced at 6th month old to 9 month old, by some mothers it was introduced before 6th month old. Semi solid foods that has to be introduced between 9th – 12th mo and solid foods at 12th mo was also introduced earlier. Besides that, the first CF introduced was also inappropriate. They introduced rice and rice porridge as the first CF for the infants. Based on this, we come to our first conclusion of infant feeding problem, which was **Early introduction of complementary foods (Problem #1)**.

There were still some infants who had meals less than the recommendation (3-4 times a day) and were not fed snacks. The consequence was the median percentage adequacy of energy was 92.8. This lead to the next infant feeding problem which was **Infants eat less than 3-4 times a day or with inadequate portion to fulfill daily energy requirements (Problem #2)**.

Table 4.12. The results of initial visits on complementary feeding practices

Practices	N
Introduction of	
<i>Soft food</i>	
< 6 month	3
>= 6 month	8
never	1
<i>Semi solid food</i>	
< 6 month	1
6-8 month	6
>= 9 month	4
never	1
<i>Solid food</i>	
< 12 mo	9
Never	3
First CF introduced	
- instant porridge	10
- rice	1
- rice porridge	1
Frequency of main meals a day	
2 times	2
3-4 times	10
Frequency of snacks a day	
0 times	1
1-2 times	7
> 3 times	4

Based on the initial visit (Table 4.13), the median (min-max) of total weekly frequency of plant protein in a week was only 4.5 (0-42), animal protein 0.5 (0-14) and vegetables 7 (0-49). It means that their intake was less varied and it lead to the low intake of several micronutrients. When comparing the intake with the Indonesian RDA several micronutrients such as calcium only achieve more than half of the requirements (57.6). Iron and zinc were even worst, only achieve 20 and 19.3 of the requirements. Then, the next conclusion of infant feeding problem was **Solid foods already introduced but with low vitamin and mineral content and less variation (Problem #3)**.

Table 4.13 Adequacy of energy and nutrient intake and weekly food frequency in initial visit

Dietary intake parameters	Median (min-max), (n=12)
Adequacy, (%)	
Energy	93.8 (64.5-145.9)
Protein	73.2 (41.9-178.1)
Calcium	57.6 (41.9-92.3)
Iron	20 (1.4-62.9)
Zinc	19.3 (9.3-65.3)
Weekly food frequency	
Staple	21 (14-28)
Plant protein	4.5 (0-42)
Animal protein	0.5 (0-14)
Vegetables	7 (0-49)
Fruits	1.5 (0-27)
Snacks	2.5 (0-24)

We also gave attention on hygiene practices, where based on the group interview with the caregivers, we found that many mothers still gave their infants unboiled drinking water. Most of the mothers also gave their infants pre-masticated foods. So, this will be the last infant feeding problem which was **Less attention to hygiene practices (Problem #4)**.

4.6.2 Counseling visit

After we analyzed the infant feeding problems, in the next visit (counseling visit), we discussed these problems and found the recommendations

which should be applied at home for 7-day HH trial. The 4 problems identified and the suggested recommendations were presented below.

Problem #1: Early introduction of complementary foods

Recommendations :

1. Give semi solid foods (rice porridge) starting at 9 mo
2. Give solid foods (foods prepared for family) starting at 12 mo

Problem #2: Infants eat less than 3-4 times a day or with not adequate portion to fulfill daily energy requirements

Recommendations :

1. Give additional nutritious snacks everyday
2. Give 9 spoonful for 9 mo infants, 10 spoonful for 10 mo infants and 11 spoonful for 11 mo infants (Depkes, 1997)
3. Give oil to the infants food (ex. give fried foods)

Problem #3: Solid foods already introduced but with low vitamin and mineral content and less variation

Recommendations :

1. Give vegetables and animal protein to babies foods
2. Introduce with family foods that contain various nutrients, ex. soup or eap cay
3. Give nutritious snacks like fruits (banana, orange, papaya), steam egg, fish meatballs etc
4. Give nutrient-dense foods to the infants rice/rice porridge (ex. fish and chicken liver abon, cap cay)

Problem #4: Less attention to hygiene practices

Recommendations :

1. Drink boiled water
2. Wash hands with soap after defecating, prepare for the child's foods and especially if giving the child's food
3. Do not give pre masticated foods

Although our first attention was to test the acceptability of the modified local nutrient-dense recipes, we also want to know in the trial whether they want to change their practices on infant feeding or not, so we also evaluate on the other points of recommendations in the follow up visit.

4.6.3 Follow up visit

In the follow up visit, it was found that all respondents have followed the recommendation to give additional nutritious snacks everyday, give oil to the infants food (ex. give fried foods) and give vegetables and animal protein to babies foods. More than half of the respondents also performed the following recommendations: Introduce with family foods that contain various nutrients, ex. soup or cap cay, Give nutritious snacks like fruits (banana, orange, papaya), steam egg, fish meatballs etc, Give nutrient-dense foods to the infants rice/rice porridge (ex. fish and chicken liver abon), Drink boiled water and do not give pre-masticated foods. The recommendation that was followed by none of the respondents was to give 9 spoonful for 9 mo infants, 10 spoonfuls for 10 mo infants and 11 spoonfuls for 11 mo infants.

Table 4.14. Response of the HH on the recommendations

No	Recommendation	Following the recommendations?	
		Far-market hamlets N=5	Near-market hamlets N=7
1	Give semi solid foods (rice porridge) starting at 9 mo	0	3
2	Give solid foods (foods prepared for family) starting at 12 mo	0	3
3	Give additional nutritious snacks everyday	5	7
4	Give 9 spoonful for 9 mo infants, 10 spoonful for 10 mo infants and 11 spoonful for 11 mo infants	0	0
5	Give oil to the infants food (ex. Give fried foods)	5	7
6	Give vegetables and animal protein to babies foods	5	7
7	Introduce with family foods that contain various nutrients, ex. Soup or cap cay	3	5
8	Give nutritious snacks like fruits (banana, orange, papaya), steam egg, fish meatballs etc	3	6
9	Give nutrient-dense foods to the infants rice/rice porridge (ex. Fish and chicken liver abon, cap cay)	4	3
10	Drink boiled water	3	7
11	Do not give pre masticated foods	5	6

Specifically for the recipes, the results of the 7-day HH trial were presented in Table 4.15. The recipe that was mostly tried by the household was fish meatballs; it was tried by 9 households. The motivations to try this recipe both in near and far-market hamlet were because *children like it, was easy to make, and the ingredients were available*. The motivations from the far-market hamlet were that the fish meatballs were good for health (the babies) and made the babies gain weight. From all households that tried fish meatballs mothers reported that the infants like the taste. However, one mother said that *her infant still had difficulty to chew the meatballs*. It means that the texture was not fit enough for her infants.

Recipe that was also tried by more than half (8) of the samples was cap cay. The motivations to apply cap cay were because it's good for health (far-market hamlet), child liked the taste (near-market hamlet) and *it's easy to make (both)*. While the constraint to make it was because the ingredients should be bought at the market (both for the near and far-market hamlet), the mother didn't have time to make it and child did not really like the taste. However, from 8 households that tried the recipes, 3 infants didn't like the taste; one of them was having less appetite, one of them didn't like the celery taste and the other infant didn't like the texture (too hard).

Some household made modifications when they change the cucut or tuna into the available fish in the food seller. Two household in the near-market hamlet change the fish with *turingan* and flying fish. The specific motivation for the far-market hamlet to made fish *abon* was because it was *durable*, good for health (the babies) and made the babies gain weight. While the motivations in near-market hamlet were more because of the practicality, such as easy to make, not use much oil (efficiency and good for the child), child like it and it can be eaten for the whole family. The other motivation was delicious. *Do not have much time was the constraint* of household in the near and far-market hamlet reported for not trying the recipes. From five household that tried the recipe there was one that didn't like the taste. This child was the same that didn't like cap cay, because she had less appetite.

The less tried recipe was chicken liver abon. It was only tried by 1 household. The constraints for not trying this recipe in near and far-market hamlet was because *mothers did not have much time*. Moreover, because chicken liver should be bought at the market, especially for the far-market hamlet it was still one of the constraints. One mother admitted her infant didn't like the taste was the one that had less appetite.

Table 4.15. Response to the modified nutrient-dense recipes after 7-day of HH trial

Recipes	Tried		Response of the infants	Motivations	Constraints
	Near (n=7)	Far (n=5)			
Fish abon	3	3	* child's like (5) * more appetite (1) * child didn't like (1)	(F) : Delicious, <i>durable</i> , good for health (the babies) and make the babies gain weight (N) : Easy to make, not use much oil, delicious, <i>child's like</i> , can be eaten for the whole family	(N&F): Did not have much time (N) : not really like because of the texture (tuna abon)
Chicken liver abon	1	0	* child's like	(N) : Easy to make, not use much oil, delicious, <i>child's like</i> , can be eaten for the whole family	(N&F): Did not have much time, <i>child's did not like the taste</i>
Cap cay	5	3	<ul style="list-style-type: none"> • child didn't like (3) • child's like (5) • more appetite 	(N&F): <i>Child's like the taste</i> (F) : good for health (N) : Easy to make	(N&F) : No time to make, the ingredients should be bought at the market (N) : <i>child' didn't like</i>
Fish meatballs	6	3	* child's like (8) * child still difficult to chew but like the taste	(N & F) : <i>Child's like it</i> , Easy to make, the ingredients were available (F) : good for health (the babies) and make the babies gain weight	(N&F): no time to make

N = Near market hamlets; F = Far market hamlets

The mothers that tried the recipes willing to continue in making the recipes as long as her infants liked it, the ingredients were available and they had time to make it.

After the 7-day household trial, the energy and nutrient intake increased. The median of iron and zinc intake increased more than twice. The weekly food frequency of all food groups also increased. However, for the weekly food frequency, only 10 samples were analyzed because (2 infants were ill during 7-day of HH trial that will affect their weekly food frequency).

Table 4.16. Energy and nutrient intake (from CF and breast milk) and weekly food frequency before versus after trial

Dietary intake parameters	Median (min-max)	
	Before	After
Energy (kcal), (n=12)	609.9 (419.4-948.4)	765.2 (523.3-1051.6)
Protein (gr)	11.7 (6.7-28.5)	16.8 (7.7-32)
Nutrient		
Calcium (mg)	230.4 (167.5-369)	295.4 (205-708.7)
Iron (mg)	1.4 (0.1-4.4)	3.3 (0.8-6)
Zinc (mg)	1.45 (0.7-4.9)	3.7 (1.2-7.5)
Weekly food frequency, (n=10)		
Staple	21 (14-28)	22.5 (21-70)
Plant protein	4.5 (0-42)	9.5 (2-42)
Animal protein	0.5 (0-14)	10.5 (3-22)
Vegetables	7 (0-49)	12 (3-60)
Fruits	1.5 (0-27)	3 (0-16)
Snacks	2.5 (0-24)	10 (1-21)

As can be seen from figure 4.2. After the 7-day household trial, the adequacy of energy and nutrient increased. The adequacy of energy, protein and calcium intake increased more than 20%, while iron and zinc increased more than twice.

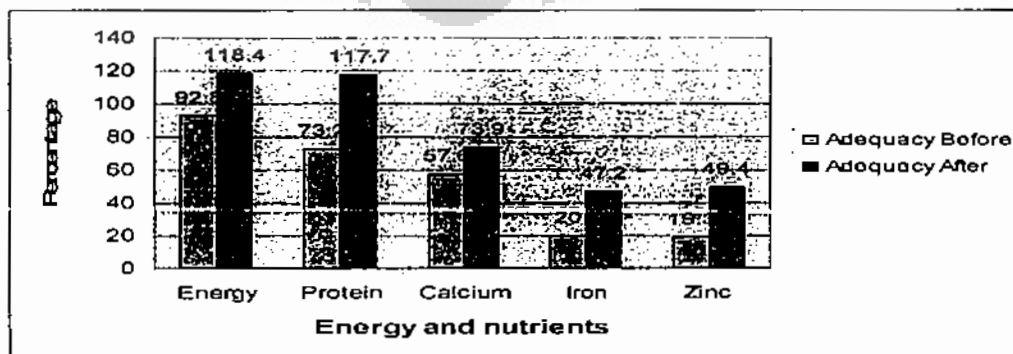


Figure 4.2. Adequacy of energy and nutrients (from complementary foods and breast milk) before and after trial

Specifically we compared the adequacy of energy and nutrients from complementary foods between infants who consumed one or more of the recipes versus infants who did not consume it the day before follow up visit day. As can be seen in Table 4.17, there was significant increment in energy, zinc, iron and calcium adequacy among infants who consumed recipes yesterday, while among infants who did not consumed the significant increment was only on calcium. The within group analysis done before and after trial showed no significantly different.

Table 4.17 Adequacy of energy and nutrient intake (from CF) of infants who consumed versus who did not consumed the recipes

Energy and nutrients	Consumed yesterday (n=6)		Not consumed yesterday (n=6)	
	Before trial ^a	After trial ^a	Before trial ^a	After trial ^a
Energy	32.6 (14.5-87.6)	74 (22.2-103.5)*	37.2 (6.2-60.8)	59.2 (25.4-73.6)
Protein	37.5 (13.1-141.9)	58.4 (15-163.8)	31.2 (5.6-104.4)	71.6 (11.9-101.9)
Ca	6.2 (1.1-51.5)	29 (12.3-47.5)*	22.2 (1.5-47.2)	39.8 (10.5-136.4)*
Fe	13.6 (2.9-62.9)	47.2 (17.1-80)*	24.3 (1.4-35.7)	53.5 (11.4-85.7)
Zn	8 (2.7-46.7)	36 (12.3-46.5)*	14 (1.3-57.3)	43.4 (8-92)

^a percent median (min-max)

* significant $p < 0.05$, *Wilcoxon Signed Ranks test*

** within group analysis before and after trial was not significantly different (*Mann Whitney test*)

CHAPTER 5 DISCUSSIONS

5.1. Local food availability, HH food accessibility, and related infant feeding practices

This study revealed that the food availability in East Lombok was still similar with the previous study by Harper (2006) and Fitriyanti (2005). Every food groups was available (consist of staple food, animal protein, plant protein, vegetables, fruits and snacks) and the nutrient-dense foods (chicken liver, fish and anchovy) were still found in the market. Like already mentioned elsewhere (chapter 3.3), based on East Lombok Board Center of Statistic (2008), Pringgabaya local food resources include: agriculture, fruits, livestock and fish resources which means that East Lombok had variety of local food resources that can be potential for the improvement of complementary foods in the area. Compared to 2005, anchovy price was increase almost 70% while the price of other nutrient-dense foods were relatively similar.

Fish and anchovy price was influenced by the season. When in the full moon, that happen about one week every month the fish price including anchovy will increase. However, the supply was available in the whole year. This also applied for chicken liver. Vegetables, were more easy to get in the rainy season for the far-market hamlet, while in near-market hamlet the vegetables were available in the whole year. The availability of the nutrient-dense foods in the whole year, implied that the application of the modified recipes could be done in other seasons throughout the year.

Regarding HH food accessibility, the study found differences of near and far-market hamlet were in term of distance and cost to go to the nearest market, food production and daily food expenditure. Far-market hamlets were having more food production, this probably because usually they had larger land than in near-market hamlets household. It was in line with FAO that stated people in cities and towns have fewer opportunities than rural people to produce their own food so they must rely on purchases and the cash to eat.

Far-market hamlets also have higher daily food expenditure for family. This probably related with the parents occupation as one of the indicator of socio economic status of the household. None of the fathers from far-market hamlets was jobless, most of them were migrant workers and some of them were driver. In the study area, driver was considered as one of the occupations that have higher income therefore have better socio economic status. In the other hand, one of the father from near-market hamlets was jobless, and some of them were being labor.

The results of this study provide evidence that the infant feeding practices were haven't optimal in East lombok. In fact, the condition was not really much different from previous study done by Fitriyanti (2005) and Harper (2006). The introduction of complementary foods was beginning too early. Almost all infants in this age group were given pre-masticated foods by the mothers. Some said because it already a habit, some also said they didn't have time to make special foods like porridge for the babies. They already stop to make special food for the infants, usually until 6th month.

Basically through the guideline on complementary feeding in 1997, the Ministry of Health has recommended soft foods like milk porridge to be introduced to the infants at 6th-9th month old. While the semi solid foods should be introduced at 9th-12th month old. The family food (solid food) then should be introduced after 12th mo. However, this recommendation were not applied by the community in the study area even from 5 years ago, which the study by Fitriyanti (2005) and Harper (2006) had found the similar condition. In other areas, the studies done almost seventeen years ago in Bogor also found the early introduction of CF (in that time the recommendation was at 4th mo) (Sudjasmin et al, 1993 and Arnelia & Mulyati, 2003). Several reasons implied behind this, one of them probably because lack of the knowledge of the community to that recommendations, or the cultural/belief that lies behind the practices in the community. *Therefore, the effort from the government should be stress to solve this problems, one of them probably through the nutrition education that can be delivered through the Growth Monitoring Program every month.*

The recommendations of the age of introduction of complementary foods was actually related to neuromuscular development of infants, dictates the

minimum age at which they can ingest particular types of foods (WHO/UNICEF, 1998). Semi-solid or pureed foods are needed at first, until the ability for “munching” (up and down mandibular movements) or chewing (use of teeth) appears.

The early introduction of complementary foods will influence the child nutritional status in the later days. One study in Indonesia done in Ogan Komering Ilir, South Sumatera found significant correlation between age of introduction of complementary food with nutritional status of 6-12 mo infants. Infants that introduced with complementary foods less than 4th month have risk to be undernourished 5.2 times than the infants that introduced with complementary foods between 4th – 6th mo after corrected with energy intake (Ansory, 2001).

Regarding the frequency of meals, from this study it was found that the mothers gave less meals a day than the recommendation by the WHO and Ministry of Health. Most of them gave 2-3 times a day in both near and far-market hamlet. Even though there were still mothers that didn't give snacks to the infants, the majority of them already gave snacks to the infants. In near-market hamlets they tend to give more snacks in a day than far-market hamlets.

The recommendation by WHO and Ministry of Health on the frequency of feeding is calculated from the energy needs from complementary foods and assuming a gastric capacity of 30 g/kg body weight/d and a minimum energy density of complementary foods of 0.8 kcal/g (Dewey and Brown, 2002). When energy density of the usual complementary foods is less than 0.8 kcal/gr, or infants typically consume amounts that are less than the assumed gastric capacity at each meal, meal frequency would need to be higher than the values shown above (Dewey, 2001). Therefore, less frequency of meals and snacks in a day will lead to inadequate of energy intake and furthermore will lead to undernourished.

5.2 Development of nutrient-dense recipes

Six modified local nutrient-dense recipes were developed in this study. They were cap cay, anchovy powder, chicken liver abon, cucut abon, tuna abon, and fish meatballs. The development of anchovy, chicken liver and fish (nutrient-dense foods) were basically based on WHO (1998) that mentioned, based on the scientific review from some studies iron, zinc and calcium were defined as the

most important “problem nutrients” because it appeared that the density of these nutrients in complementary foods was substantially less than desired. In this study area, the similar condition was found (Fitriyanti, 2005 and Harper, 2006). Anchovy, chicken liver and fish were known as the nutrient-dense foods that can fill the nutrient gap for Ca, Fe and Zn, accordingly. Therefore, the development of CF recipes using these nutrient-dense foods that have intention to solve the micronutrient problems was urged.

The food-based intervention also believed as the most sustainable solutions as such strategies can address multiple micronutrient problems, cost effective, and promote general community and human development (Trowbridge et al., 1993). Therefore, with simple food-technology we developed the modified local nutrient-dense recipes. Mensah & Tomkins (2003) stated the importance of traditional household food technologies due to the concern of inadequate and unsafe complementary foods that compromise the health and development of children.

The development of fish, chicken liver and anchovy into powder also based on the previous study by Fitriyanti (2005) that there was one mother tried to process the anchovy into powder since they concern about it's texture. Abon was actually not a new food products in the area, which they already recognized beef and fish abon. However the abon consumption among infants was still rare.

The processing of nutrient-dense foods into powder also encouraged by Mensah & Tomkins (2003) whom encouraged preservation of fish by drying. They stated that small, soft-boned fish, such as anchovies and *Sardinella sp.*, can be processed as fish powder to enrich various recipes of complementary foods. Kocho, a fermented maize porridge in Ghana also supplemented by fish powder to enhance it nutritional value (Lartey et al., 1999).

The powder foods also become a concern because the seasonal availability of nutritious foods, means that without the application of food storage technology, children are deprived of important sources of nutrients for many months of the year. Fish including anchovy, is one of the foods that has seasonal influence on it's price, even though it always available but 1 week in every month when the full moon come, the fish price will be increase. To process it into powder will be

one of solutions, where the mothers could buy more fish when the price low and preserved it for the consumption when the full moon comes.

Chicken liver, even though it was not influenced by the seasons, but it become a concern for the consumption since it was not available in the near food seller and only available in the market. Especially for the far-market hamlet, it could be one solution also to make it into powder.

Cap cay was promoted to improve the variability of infants diets, since it contain mix of vegetables and also animal and plant protein. It was in line with Caulfield, Huffinan & Piwoz (1999) that recommend to increase variety of the infant's diet. Children need to be offered a variety of foods so that they can develop tastes and preferences and move away from a one-food liquid diet (breast milk) to the variety of foods that will characterize their diet for the rest of their life.

The cost of foods per average portion were range between Rp. 39-536,-. If we back to the daily food expenditure (meal and snacks) for a child, both in near and far-market hamlet it range between Rp. 3.000- 14.000 (more or less)-, so the price of the modified nutrient-dense recipes were still in the range that *affordable* for them.

This study had successfully developed recipes that correspond to problem nutrients. Based on WHO (2002) in Dewey and Brown (2003), the average desired for zinc in complementary foods was 1.1 mg/100kcal, while for iron was 3 mg/100kcal and calcium was 74 mg/100kcal. In this regard, the chicken liver abon could meet the iron and zinc density, while anchovy powder could meet calcium and zinc density. However, the fish products couldn't meet the zinc density as it was intended to. Moreover, the analysis of nutrient-dense of the mix foods/diet also was not done in this study.

The analysis done by Gibson, Ferguson & Lehrfeld (1998), of 23 complementary foods analyzed from several of regions almost all complementary foods fail to meet the desired nutrient-density of iron and zinc when moderate bioavailability is assumed. In fact, the bioavailability of iron and zinc from the cereal-based porridges is likely to be low, because most porridges are exclusively plant-based, with content of phytic acid. *Hence, any strategies that reduce the*

phytic acid content of these complementary foods will markedly enhance zinc bioavailability, and simultaneously increase absorption of non-haem iron to some degree should be encouraged.

The local nutrient-dense modified recipes had successfully reduced the amount of nutrient-dense foods that should be consumed to fulfill the nutrient requirements. Based on Table 5.1, four spoonful of anchovy powder per day should be consumed to fulfill the calcium and zinc requirements. While 6.5 spoonful of chicken liver abon per day could achieve the iron and zinc requirements. However, more spoonful of fish abon was needed to fulfill the zinc requirement (8 for cucut and 11 for tuna). The reduction of amount of nutrient-dense foods that should be consumed with the consumption of nutrient-dense modified recipes was helping the infants to meet their daily nutrient requirements with their limited gastric capacity.

Table 5.1. Actual foods and modified recipes should be consumed to fulfill the nutrient requirements

Actual foods	Nutrient	Portion consumed to fulfill requirement (gr) ^a	Modified recipes	Portion consumed to fulfill requirement (gr)	HH measure
Anchovy	Calcium	21	Anchovy powder	14.5	1.5 spoonful
	Zinc	44		37	4 spoonful
Chicken liver	Iron	108	Chicken liver abon	64	6.5 spoonful
	Zinc	72		37	4 spoonful
Fish	Zinc	100	Cucut abon	80	8 spoonful
			Tuna abon	109	11 spoonful
			Fish meatballs	242	

^a source from WHO (1998)

* nutrient requirements of complementary foods with average breast milk intake (energy limit= 300kcal)

However, even though the anchovy powder was a promising recipe as it can achieve the desired calcium and zinc density with affordable price, after the acceptability test in 2nd recipe trial the anchovy products (powder and abon) still had low acceptance among infants and mothers. So, unfortunately in this study we can't see the acceptability trial of anchovy as the nutrient-dense food for calcium since we haven't found way to processed it into the more acceptable by the infants.

Basically, the anchovy (dried fish) that has the desired calcium-density was not really common to consume by the infants, especially regarding its texture. Among Peruvian infants, dried fish, was also not usually consumed (WHO, 1998). Moreover, in the same area, East Lombok, Fitriyanti (2005) found that anchovy was rarely consumed. Its maximum weekly frequency was only 0.5, means that the infants only consumed it twice a month. Harper (2006) also found that anchovy was only consumed by less than 10 from infants in the quantitative study. In this recent study, even though the anchovy already consumed by almost half of the infants, the average portion intake was still too low (4.1 gram). Moreover, with regard to its texture the mothers usually gave pre-masticated anchovy. With these acceptability constraints, more time will be needed to explore deeper on possible complementary food recipes developed. One possibility was to insert the anchovy in form of snacks.

5.3 The acceptability trial

The acceptability trial in this study found the recipes that mostly tried by the household in near and far-market hamlet was fish meatballs and cap cay; it was tried by 9 household. Compare to other modified recipes, fish meatballs and cap cay were the modified recipes that required least time for preparation. It was in line with Brown et al (1992) that in the evaluation of weaning education, the most popular and most frequently implemented messages were those requiring little time.

However, there was still the constraint to make cap cay because the ingredients should be bought at the market (both for the near and far-market hamlet). Three from the infants that the household tried the recipe didn't like the taste; one of them was having less appetite, one of them didn't like the celery taste and the other infant didn't like the texture (too hard).

The hard texture actually can be solved by cooking it longer. However, there is an attention of some vitamins that will be broken if the cooking process that involved heat was too long. Muchtadi (1997) mentioned that with over heat process, some of vitamins will be broken or reduce. Moreover, Winarno (1997) stated that vitamin A was easy to broke in the high temperature. Mash the

vegetables before giving it to the infants would be also another possibility to solve the hard texture of cap cay.

Preferences on celery taste most probably cause by the habitual consumption of itself. Mennela et al (2001) in the experimental study showed that the infants who had exposure to the flavor of carrots in either amniotic fluid or breast milk behaved differently in response to that flavor in a food base than did non exposed control infants. Specifically, previously exposed infants exhibited fewer negative facial expressions while feeding the carrot-flavored cereal compared with the plain cereal, whereas control infants whose mothers drank water during pregnancy and lactation exhibited no such difference. Moreover, those infants who were exposed to carrots during prenatal were perceived by their mothers as enjoying the carrot-flavored cereal more compared with the plain cereal.

Even though the ingredients of the cap cay like carrot and potato were only be bought in the market which can be possible constraint for the far-market hamlet, based on the acceptability trial 3 out of 5 mothers from far-market hamlet tried the recipe. While, one mother in near-market hamlet didn't tried the recipe because she didn't have enough time to go to the market to buy the ingredients, because usually she only buy the foods from food seller in the neighborhood. It means, that both near and far-market hamlet feel that to buy the foods to the market was one of their constraint to provide the nutritious foods for the infants. It also means that all recipes can be applied in near or far-market hamlet as long as they have motivation to try it.

Fish abon was tried by half of the respondents. Some household made modifications when they change the cucut or tuna into the available fish in the food seller. Two household in the near-market hamlet change the fish with *turingan* and flying fish. Do not have much time was the constraint of household in the near and far-market hamlet for not tried the abon. Mensah & Tomkins (2003) mentioned that constraints such as limited time, food and fuel, mothers often find it difficult to cook separate meals for only one child. One of our exclusion criteria was actually food insecure with hunger, so the constraint should be not on the affordability. In interview with mothers, only 4 from 12 mothers

worked. Two were farmers, one was an entrepreneur and one was teacher. From this four working mothers, three mothers have limited time as the constraint. The others were housewife. One of the housewife mothers said that there was a family weeding celebration, so she didn't have the time to apply the recipe, the other said that she couldn't applied the recipe because her mother was sick, so she has to take care of her mother besides taking care of her child, while the rest said that they didn't have time because they have to take care of their child. The household trial that was only done in 7 day, most probably could not really captured the practice if there were an unconditional situations. In term of knowledge, more than half of the respondents have the knowledge on infant feeding practices and they know what foods have to consume by their infants. The other possibility of why they didn't tried the recipe maybe because they were less motivated. Motivation to apply the recipe was actually given in the counseling visit. *Therefore, the counseling session will be a very critical time, where there has to be sufficient time, skilled facilitator and the most effective motivation.*

The less tried recipe was chicken liver *abon*. It was only tried by 1 household. The constraints for not tried this recipe in near and far-market hamlet was because mothers do not have much time and children do not like the taste (in this case, this infant has less appetite). Regarding time preparation, it needs 30 minutes to process the chicken liver *abon*, with several steps have to be done. In line with Brown et al. (1992), that the messages that meet the most resistance were the message required more preparation. To overcome with the time limitation of mothers, WHO recommendation on community-prepared foods can be one solution on the time needed for *abon* preparation. *However, the nutrition education was urgently needed to enhance their awareness on the appropriate complementary foods for their children, so that they will use the nutritious recipes/products prepared by the community.*

Moreover, because chicken liver should be bought at the market, especially for the far-market hamlet it still becomes one of the constraints. However, some mothers in near-market hamlets also stated it one of their constraint for not applied the recipe. As the chicken liver should be bought at the market, it implied that chicken liver was not usually consumed by most of the

infants, especially from far-market hamlets. It also confirmed in this study from the food list obtained from GI with caregivers. Two infants from far-market hamlets (Sanggar) didn't consume the chicken liver. Exposure to particular flavor will give influence on the acceptability of the infants. The results by Mennela et al (2001) about prenatal and postnatal flavor learning and its influence on the weaning foods supported this. Because the chicken liver was only be bought at the market, the infants rarely given the chicken liver so they need more adaptation with the chicken liver taste. Suggestion came from one mother to make the taste of chicken liver abon better, which to add fried onion on to the chicken liver abon.

Affordability was found to be another constraint in near and far-market hamlet, even though it was not explicitly stated. From the cost analysis, per average portion it cost Rp. 331,- or on average Rp. 1.000,- a day (3 times meal). This cost still on the average daily food expenditure a hamlets could afford for the child. Therefore, the affordability should not become the constraint and the high cost of the recipe was only their perception that can hinder their practice to apply the recipe (Mensah & Tomkins, 2003).

In general, the most motivation for tried the recipes for near and far-market hamlets was because child like the taste. While the specific motivation for far-market hamlets was durability (abon) and good for health (cap cay, fish abon and meatballs). It implied to the need for food preservation in far-market hamlets, and also the concern on child's health. On the other hand, the specific motivation near-market hamlets were because the recipes were easy to make (abon and cap cay), not use much oil and can be eaten for the whole family member (abon). It implied that they were more concern on the practicality of the recipes.

This study revealed that the mothers that tried the recipes were willing to continue in making the recipes as long as her infants like, the ingredients available and they have time to make it. This is in line with the analysis done by Caulfield, Huffman & Piwoz (1999), that when the children liked the foods and were willing to eat them was the major motivation for mothers in variety of settings to change and continue new foods and practices. They also stated that time is an important

constraint to many women; therefore to be successful, enriched foods must involve minimal change in maternal time spent in preparation and feeding.

This study found the significance of the modified nutrient-dense recipes to enhance the infant's dietary intake. Among infants who consumed recipes yesterday there was significant increment in adequacy of energy, zinc, iron and calcium from complementary foods, while among infants who were not consumed recipes yesterday the significant increment was only on calcium.

This finding was supporting the previous study done to investigate the significance of improved complementary foods on infants dietary intake and nutritional status. Abebe et al. (2006) found the addition of kidney beans and pumpkins was found effective in improving the nutritive value of traditional Ethiopian complementary foods prepared from corn or *kocho*. Lartey et al. (1999) also found the significance of *kocho* plus fish powder on the infants growth. In Indonesia the study that was done in 1991, found the significant effect of supplementary feeding on weight gain and motor development (Husaini et al., 1991).

Compared with the best-case scenario from Linear programming analysis done previously in Lombok (Harper, 2006), the significant improvement of iron intake by modified local nutrient-dense food recipes was higher i.e. 47%RNI by modified recipes, 35%RNI with best case scenario. However, for calcium and zinc, the increment by the modified recipes was still below the best case scenario.

Based on Gibson et al (1998), the complementary foods should provide approximately 25-50% of daily requirements for protein, 50-75% of calcium, and 75-100% for iron and zinc. Even with the significant increment in iron and zinc after trial, it still can't fulfill daily requirements because the median for iron only 47.2% and zinc only 36%.

Improvement of the adequacy could possibly be done with increasing the portion of modified recipes consumed. Since the portion they consumed was still so small. For example, in each portion they only consumed abon in average ± 2 gram, that means that in 1 day they only consumed ± 6 gram. If they can increase the consumption for each meal ± 10 gram (1 spoonful), it means that in one day

they can increase the intake about 5 times or \pm 30 gram and this possibly will increase their nutrient intake from complementary foods.

Other possibility to improve the nutrient adequacy was through the consumption of other nutrient-source foods in available in the market. Based on nutrient content of food available in the market, there were some foods found to be the source of calcium and iron, such as tofu and dark green leafy vegetables (spinach, cassava leaves, etc). More foods were identified as the source of zinc: tofu, tempe, mungbean, quail and duck egg, crab, beef and dark green leafy vegetables (spinach, cassava leaves, etc). Other zinc sources were in form of fortified foods.

Another approach to improve of micronutrient intake, specifically iron and zinc that still below the requirements urged that *the strategies to optimize nutrient intake from locally available foods may need to be coupled with other approaches in order to fully address the problems in micronutrient malnutrition* (Dewey & Brown, 2003). Trowbridge et al. (1993) also stated that the food-based strategy to improve the dietary intake of the infants may need to complement by other strategies such as fortification or supplementation. Moreover, several studies have been found that the fortified complementary foods can significantly improve the micronutrient intake and nutritional status of the children. Like the use of Incaparina in Guatemala (Barenbaum et al., 2001). Corn-soy blend (CSB) or wheat-soy blend (WSB) in Haiti were successfully improved the micronutrient intake of children in their second year of life, while the infants need combination of approaches such as using home fortification methods such as sprinkles, spreads or dispersable tablets (Ruel et al., 2004). However, such approach also has to be improved since there were still some constraints in term of the low compliance, the risk of over dose or the dependency on distribution system (Dewey and Brown, 2003).

Bhandari et al. (2001) concerned with the nutrient intake from complementary foods that may still be low because of the barriers that hinder acceptability. Guptill, Esery, Oni and Brown (1993) conclude that these barriers include cultural belief and traditions, education and *perceptions of the cost and length of time for preparation of the recipe* (Mensah and Tomkins, 2003).

In this study, even though there was two mothers consider fish as prohibited because they afraid the infants of being cough and diarrhea, with giving them more knowledge especially on nutrition, they want to try the modified local nutrient-dense recipes, fish abon and meatballs. Furthermore, study in rural Bangladesh suggest that if a mother had evidence that adding a food improved her child's health, she was often willing to overcome her stated feeding belief (Brown et al, 1992).

Even though the current study was conducted in one sub-district from East lombok (Pringgabaya), the results should potentially be promoted to the district level as from the East Lombok Board Center of Statistic (2008), the food supply in other sub-districts were not really much different. It means, the potential foods resources to improve the complementary foods were available. However, this generalization should also be supported with the current infant feeding practiced in other sub-districts.

This formative study not only provide evidence of the current infant feeding practices in East lombok but also the development of population-based local complementary food recipes from East lombok, specifically among 9-11 mo infants that used the community trial to test it's acceptability. Over the past 20 years, the findings from behavioral trials have been good predictors of behavior change for programs (The manoff group). Thus, the information's can then be used for further program implication of the Ministry of Health especially to encourage it local complementary foods program. Specifically, the information can also be used by the local health officers in East lombok to improve the infant dietary intake and complementary feeding practices.

However, the limitation of this study was because this study uses small sample size. As is the case with most qualitative methods, results sometimes are met skeptically by physicians because the sample sizes are small (The manoff group). Even though we already follow the guideline by Dickins, Griffith and Piwoz (1997) of designing consultative research, having more sample will give us more broader picture and variety of response of acceptability of the recipes it self. Another limitation was because the short duration of acceptability trial, we can't really guarantee that some practices will be really changed.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Variety of local food resources as indicated by availability of all food groups in the market can be potential for the improvement of complementary foods in the area. The nutrient-dense foods found from previous study were available in the whole year and were affordable by the community. Differences of near and far-market hamlet in HH accessibility to food was in term of distance, cost to go to the nearest market, food production and daily food expenditure. Complementary feeding practices were not optimal as indicated by early introduction of complementary foods, less frequency of meals and snacks a day and consumption of pre-masticated foods.

This study had successfully developed recipes that correspond to problem nutrients (Fe, Ca & Zn) with affordable price: the chicken liver abon could meet the iron and zinc density and was well accepted by infants and mothers; anchovy powder could meet calcium and zinc density but its acceptability was still less than expected. Those recipes had also successfully reduced the amount of actual nutrient-dense foods that should be consumed to fulfill the nutrient requirements. However, the fish products while well accepted by infants and mothers couldn't meet the zinc density as it was intended to.

This study found the significance of the modified nutrient-dense recipes to enhance the infant's dietary intake. There was significant improvement on the adequacy of energy, iron, calcium and zinc from complementary foods among infants who consumed the recipes.

6.2 Recommendations

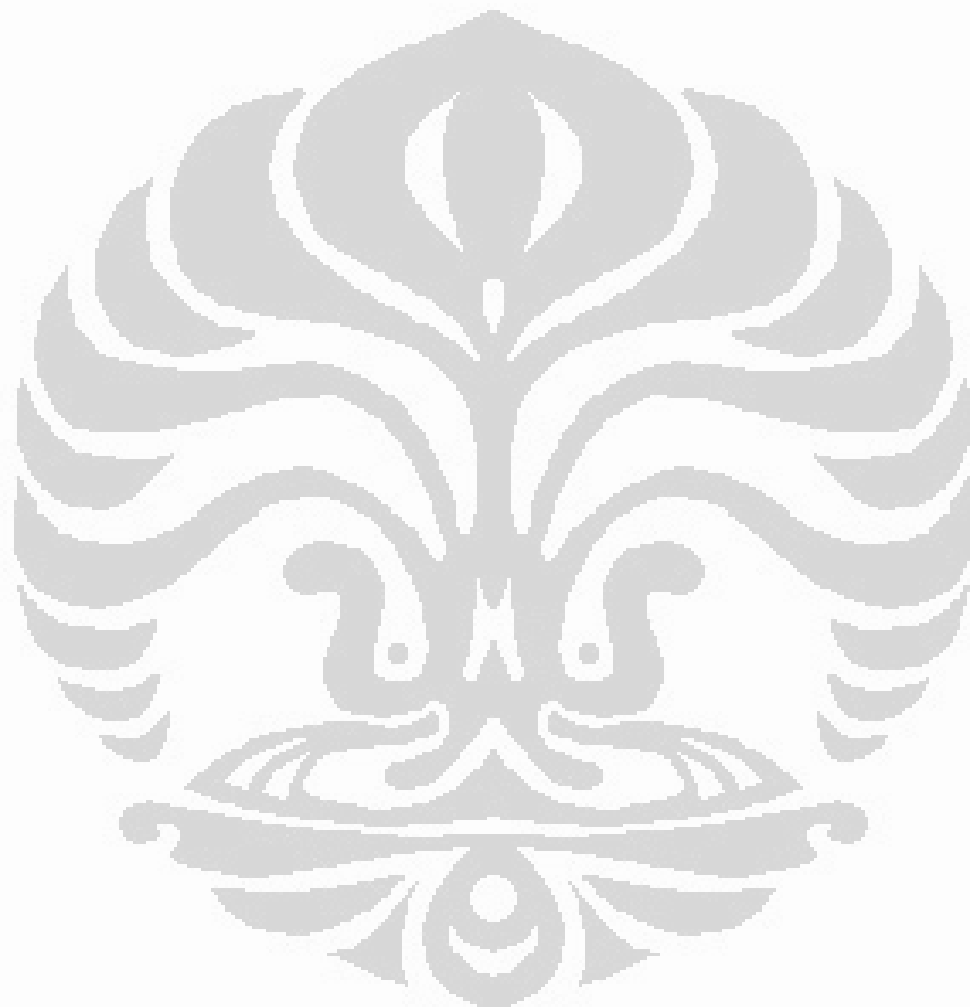
Programmers

1. The time limitation and willingness of the mothers to prepare the modified local nutrient-dense complementary foods recipes can be minimized by community-prepared foods, possibly by cooperating with the cadres to prepare and distribute the recipes in nearby food seller, therefore need support from local health officers. Other possibility was with advocating the food sellers, such as "*pentol*" or meatballs sellers to prepare and sell the recipes.
2. The difficulties of fulfilling micronutrient intake for the infants by local complementary foods alone suggest the need to couple the strategies with others such as home fortification or sprinkles. However with the fulfillment of nutrients from the nutrient-dense recipes, home fortification can be done less frequently thus still encouraging practice of good dietary diversity.
3. Integration of the developed nutrient-dense recipes into local complementary feeding recommendation (CFR) is strongly urged. The socialization of the local CFR can be complemented with counseling when necessary.

Next studies

1. Further exploration (more recipe trials) on developing modified local nutrient-dense food from less acceptable food such as anchovy, possibly by inserting it in form of snacks.
2. Further studies is required with longer duration and larger sample size for the acceptability trial to capture the variety and to avoid the unexpected situation, not to forget sufficient times in counseling visit, effective motivation and skilled facilitator
3. Further study is needed to compare cost-effectiveness between local CFR with nutrient-dense recipes versus other alternatives (home fortification) in terms of nutrient fulfillment and dietary diversity.

4. Limited studies on the enhancement of zinc and iron bioavailability on the complementary foods, urged the need for further studies that reduce the phytic acid content of the plant-based diet, such as germination, soaking, fermentation etc.



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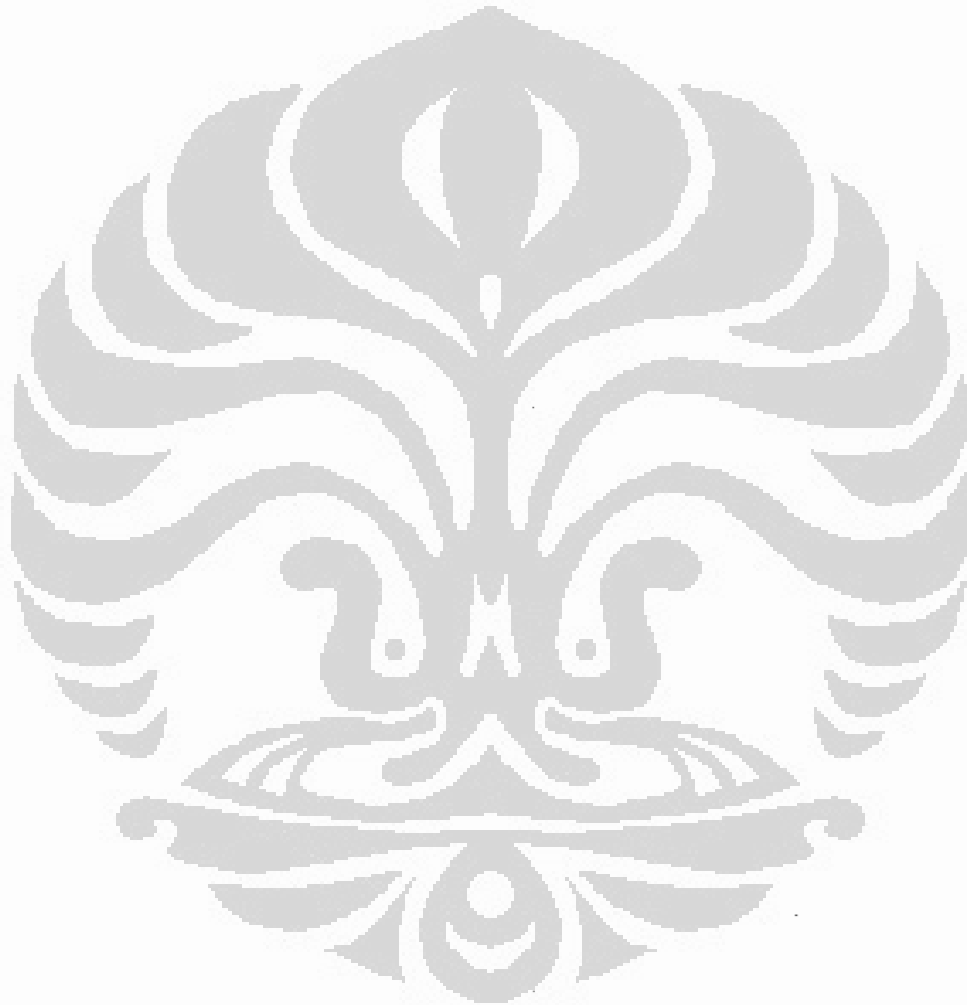
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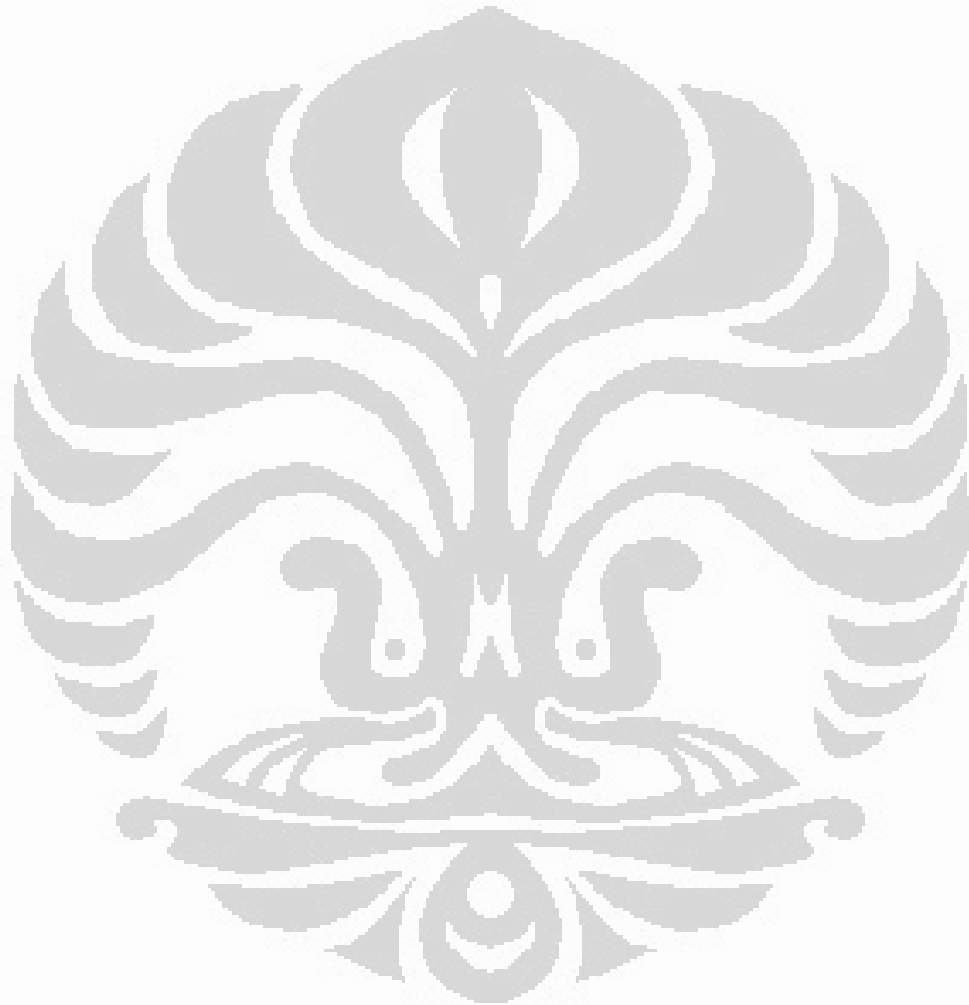
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Appendix 1

MANUSCRIPT FOR PUBLICATION



1 **MANUSCRIPT FOR PUBLICATION**

2 **To be submitted to The Journal of Nutrition**

3
4 **MODIFIED LOCAL NUTRIENT-DENSE COMPLEMENTARY FOOD**
5 **RECIPES COULD IMPROVE THE NUTRIENT ADEQUACY AMONG 9-**
6 **11 MONTH OLD INFANTS**

7
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1 **ABSTRACT**

2 Iron, zinc and calcium consistently become problem nutrients among 9-11
3 mo infants in East lombok. One of the strategy to improve the intake of problem
4 nutrients was through the low cost complementary foods, using locally available
5 foods and simple food processing. We present results from a formative study on
6 the development of modified local nutrient-dense complementary foods for 9-11
7 month old infants in East Lombok, West Nusa Tenggara Province, Indonesia.
8 Two sites were purposively selected to maximize sample diversity: 1. near-market
9 and 2. far-market. The data collection including a series of market survey, group
10 interview with caregivers and cadres, recipe trials, recipe development, and HH
11 acceptability trial. This study had successfully developed recipes that correspond
12 to problem nutrients (Fe, Ca & Zn) with affordable price; the chicken liver abon
13 could met the iron and zinc density, while anchovy powder could met calcium and
14 zinc density. Those recipes had also successfully reduced the amount of actual
15 nutrient-dense foods that should be consumed to fulfill the nutrient requirements.
16 However, the fish products couldn't met the zinc density as it was intended to.
17 The recipe that mostly tried by the household in near and far-market hamlet was
18 fish meatballs and cap cay, while the least recipe tried was chicken liver abon.
19 This study suggested that there would be potential to benefit from the modified
20 recipes as there was significant improvement on nutrient adequacy of energy, iron,
21 calcium and zinc from complementary foods among infants who consumed the
22 recipes.

23 **KEYWORDS:** local nutrient-dense complementary food recipes * infants

24 * east lombok * acceptability trial * nutrient adequacy

1 INTRODUCTION

2 During the transition period, between exclusive breastfeeding and the
3 introduction of family foods (ages 6-23 months), the prevalence of malnutrition
4 increases substantially in many countries because of increased infections and poor
5 feeding practices (1). Regarding complementary feeding, it frequently begins too
6 early or too late, and foods are often nutritionally inadequate and unsafe (2).

7 The complementary foods in developing countries were inadequate
8 especially in micronutrient (3,4). Further, analysis done on 23 complementary
9 foods mixture used in developing countries, had emphasized that many of the
10 complementary food studied fail to meet the desirable levels for calcium, iron and
11 zinc, when expressed as intakes per day and as nutrient densities (per 100kcal) (5).
12 In Indonesia, multi center complementary food study done in 6 locations by
13 UNICEF 1997, found that the local complementary food consumed by the
14 children still below the Recommended Nutrient Intake (RNI). The most problem
15 nutrients are micro nutrient content which only can fulfill 20% of the RNI,
16 especially zinc and iron (6).

17 A technical workshop of coordinated strategies for controlling
18 micronutrient malnutrition (1991) urged that of the micronutrient intervention
19 programs available, effective food-based dietary strategies will be the most
20 sustainable as long as nutritionally adequate diet based on local foods can be
21 successfully identified and promoted (7). In line with that, WHO in the Global
22 Strategy of Infant and Young Child Feeding (2) recommended *low-cost*
23 *complementary foods*, prepared with locally available ingredients using suitable
24 small-scale production technologies in community settings as one of the strategy

1 to help the infants meet their nutritional needs. Moreover, locally available and
2 affordable foods can successfully enhance nutritional quality of complementary
3 foods in Southern Ethiopia. While, several studies have shown the significance of
4 improved complementary feeding on infant's growth and dietary intake (8).

5 Effort to improve complementary feeding in developing countries have
6 often focused on the use of cheap, locally available ingredients as a way to make
7 these foods affordable to poor families. Although these may improve the
8 macronutrient content of the diet, the micronutrient quality is often neglected (9).

9 Therefore, the study needs to be done to improve the complementary foods
10 with locally available foods, affordable, using simple food technologies which
11 have attention on micronutrient quality.

12 13 **METHODS**

14 **Location.** We conducted the study at East Lombok district, West Nusa
15 Tenggara Province because of it has high under nutrition prevalence among under
16 five children compare to the National prevalence. East Lombok district was
17 purposively chosen because of high under nutrition among under five.
18 Pringgabaya sub district was chosen because this district has typically similar
19 characteristics with East Lombok district in term of population density (649
20 people/km²) and poverty condition (35% of sub welfare family) in 2005. Two
21 sites were purposively selected to maximize sample diversity: 1. near-market and
22 2. far-market. The distance was determined based on the consideration of length
23 of time and cost needed to go to the nearest and common market visit by

1 caregivers that also validated by the agreement with the local officers in sub-
2 district office of their perception on far and near market hamlets.

3 **Study design.** This cross-sectional was conducted in February 2010
4 (during wet season). Method used in this study adopted the method used in
5 consultative research, which were basically qualitative.

6

7 **Data collection methods**

8 *Rapid Assessment Procedure (RAP)*

9 *Group Interview (GI) with the cadres*

10 In the GI with the cadres, the cadres asked about the foods usually
11 consumed by the infant's 9-11 mo in that area based on their experience and
12 observations, local CF recipes exist as well as the food pattern and food
13 taboo/belief in population. Four GI with cadres were conducted in near and far
14 market hamlets (each group consist of 2-6 informants) (10).

15 *GI with caregivers*

16 The purpose of the group interview with the caregivers was to explore the
17 information on complementary foods and existing recipes also food belief/taboo
18 and the food pattern of infants 9-11 month old. Besides that GI with caregivers
19 also conducted to introduce the modified recipes. Four GI with the caregivers
20 were conducted in the two randomly selected near and far-market hamlets (each
21 group consist of 2-6 informants).

22 *Recipe trials*

23 The 1st recipe trial was held in order to have information on the existing
24 recipes or how the caregivers developed recipes based on her usual practices. One

1 trial was conducted in one near-market hamlet with the justification that based on
2 the RAP results this hamlet had most CF local recipes. The 2nd recipe trial were
3 held to introduce the modified recipes and to choose the most popular recipes
4 which will be used for the TIPs (household trial), used a structured form to score
5 responses on taste by mothers and infants, availability of items, willingness to
6 give the recipes when the infants were ill, time of preparation and willingness to
7 prepare. Each of the recipe was introduce and assessed it's acceptance among
8 infants and mothers at the infants meals time. Second recipe trials were conducted
9 two times in near and far-market hamlets .

10 The recipe trials were conducted in different communities that were
11 scheduled for the TIPs. The number of caregivers participating in the 1st recipe
12 trial was 6. While in the 2nd recipe trial the number of caregivers was 6 in near-
13 market hamlet and 4 in far-market hamlet.

14 For the RAP and recipe trials, two out of 36 near-market hamlet and two
15 out of 29 far-market hamlet were randomly selected. The inclusion criteria for
16 the subjects in the RAP and recipe trials were: aged 9-11 months on the day of the
17 study recruitment), breastfed, apparently healthy (did not suffer from illness that
18 may changes their food intake), and willing to join the study while the exclusion
19 criteria was severe undernourished.

20 *Market survey*

21 Market survey was done to collect information on the food available
22 including nutrient-dense foods in the market and to determine the cost of each
23 foods. It was done in the 4 market in East Lombok, which were Apitaik,
24 Pringgabaya, Pohgading and Labuan lombok,. One sample of each food was

1 collected. This information was used in determining the cost of modified local
2 recipes.

3 *Recipe development*

4 Basically, the recipes were developed based on the local complementary
5 food exist in the study area. The information of food available for the recipes
6 ingredients and complementary recipes exist in the area was based on the previous
7 study (11, 12) that also validated by this study in RAP (GI with cadres and
8 caregivers), market survey and 1st recipe trial.

9 Those recipes found were modified to reach the desired outcome, which
10 was to make the nutrient-dense recipes for the 9-11 mo infants with the attention
11 on 3 problem nutrients, calcium, iron and zinc. The process of recipe
12 development was done using *trial and error* method. The trial of food processing
13 was done with the consideration of the energy and nutrient density to fulfill the
14 requirements. The way of preparation and cooking method was also following the
15 local recipes preparation using simple home food technologies.

16 *Recipes acceptability trial*

17 The community acceptability of the recipes tested by using the Trial of
18 Improved Practices (TIPs) Protocols (10). TIPs include three visit to the
19 household. The first visit (initial) were done to collect background information
20 and conduct dietary assessments based on the prepared 24-hour recall and food
21 frequency forms (10). In the second visit (counseling visit) the interviewer
22 discusses the child's positive feeding practices and feeding problems. The
23 modified recipes then introduced through cooking demonstration. During the
24 counseling session, the researcher discussed the modified recipes formulated, the

1 acceptability, feasibility of cooking in home and the willingness of the caregivers
2 to give the recipe to the infants. The follow-up visit (third visit) will be carried
3 seven days later. In this visit the researcher's finds out if there are any significant
4 changes in the home or in the child's health since the previous visit. A second 24-
5 hour food recall was conducted, and the mothers were interviewed about her
6 reaction to the agreed-on practices. These discussions include the mother's
7 experience with the new practice(s), the child's response, the mother's willingness
8 to continue the practice in the future, and any modifications of the
9 recommendations.

10 For TIPs, the sample was 2 groups, near and far-market hamlet. Seven
11 infants from near-market hamlet and 5 from far-market hamlet. The inclusion
12 criteria for the subjects in the recipe acceptability trial were: aged 9-11 months on
13 the day of the study recruitment), breastfed, apparently healthy (did not suffer
14 from illness that may changes their food intake), literate mother and willing to
15 join the study while the exclusion criteria were severe undernourished, food
16 insecure with severe hunger (Food Security Survey Module, USDA) and have
17 food taboo or allergic with fish, chicken liver and dried anchovy.

18 **Data analysis.** The GIs and in-depth interviews were transcribed verbatim
19 and translated to Indonesian (when the interviews was in local language).

20 The Z-scores for weight-for-age of infants surveyed were analyzed using
21 WHO 2006. Underweight defined as a Z-score < -2 SD while well nourished was
22 defined as Z-score $-2 - 2$ SD.

23 Energy and nutrient contents of the food obtained from Indonesian Food
24 Composition database available in Nutri Survey for Windows, version 2004. To

1 calculate the daily energy and nutrient intakes of the infants, the intakes from
2 complementary foods obtained from single 24hr recall were added by the average
3 breast milk intake (13). Adequacy of energy and nutrient intake was analyzed
4 with comparing the infants intake from single 24hr recall with the Indonesian
5 Recommended Nutrient Intake (RNI) for infants 6-12 mo (14) and then multiply
6 by 100%. The macro and micro nutrient content of the food products (except cap
7 cay) were analyzed in Food Laboratory (*Balai Besar Industri Agro, Bogor*).

8 Score of acceptability test in the 2nd recipe trial was calculated for each
9 parameter and presented below. The **individual score** of each parameter was 5 =
10 very likeable, 4 = likeable, 3= acceptable, 2 = less acceptable, and 1=
11 unacceptable. The total score of a food product was calculated by summing up
12 score of each parameter. So, the highest the score it means that the food products
13 were more acceptable. While, the rank of each parameter was gathered by listed
14 the score in each parameter. The highest score means it has the highest rank in
15 each parameter. The total rank was calculated by summing up rank of each
16 parameter. So, the more acceptable the food products will have highest rank also
17 (or lowest in number).

18 The population-descriptive statistics were analyzed using SPSS for
19 Windows, version 15.0.

20 The ethical clearance of the study was approved by the Medical Faculty,
21 University of Indonesia.

22

23 **RESULTS**

24 **Development of modified local nutrient-dense recipes.**

1 Even with adherence to the Complementary Feeding Recommendations
2 (CFR's), the requirements of some nutrients, namely iron, zinc, calcium and
3 niacin, cannot be met by local foods alone in quantities currently consumed (11).
4 Possible food item as the source of iron was **chicken liver** and the possible food
5 item as the source of iron was **dried anchovy**, while zinc can be fulfilled by **fish**
6 consumption (12). However, some mothers in far-market hamlets found it
7 difficult to provide chicken liver once a week due to accessibility constraint.
8 Moreover, dried anchovy was still rarely consumed due to its texture. However,
9 one mother has ever tried to make in into powder before gave to the infants (12).

10 Based on the group interview with cadres and mothers, most of the
11 mothers have no longer cooked special foods for the infants. They already gave
12 the infants the same foods with the family, even though they still avoided spicy
13 foods for the infants. **Chicken liver** was usually consumed in near-market hamlet,
14 because usually the chicken liver only available in the market. In this case, there
15 was a challenge to make chicken liver more *durable*.

16 Anchovy already consumed by almost half of the infants. However, two
17 infants from one far-market hamlet didn't used to consume it. It because the hard
18 texture, that also make all of the infants usually consume it in pre-masticated.
19 Based on this, there was a challenge to make the texture more acceptable (*more*
20 *soft*). The portion consumed was also still so small, in average only 4.1 gram.

21 From the individual interview of these mothers obtaining the food list they
22 usually consumed, almost all mothers gave **fish** to their infants. Moreover, from
23 the group interview with the mothers far-market hamlet, only fish that usually
24 consumed by their infants as animal protein.

1 SUN, as one of fortified foods was only consumed by small number of
2 infants in near-market hamlets, whereas they usually had stopped to give SUN or
3 fortified porridge when the infants were 8th mo. However, fortified foods were
4 mostly consumed by the infants in form of the snacks.

5 Based on the cadres, some of the mothers still practice food taboo/belief
6 for particular foods. **However, most of the mothers, in near and far-market**
7 **hamlet said there were no avoidance of a particular foods.**

8 From observation and individual interview with the mothers known that
9 meatballs were the usual snacks among the people in the community, including
10 the infants. They usually make meatballs from “beef or chicken” but dominated
11 with flour. Based on this, one of the alternatives of modified local
12 complementary foods was to make the **meatballs from fish.**

13 Abon was one of the food products available in the community. However,
14 the abon was usually made from beef or fish. The consumption of abon also
15 hasn't too familiar for the infants. Which based on the group interview with the
16 cadres, abon usually only consumed by infants from higher socio economic status.
17 Therefore, we consider abon as local complementary foods to be promoted
18 because it can be one of solution for the durability, texture and also higher
19 nutrient-dense foods. We then developed the **chicken liver and fish into abon**
20 **and anchovy into powder.** One additional modified product was **fish meatballs.**

21 From the results of the 1st recipe trial, there were 6 complementary food
22 recipes have been identified. This will add the potential recipe to be promoted.
23 There were vegetable (spinach and longbean) soup, mungbean flour porridge, mix
24 rice porridge A (rice, potato & chicken liver), mix rice porridge B (rice, carrot,

1 potato, chicken liver, anchovy, tofu, tempe, spinach, cassava leaves, kangkung,
2 tomato), biscuit pudding (jelly, sweet condense milk, biscuit), banana pudding
3 (jelly, banana) and cap cay (tofu, meatball, carrot, green beans, potato, spinach).
4 Based on the results, *cap cay* will be promoted because it can mix many items,
5 such as vegetables and animal protein to add the variability of infants diet and also
6 because it can be vehicle for the nutrient-dense foods.

7 Six recipes were developed and modified. The chicken liver abon can met
8 the desired Fe and Zn density while anchovy powder can met the desired Ca and
9 Zn density. However, the fish products (fish meatballs, cucut and tuna abon) that
10 intended to have high Zn density can not met the desired Zn density.

11 Because the cost analysis was done per portion consumed, the cost of each
12 recipe depends on the portion consumed besides its ingredients. The lowest cost
13 was for anchovy powder and the highest was cap cay. In term of time for
14 preparation, the longest time was needed to prepare fish abon (55 minutes) while
15 the shortest time was needed to prepare cap cay.

16 Based on the acceptability test on Table I, the highest score was cap cay,
17 and the lowest score was anchovy powder. Meanwhile, the lowest rank, which
18 mean a better rank was also cap cay, while the highest rank which mean the
19 lowest rank, was anchovy powder. Moreover, anchovy powder also has lowest
20 amount consumed compare to the other powder-kind of foods. Based on this
21 consideration, anchovy powder will not include in the next step, which is to test
22 it's acceptability in the 7-day household trial.

23 **Recipe acceptability trial**

1 Based on the initial visit (Table 2), the median (min-max) of weekly
2 frequency of plant protein in a week was only 4.5 (0-42), animal protein 0.5 (0-
3 14) and vegetables 7 (0-49). It means that their intake were less varied and it'll
4 lead to the low intake of several micronutrients. When comparing the intake with
5 the Indonesian RDA several micronutrients such as calcium only achieve more
6 than half of the requirements (57.6). Iron and zinc were even worst: only achieve
7 20 and 19.3 of the requirements.

8 In the counseling visit, we introduced the five modified local nutrient-
9 dense foods to be tried at home for the next 7-day. The 5 recipes promoted were
10 presented in Table 3. In this meeting we also gave motivation so that they would
11 try these recipes at home.

12 As can be seen in Table 4, the recipe that mostly tried by the household
13 was fish meatballs; it was tried by 9 households. The motivations to try this
14 recipe both in near and far-market hamlet were because *children like it, easy to*
15 *make, and the ingredients were available*. The motivations from the far-market
16 hamlet also because the fish meatballs were good for health (the babies) and make
17 the babies gain weight. From all households that tried fish meatballs admitted that
18 the infants like the taste. However, one mother said that *her infant still difficult to*
19 *chew the meatballs*. It means that the texture was still hasn't fit for her infants.

20 Recipe that was also tried by more than half (8) of the samples was cap
21 cay. The motivations to apply cap cay were because it's good for health (far-
22 market hamlet), child's like the taste (near-market hamlet) and *easy to make*
23 *(both)*. While the constraint to make it was because the ingredients should be
24 bought at the market (both for the near and far-market hamlet); the mother didn't

1 have time to make it and child's not really like the taste. From 3 infants didn't
2 like the taste; one of them was having less appetite, one of them didn't like the
3 celery taste and the other infant didn't like the texture (too hard).

4 Some household made modifications when they change the cucut or tuna
5 into the available fish in the food seller. Two household in the near-market
6 hamlet change the fish with *turingan* and flying fish. The specific motivation for
7 the far-market hamlet to made fish *abon* was because it was *durable*, good for
8 health (the babies) and make the babies gain weight. While the motivations in
9 near-market hamlet were more because of the practicality, such as easy to make,
10 not use much oil (efficiency and good for the child), child's like it and it can be
11 eaten for the whole family. The other motivation was delicious taste. *Do not*
12 *have much time was the constraint* of household in the near and far-market
13 hamlet for not tried the recipes. From five household that tried the recipe there
14 was one infant that didn't like the taste. This child was the same that didn't like
15 cap cay, because she had less appetite.

16 The less tried recipe was chicken liver abon. It was only tried by 1
17 household. The constraints for not tried this recipe in near and far-market hamlet
18 was because *mothers do not have much time*. Moreover, because chicken liver
19 should be bought at the market, especially for the far-market hamlet it still
20 becomes one of the constraints. The infant that didn't like the taste was the one
21 that have less appetite.

22 **Improvement on the infants nutrient adequacy**

23 Specifically we were compare the percentage adequacy of energy and
24 nutrients intake from complementary foods between infants who consumed one or

1 more of the recipes with infants who were not consumed it the day before follow
2 up visit day. As can be seen in Table 5, the adequacy of energy and nutrients the
3 infants who consumed vs who were not consumed were increase after 7-day of
4 trial. There was significant increment in percentage energy, zinc, iron and
5 calcium adequacy among infants who consumed recipes yesterday, while among
6 infants who were not consumed recipes yesterday the significant increment was
7 only on calcium.

9 DISCUSSION

10 This study had successfully developed recipes that correspond to problem
11 nutrients. The average desired for zinc in complementary foods was 1.1
12 mg/100kcal, while for iron was 3 mg/100kcal and calcium was 74 mg/100kcal
13 (13). In this regard, the chicken liver abon could meet the iron and zinc density,
14 while anchovy powder could meet calcium and zinc density. However, the fish
15 products couldn't meet the zinc density as it was intended to.

16 The analysis of 23 complementary foods analyzed from several of regions
17 almost all complementary foods fail to meet the desired nutrient-density of iron
18 and zinc when moderate bioavailability is assumed (5). In fact, the bioavailability
19 of iron and zinc from the cereal-based porridges is likely to be low, because most
20 porridges are exclusively plant-based, with content of phytic acid. *Hence, any*
21 *strategies that reduce the phytic acid content of these complementary foods will*
22 *markedly enhance zinc bioavailability, and simultaneously increase absorption of*
23 *non-haem iron to some degree should be encouraged.*

1 The local nutrient-dense modified recipes had successfully reduced the
2 amount actual nutrient-dense foods that should be consumed to fulfill the nutrient
3 requirements. Based on Table 6, 4 spoonful of anchovy powder per day should be
4 consumed to fulfill the calcium and zinc requirements. While with 6.5 spoonful
5 of chicken liver abon per day could achieve the iron and zinc requirements.
6 However, more spoonful of fish abon needed to fulfill the zinc requirement (8 for
7 cucut and 11 for tuna). The reduction of amount of nutrient-dense foods that
8 should be consumed with the consumption of nutrient-dense modified recipes was
9 helping the infants to meet their daily nutrient requirements with their limited
10 gastric capacity.

11 However, even though the anchovy powder was a promising recipe as it
12 can achieve the desired calcium and zinc density with affordable price, after the
13 acceptability test in 2nd recipe trial the anchovy products (powder and abon) still
14 had low acceptance among infants and mothers. So, unfortunately in this study
15 we can't see the acceptability trial of anchovy as the nutrient-dense food for
16 calcium since we haven't found way to processed it into the more acceptable by
17 the infants.

18 Basically, the anchovy (dried fish) that has the desired calcium-density
19 was not really common to consume by the infants, especially regarding it's texture.
20 Among Peruvian infants, dried fish, was also not usually consumed (15).
21 Moreover, in the same area, East Lombok, anchovy was rarely consumed (12). It
22 maximum weekly frequency was only 0.5, means that the infants only consumed
23 it twice a month. It was only consumed by less than 10 from infants in the
24 quantitative study (11). In this recent study, even though the anchovy already

1 consumed by almost half of the infants, the average portion intake was still too
2 low (4.1 gram). Moreover, with regard to it's texture the mothers usually gave
3 pre-masticated anchovy. With these acceptability constraint, more time will be
4 needed to explore deeper on possible complementary food recipes developed.
5 One possibility was to insert the anchovy in form of a snacks.

6 The acceptability trial in this study found the recipes that mostly tried by
7 the household in near and far-market hamlet was fish meatballs and cap cay; it
8 was tried by 9 household. Compare to other modified recipes. fish meatballs and
9 cap cay were the modified recipes that required least time for preparation. It was
10 in line that in the evaluation of weaning education, the most popular and most
11 frequently implemented messages were those requiring little time (16).

12 However, there was still the constraint to make cap cay because the
13 ingredients should be bought at the market (both for the near and far-market
14 hamlet). Three from the infants that the household tried the recipe didn't like the
15 taste; one of them was having less appetite. one of them didn't like the celery taste
16 and the other infant didn't like the texture (too hard).

17 The hard texture actually can be solved by cooking it longer. However,
18 there is an attention of some vitamins that will be broken if the cooking process
19 that involved heat was too long. With over heat process, some of vitamins will be
20 broken or reduce (17). Moreover, vitamin A was easy to broke in the high
21 temperature (18). Mashed the vegetables before giving it to the infants would he
22 also another possibility to solve the hard texture of cap cay.

23 Preferences on celery taste most probably caused by the habitual
24 consumption of itself. In the experimental study showed that the infants who had

1 exposure to the flavor of carrots in either amniotic fluid or breast milk behaved
2 differently in response to that flavor in a food base than did non exposed control
3 infants. Moreover, those infants who were exposed to carrots during prenatal
4 were perceived by their mothers as enjoying the carrot-flavored cereal more
5 compared with the plain cereal (19).

6 Fish abon was tried by half of the respondents. Some household made
7 modifications when they change the cucut or tuna into the available fish in the
8 food seller. Do not have much time was the constraint of household in the near
9 and far-market hamlet for not tried the abon. Constraints such as limited time,
10 food and fuel. mothers often find it difficult to cook separate meals for only one
11 child (20). The other possibility of why they didn't tried the recipe maybe
12 because they were less motivated. Motivation to apply the recipe was actually
13 given in the counseling visit. Therefore, the counseling session will be a very
14 critical time, where there has to be sufficient time, skilled facilitator and the most
15 effective motivation.

16 The less tried recipe was chicken liver *abon*. It was only tried by 1
17 household. The constraints for not tried this recipe in near and far-market hamlet
18 was because mothers do not have much time and children do not like the taste (in
19 this case, this infant has less appetite). Regarding time preparation, it needs 30
20 minutes to process the chicken liver *abon*, with several steps have to be done. In
21 line with previous study, that the messages that meet the most resistance were the
22 message required more preparation (16). To overcome with the time limitation of
23 mothers, WHO recommendation on community-prepared foods can be one
24 solution on the time needed for *abon* preparation. However, the nutrition

1 education was urgently needed to enhance their awareness on the appropriate
2 complementary foods for their children, so that they will use the nutritious
3 recipes/products prepared by the community (15).

4 Moreover, because chicken liver should be bought at the market,
5 especially for the far-market hamlet it still becomes one of the constraints. The
6 results about prenatal and postnatal flavor learning and it's influence on the
7 weaning foods supported this (17). Suggestion came from one mother to make
8 the taste of chicken liver abon better, which to add fried onion on to the chicken
9 liver abon.

10 Affordability was found to be another constraint in near and far-market
11 hamlet, even though it was not explicitly stated. From the cost analysis, per
12 average portion it cost Rp. 331,- or on average Rp. 1.000,- a day (3 times meal).
13 This cost still on the average daily food expenditure for the child. Therefore, the
14 affordability should not become the constraint and the high cost of the recipe was
15 only their perception that can hinder their practice to apply the recipe (20).

16 In general, the most motivation for tried the recipes for near and far-
17 market hamlets was because child like the taste. While the specific motivation for
18 far-market hamlets was durability (abon) and good for health (cap cay, fish abon
19 and meatballs). It implied to the need for food preservation in far-market hamlets,
20 and also the concern on child's health. On the other hand, the specific motivation
21 near-market hamlets were because the recipes were easy to make (abon and cap
22 cay), not use much oil and can be eaten for the whole family member (abon). It
23 implied that they were more concern on the practicality of the recipes.

1 This study revealed that the mothers that tried the recipes were willing to
2 continue in making the recipes as long as her infants like, the ingredients available
3 and they have time to make it. This is in line with the analysis done previously,
4 that when the children liked the foods and were willing to eat them was the major
5 motivation for mothers in variety of settings to change and continue new foods
6 and practices. They also stated that time is an important constraint to many
7 women; therefore to be successful, enriched foods must involve minimal change
8 in maternal time spent in preparation and feeding (21).

9 This study found the significance of the modified nutrient-dense recipes to
10 enhance the infant's dietary intake. Among infants who consumed recipes
11 yesterday there was significant increment in adequacy of energy, zinc, iron and
12 calcium from complementary foods, while among infants who were not consumed
13 recipes yesterday the significant increment was only on calcium. This finding was
14 supporting the previous study done to investigate the significance of improved
15 complementary foods on infants dietary intake and nutritional status. The
16 addition of kidney beans and pumpkins was found effective in improving the
17 nutritive value of traditional Ethiopian complementary foods prepared from corn
18 or *kocho* (22). The significance of *kocho* plus fish powder on the infants growth
19 was also found (23).

20 However, the complementary foods should provide approximately 25-50%
21 of daily requirements for protein, 50-75% of calcium, and 75-100% for iron and
22 zinc. Even with the significant increment in iron and zinc after trial, it still can't
23 fulfill daily requirements because the median for iron only 47.2% and zinc only
24 36% (24).

1 Improvement of the adequacy could possibly be done with increasing the
2 portion of modified recipes consumed. Since the portion they consumed was still
3 so small. For example, in each portion they only consumed about in average ± 2
4 gram, that means that in 1 day they only consumed ± 6 gram. If they can increase
5 the consumption for each meal ± 10 gram (1 spoonful), it means that in one day
6 they can increase the intake about 5 times or ± 30 gram and this possibly will
7 increase their nutrient intake from complementary foods.

8 Other possibility to improve the nutrient adequacy was through the
9 consumption of other nutrient-source foods in available in the market. Based on
10 nutrient content of food available in the market, there were some foods found to
11 be the source of calcium and iron, such as tofu and dark green leafy vegetables
12 (spinach, cassava leaves, etc). More foods found to be the source of zinc, they
13 were tofu, tempe, mungbean, quail and duck egg, crab, beef and dark green leafy
14 vegetables (spinach, cassava leaves, etc). Other zinc sources were in form of
15 fortified foods.

16 Another approach to improve the micronutrient intake, specifically iron
17 and zinc that still below the requirements urged that *the strategies to optimize*
18 *nutrient intake from locally available foods may need to be coupled with other*
19 *approaches in order to fully address the problems in micronutrient malnutrition*
20 (13,25). Fortified foods can be one solution. Several studies have been found that
21 the fortified complementary foods can significantly improve the micronutrient
22 intake and nutritional status of the children. Like the use of Incaparina in
23 Guatemala (28). Corn-soy blend (CSB) or wheat-soy blend (WSB) in Haiti were
24 successfully improved the micronutrient intake of children in their second year of

1 life, while the infants need combination of approaches such as using home
2 fortification methods such as sprinkles, spreads or dispersable tablets (26).
3 However, such approach also has to be improved since there were still some
4 constraints in term of the low compliance, the risk of over dose or the dependency
5 on distribution system (13).

6 The limitation of this study was because this study uses small sample size.
7 Even though we already follow the guideline of designing consultative research,
8 having more sample will give us more broader picture and variety of response of
9 acceptability of the recipes it self (10). Another limitation was because the short
10 duration of acceptability trial, we can't really guarantee that some practices will
11 be really changed.

12 **In conclusion,** this study suggest that there would be potential to benefit
13 from the modified recipes as there was significant improvement on percentage
14 adequacy of energy, iron, calcium and zinc from complementary foods among
15 infants who consumed the recipes yesterday.

16 The time limitation and willingness of the mothers to prepare the modified
17 local nutrient-dense complementary foods recipes can be minimized by
18 community-prepared foods, cooperate with the cadres, therefore need support
19 from local health officers.

20 The difficulties of fulfilling micronutrient intake for the infants by local
21 complementary foods alone, urged the need to couple the strategies with others
22 such as home fortification or sprinkles. Therefore, the effective strategies to
23 eliminate the constraints of home fortification implementation urgently required.

1 Further exploration on developing modified local nutrient-dense food from
2 less acceptable food such as anchovy. Longer duration and larger sample size for
3 the acceptability trial to capture the variety and to avoid the unexpected situation.

4

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9 N.H.U, U.F and O.S designed research; N.H.U and U.F conducted
10 research; N.H.U, U.F and O.S analyzed data; N.H.U wrote the paper and had
11 primarily responsibility for final content. All authors read and approved the final
12 manuscript.

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Table 1. The acceptability test on 2nd recipe trial

Acceptability parameters	Score and rank of food products											
	Cap cay		Anchovy powder		Chicken liver abon		Cucut abon		Tuna abon		Fish meatballs	
	Score	rank	score	rank	score	rank	score	rank	score	Rank	Score	rank
Taste by mother	45	1	32	5	40	3	43	2	29	6	39	4
Taste by child	45	1	33	5	41	4	42	2	31	6	42	3
Feed to sick	28	1	16	5	24	2	19	4	16	5	20	3
Availability of items	34	2	29	6	32	4	32	5	36	1	33	3
Preparation time	33	2	24	5	28	3	27	4	24	5	34	1
Willing to prepare	34	1	26	6	33	2	28	5	28	4	32	3
Total	219	8	160	32	198	18	191	22	164	27	200	17
Amount consumed			1.8		2.3		2.9		2.5			
Cost per portion (IDR)	536		39		331		240		160		337	

Table 2. Percentage adequacy and weekly food frequency in initial visit

Practices	Median (min-max), (n=12)
Percent adequacy of	
Energy (kcal)	93.8 (64.5-145.9)
Protein (gr)	73.2 (41.9-178.1)
Calcium (mg)	57.6 (41.9-92.3)
Iron (mg)	20 (1.4-62.9)
Zinc (mg)	19.3 (9.3-65.3)
Weekly food frequency	
Staple foods	21 (14-28)
Plant protein	4.5 (0-42)
Animal protein	0.5 (0-14)
Vegetables	7 (0-49)
Fruits	1.5 (0-27)
Snacks	2.5 (0-24)

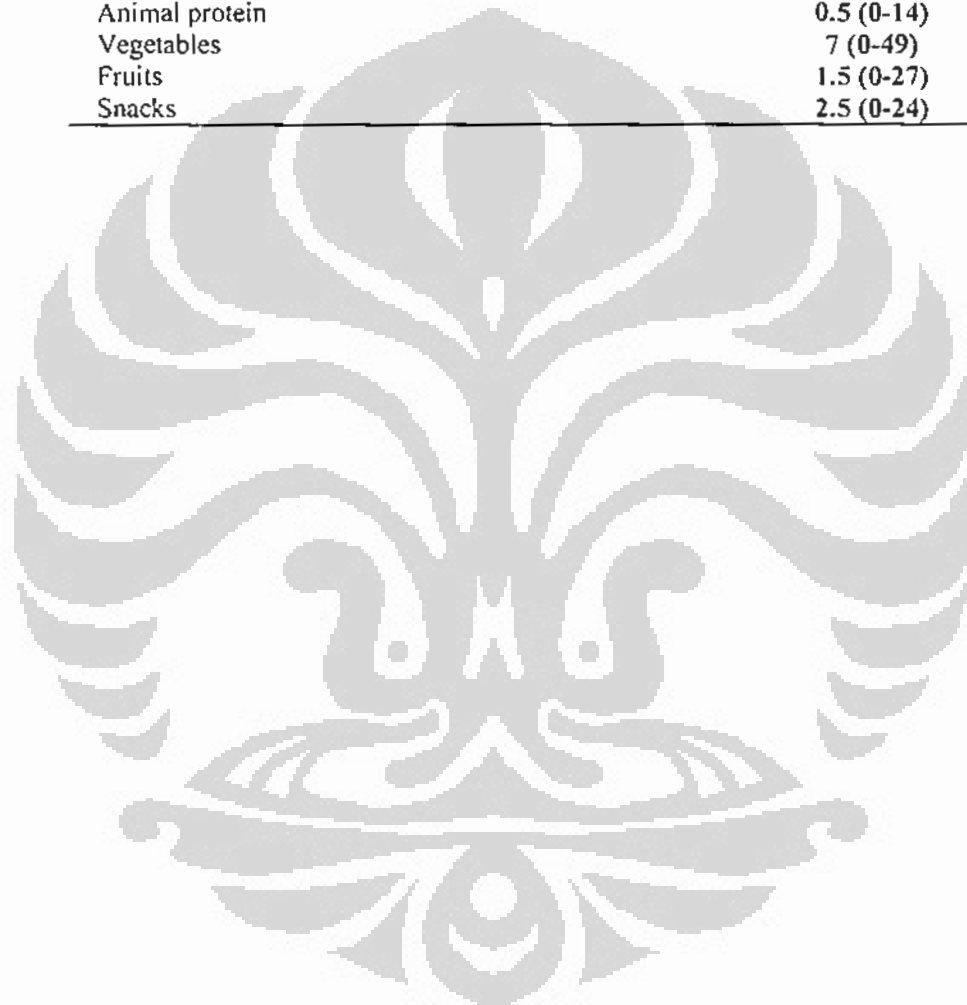


Table 3. Nutrient profile, cost and time for preparation of modified nutrient-dense foods recipes

Recipes	Ingredients	Nutrient value per 100 gram	Nutrient-density (mg/100kcal)	Cost per average portion (IDR)	Time for preparation (minutes)
Cucut abon ^a	Cucut, Vegetable oil, spices	E : 486 kkal P : 48.8 g F : 24.9 g Ca : 123 mg Fe : 3.34 mg Zn : 2.88 mg	Fe : 0.7 Ca : 25.3 Zn : 0.6	240	55
Tuna abon ^a	Tuna, Vegetable oil, spices	E : 361 kkal P : 50.2 g F : 11.2 g Ca : 224 mg Fe : 5.09 mg Zn : 2.11 mg	Fe : 1.4 Ca : 62.0 Zn : 0.6	160	55
Chicken liver abon ^a	Chicken liver abon, Vegetable oil, spices	E : 412 kkal P : 33 g F : 22.5 g Ca : 23.9 mg Fe : 16.9 mg Zn : 6.32 mg	Fe : 4.1 Ca : 5.8 Zn : 1.5	331	30
Anchovy powder ^a	Anchovy, oil, spices	E : 492 kkal P : 57.1 g F : 27.4 g Ca : 2440 mg Fe : 4.79 mg Zn : 5.81 mg	Fe : 1.0 Ca : 495.9 Zn : 1.2	39	10
Cap cay ^b	Tofu, vegetables, meatballs, egg	E : 150.9 kkal P : 5.2 g F : 12.2 g Ca : 51.4 mg Fe : 2.4 mg Zn : 0.6 mg	Fe : 1.6 Ca : 34.1 Zn : 0.4	536	15
Fish meatballs ^a	Fish, cassava flour, flour, spices	E : 170 kkal P : 9.96 g F : 1.61 g Ca : 58.2 mg Fe : 1.34 mg Zn : 0.95 mg	Fe : 0.8 Ca : 34.2 Zn : 0.6	337	25

^a analysed in food laboratory (*Balai Besar Industri Agro, Bogor, West Java, Indonesia*)

^b analysed in Nutri survey (2004)

*desired density per 100kcal of Fe = 3 mg, Ca = 74 mg & Zn = 1.1 mg (13)

Table 4. Response to the modified nutrient-dense recipes after 7-day of HH trial

Recipes	Tried			Motivations	Constraints
	Near (n=7)	Far (n=5)	Response of the infants		
Fish abon	3	3	* child's like (5) * more appetite (1) * child didn't like (1)	(F) : Delicious, <i>durable</i> , good for health (the babies) and make the babies gain weight (N) : Easy to make, not use much oil, delicious, <i>child's like</i> , can be eaten for the whole family	(N&F): Did not have much time (N) : not really like because of the texture (tuna abon)
Chicken liver abon	1	0	* child's like	(N) : Easy to make, not use much oil, delicious, <i>child's like</i> , can be eaten for the whole family	(N&F): Did not have much time, <i>child's did not like the taste</i>
Cap cay	5	3	<ul style="list-style-type: none"> • child didn't like (3) • child's like (5) • more appetite 	(N&F): <i>Child's like the taste</i> (F) : good for health (N) : Easy to make	(N&F) : No time to make, the ingredients should be bought at the market (N) : <i>child' didn't like</i>
Fish meatballs	6	3	* child's like (8) * child still difficult to chew but like the taste	(N & F) : <i>Child's like it</i> , Easy to make, the ingredients were available (F) : good for health (the babies) and make the babies gain weight	(N&F): no time to make

Table 5. Adequacy of energy and nutrients intake (from CF) of infants who consumed and who did not consumed the recipes

Energy and nutrients	Consumed yesterday (n=6)		Not consumed yesterday (n=6)	
	Before trial ^a	After trial ^a	Before trial ^a	After trial ^a
Energy	32.6 (14.5-87.6)	74 (22.2-103.5)*	37.2 (6.2-60.8)	59.2 (25.4-73.6)
Protein	37.5 (13.1-141.9)	58.4 (15-163.8)	31.2 (5.6-104.4)	71.6 (11.9-101.9)
Ca	6.2 (1.1-51.5)	29 (12.3-47.5)*	22.2 (1.5-47.2)	39.8 (10.5-136.4)*
Fe	13.6 (2.9-62.9)	47.2 (17.1-80)*	24.3 (1.4-35.7)	53.5 (11.4-85.7)
Zn	8 (2.7-46.7)	36 (12.3-46.5)*	14 (1.3-57.3)	43.4 (8-92)

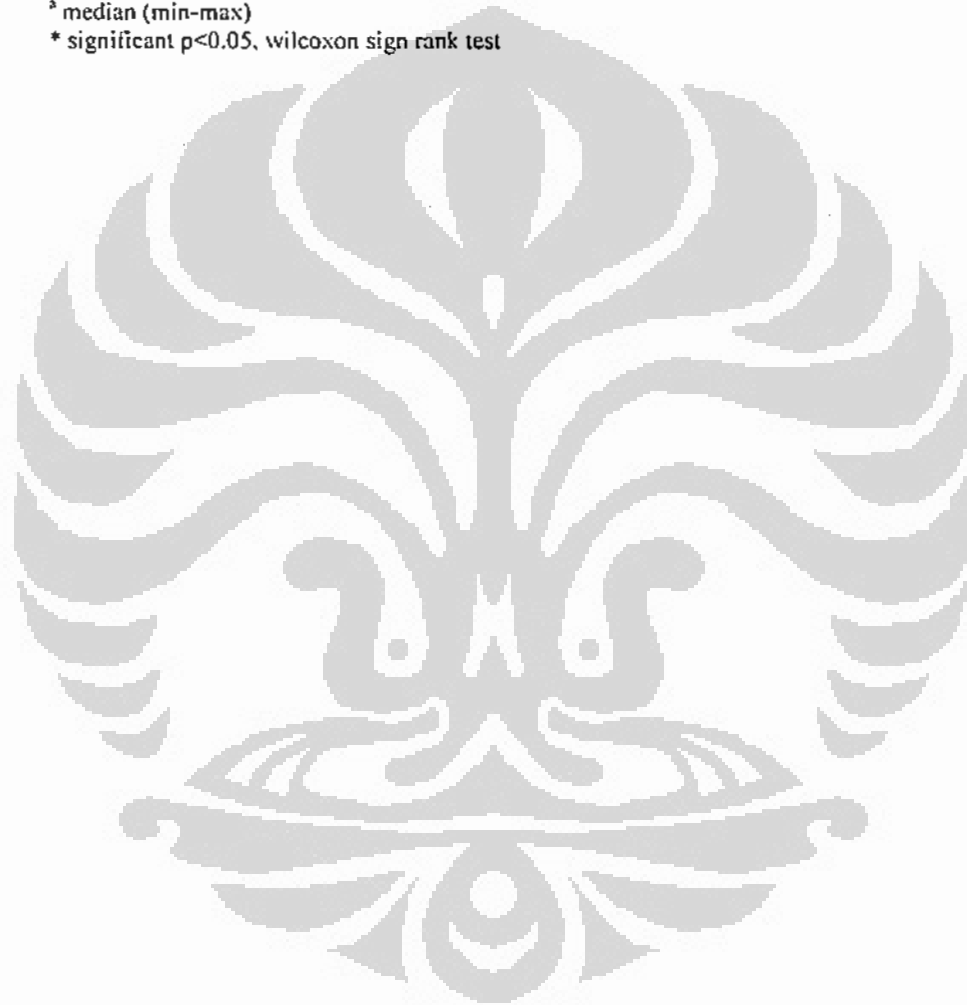
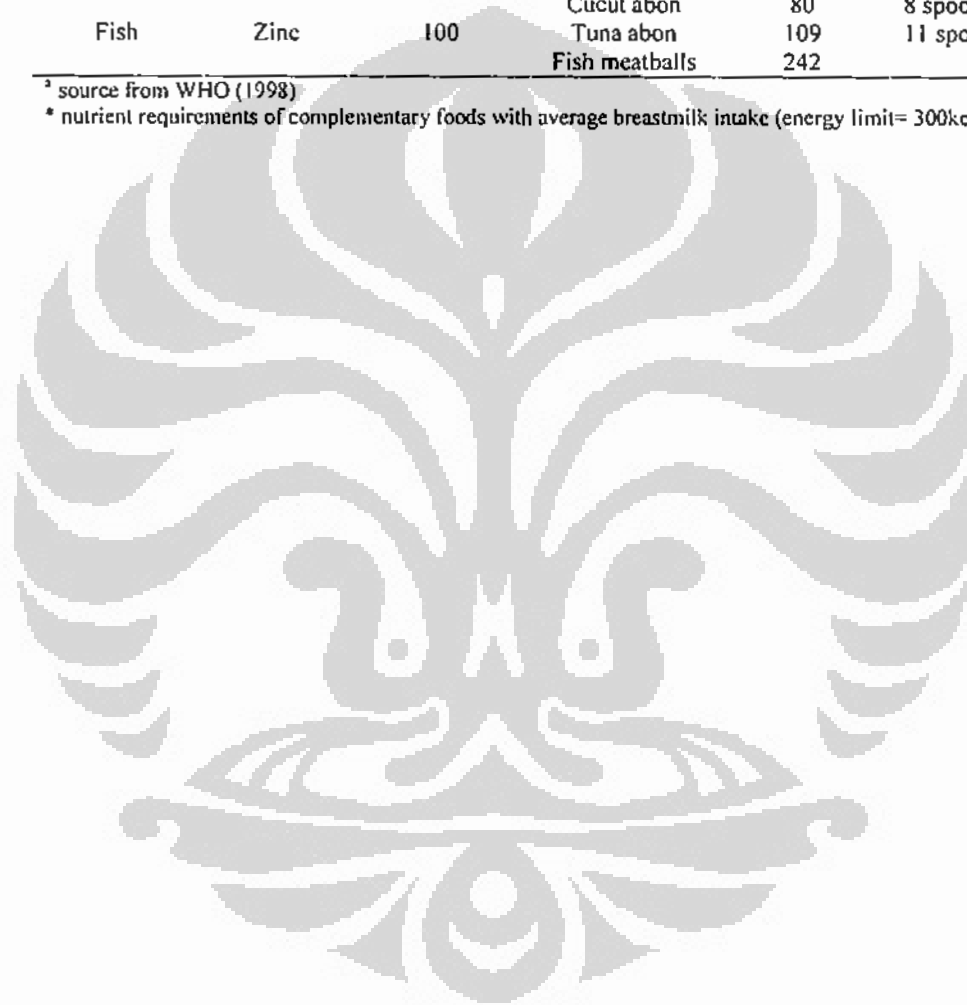
^a median (min-max)* significant $p < 0.05$, wilcoxon sign rank test

Table 6. Actual foods and modified recipes should be consumed to fulfill the nutrient requirements

Actual foods	Nutrient	Portion consumed to fulfill requirement (gr) ^a	Modified recipes	Portion consumed to fulfill requirement (gr)	HH measure
Anchovy	Calcium	21	Anchovy powder	14.5	1.5 spoonful
	Zinc	44		37	4 spoonful
Chicken liver	Iron	108	Chicken liver abon	64	6.5 spoonful
	Zinc	72		37	4 spoonful
Fish	Zinc	100	Cucut abon	80	8 spoonful
			Tuna abon	109	11 spoonful
			Fish meatballs	242	

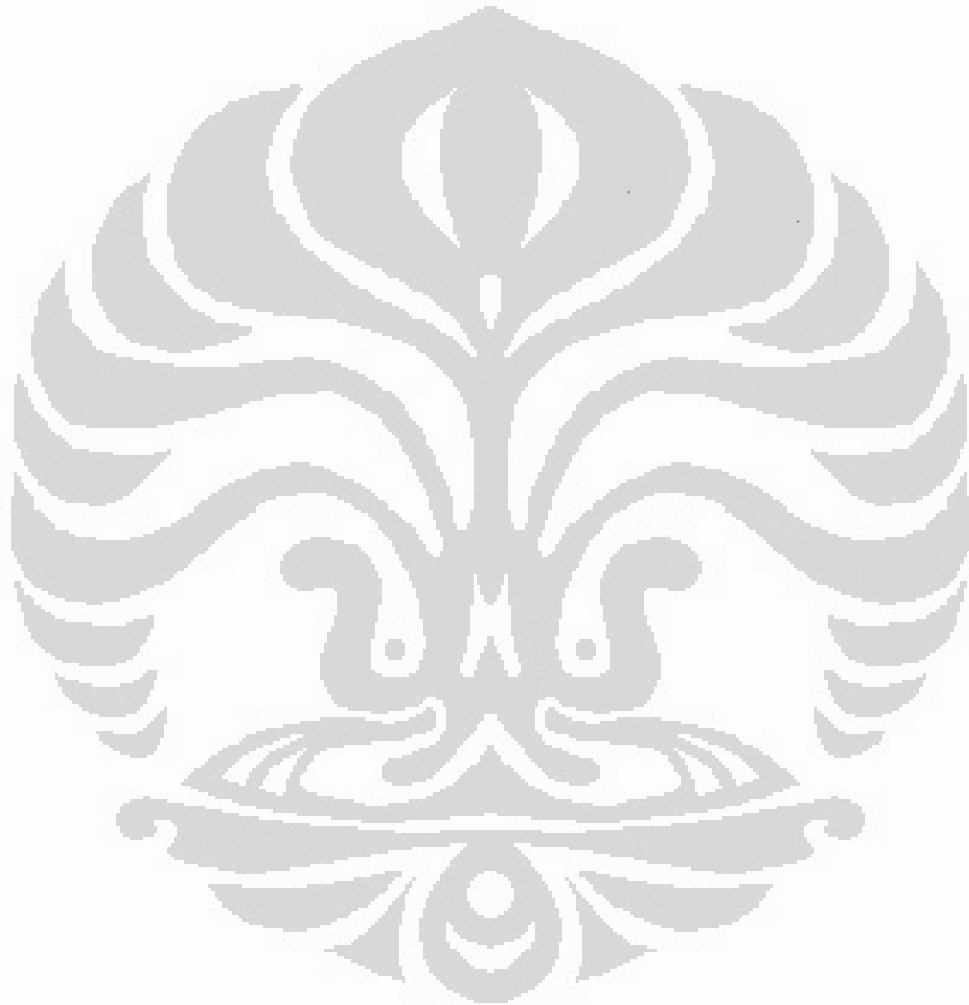
^a source from WHO (1998)

* nutrient requirements of complementary foods with average breastmilk intake (energy limit= 300kcal)



Appendix 2

GUIDELINE FOR AUTHOR



JN THE JOURNAL OF NUTRITION

MANUSCRIPT PREPARATION

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See links below under "Manuscript Preparation" to view sample files for a submitted manuscript, tables, figures, and an editorial checklist.

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- Use only standard abbreviations.
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- A) Title Page
 - B) Abstract Page
 - C) Introduction
 - D) Materials and Methods
 - E) Results and Discussion
 - F) Literature Cited
 - G) Acknowledgement
 - H) Statement of Authors' Contributions to Manuscript
 - I) Required forms
-

A) TITLE PAGE: The title page must include:

1. The title should be composed as a single declarative statement. The title should be focused on the results presented in the manuscript. Please do not use a colon or semicolon in the title. Please keep the title as generally applicable as possible. It usually is not necessary to include the exact study location or a specific study name in the title, as this information can be included in the abstract.
2. The names of all authors (first name, middle initial, last name) including their departmental and institutional addresses. Indicate which authors are associated with which institutions by numbered footnotes. Identify a corresponding author and provide a complete mailing address, telephone number, fax number, and email address. Please note that all authors' names should appear on the manuscript exactly as they should appear in PubMed if the paper is published. ASN will not replace files to correct author names once published.
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7. Whether supplementary online material has been submitted.
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9. Footnotes to the title disclosing: (a) all sources of financial support; (b) all potential conflicts of interest; (c) the existence of online supporting material, if appropriate (see section on Online Supporting Material).

Conflict of Interest and Funding Disclosure: Any existing financial arrangements between an author and a company whose product figures prominently in the submitted manuscript or between the author and any company or organization sponsoring the research reported in the submitted manuscript should be brought to the attention of the Editor in the cover

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Individuals who are asked to review a manuscript should decline the solicitation if they have a conflict of interest. Detailed guidelines on conflicts of interest for reviewers can be found at ASN Journals Conflict of Interest Guidelines.

B) ABSTRACT PAGE: The abstract must be a single unstructured paragraph of no more than 250 words summarizing the relevant problem addressed by the study and the theory or hypothesis that guided the research. The abstract should include the study design/methodology and clear statements of the results, conclusions and importance of the findings.

C) INTRODUCTION: Background to the research conducted and specific objectives should be clearly indicated. This should not be a comprehensive review of the literature, however.

D) MATERIALS AND METHODS: Documentation of methods and materials used should be sufficient to permit replication of the research. State the source of specialized materials, diets, chemicals, and instruments and other equipment, with model or catalog numbers, where appropriate. Specify kits, analyzers, and commercial laboratories used. Cite references for methods whenever possible and briefly explain any modifications made.

HUMAN AND ANIMAL RESEARCH. Reports of human studies must include a statement that the protocol was approved by the appropriate institutional committee or that it complied with the Helsinki Declaration as revised in 1983. When preparing reports of randomized, clinical trials, authors should refer to the checklist published in the CONSORT Statement and should include as online supporting material a trial profile summarizing participant flow (2). Include in Methods the sizes (n) of initial (recruited, enrolled) and final groups. Research on animals should include a statement that the protocol was approved by the appropriate committee or complied with the Guide for the Care and Use of Laboratory Animals (3). Describe how animals were killed. Describe control and experimental subjects giving age, weight, sex, race, and for animals, breed or strain. Include the supplier of experimental animals.

DIETS. Composition of control and experimental diets must be presented. When a diet composition is published for the first time in *The Journal of Nutrition*, utilize a table or a footnote to provide complete information on all components. If previously described in *The Journal of Nutrition* or *The American Journal of Clinical Nutrition*, a literature citation may be used. State specifically any modifications made to the published diet compositions.

The proximate composition of closed formula diets should be given as amounts of protein, energy, fat, and fiber. Components should be expressed as g/kg diet. Vitamin and mineral mixture compositions should be included using *Journal of Nutrition* units and nomenclature. For a discussion of the formulation of purified animal diets, refer to Baker (4) and to a series of ASN publications (5–8).

STATISTICAL METHODS. Describe all statistical tests utilized and indicate the probability level (P) at which differences were considered significant. If data are presented in the text, state what they represent (e.g. means \pm SEM). Indicate whether data were transformed before analysis. Specify any statistical computer programs used.

Present the results of the statistical analysis of data in the body of each and on figures per se. Use letters or symbols to indicate significant differences; define these in a table footnote or the figure legend. Provide the appropriate statistics of variability. An estimate of the error variance (SD or SEM) of group means should be displayed in figures. Standard ANOVA methodology assumes a homogeneous variance. If error variance is tested and found to be heterogeneous, data should be transformed before ANOVA, or nonparametric tests should be used. For a discussion of variability calculations and curve-fitting procedures, see Baker (4).

E) RESULTS AND DISCUSSION Report the results of the study. Discuss the significance of the findings, interpret the results and conclusions.

F) LITERATURE CITED The *Journal of Nutrition* reference format will be modified to be consistent with the International Committee of Medical Journal Editors (ICMJE) recommended format for bibliographic citations with the following exception: references should include the names of all authors, unless there are more than ten, in which case list the first nine plus "et al." There is no limit on the number of citations allowed; recent literature should be comprehensively cited. The list of references must begin on a new page and should include the heading "Literature Cited." Abbreviate journal names according to the National Library of Medicine (NLM) journal abbreviations list. References should be numbered consecutively in the order in which they are first mentioned in the text.

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Recognized headings include the following:

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Reference List
Literature Cited
References and further reading
Bibliography
Literature

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H) STATEMENT OF AUTHORS' CONTRIBUTIONS TO MANUSCRIPT. Effective July 1, 2009, authors must indicate their contribution(s) to the manuscript in the Acknowledgments section. Use the descriptors listed below unless the author performed a function that clearly is not covered by one of these. While not all manuscripts will necessarily include all descriptors, all manuscripts, including reviews, must indicate who is responsible for design, writing, and final content.

1. designed research (project conception, development of overall research plan, and study oversight.)
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7. other (use only if categories above are not applicable; describe briefly) .
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Please do not include "obtained funding" (the initials of authors who received grants may be included in the footnote regarding Support).

An example is: A. X., R. F. G., and P. G. Y. designed research; R.F. G. and Q. C. conducted research; P. T. analyzed data; A. X., P. G. Y. and Q. C. wrote the paper. P. G. Y. had primary responsibility for final content. All authors read and approved the final manuscript.

1) Required forms

UNITS OF MEASURE. Most measurements must conform to *le Systeme Internationale d'Unites* (SI) (9). The metric system and the Celsius scale ($^{\circ}$ C) must be used. Concentrations should be expressed on a molar basis. Except for diet composition, convert to substance concentration, e.g., mol/L. The denominator should be L. Do not use *M*, *mM*, *N*, etc. Use one of three acceptable options to express measurements. (a) Use SI units exclusively. (b) Use SI units and, if appropriate, provide conventional units parenthetically in the text and give conversion factors in table footnotes and figure legends. (c) Use conventional units, if appropriate, and provide SI units parenthetically in the text and give conversion factors in table footnotes and figure legends. Units should not be pluralized. Useful websites are:

- SI conversions: <http://www.onlineconversion.com/>
- SI conversions: http://en.wikipedia.org/wiki/Conversion_of_units
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ABBREVIATIONS. Use only standard abbreviations. Table 2 is an abridged list of abbreviations that may be used without definition in *Journal of Nutrition* articles. Other standard abbreviations are listed in *Scientific Style and Format* (1).

Full gene names are not required for tables and figures in which a database identifier number is given. A full citation to the database should be in Literature Cited and the reference number provided in the figure legend or table footnote. If the genes are listed in online supporting material (supplemental tables and figures), the citation can be given as a table footnote or in the figure legend [e.g. National Center for Biotechnology Information (NCBI) Entrez Gene (<http://www.ncbi.nlm.nih.gov/sites/entrez?db=gene>) or Unigene (<http://www.ncbi.nlm.nih.gov/unigene>).]

For genes that are discussed in some detail in the text, either the full name of the gene or a word description of the functional activity that helps identify it should be provided for clarity and the abbreviation should be included in the manuscript's abbreviation footnote.

If there are three or more abbreviations defined in the text, define each the first time it is used in the text and prepare an abbreviation footnote. The footnote should be associated with the first abbreviated term in the text and should be an alphabetized listing of all author-defined abbreviations and their definitions. Abbreviations should not be followed by a period and should not be pluralized (e.g. AA should represent both "amino acid" and "amino acids"). Use the verb (e.g. "is" or "are") that is consistent with the context in which the abbreviation is used in the sentence. Units and statistical terms also should not be followed by a period or pluralized. Use the standard abbreviations for SI prefixes found in Young (9) and in Table 3 and those for units of measure in Table 4. Abbreviations used only in tables and figures must be separately defined in the footnotes or legend for each table or figure. Abbreviations that are in the abbreviation footnote should not be redefined in table footnotes or figure legends.

NOMENCLATURE. Chemical and biochemical terms and abbreviations and identification of enzymes must conform to the recommended usage of the International Union of Biochemistry and Molecular Biology (10). Names for vitamins, related compounds, and abbreviations for amino acids should follow the ASN nomenclature policy (11,12).

Appendix 3

DETAILED RESULTS

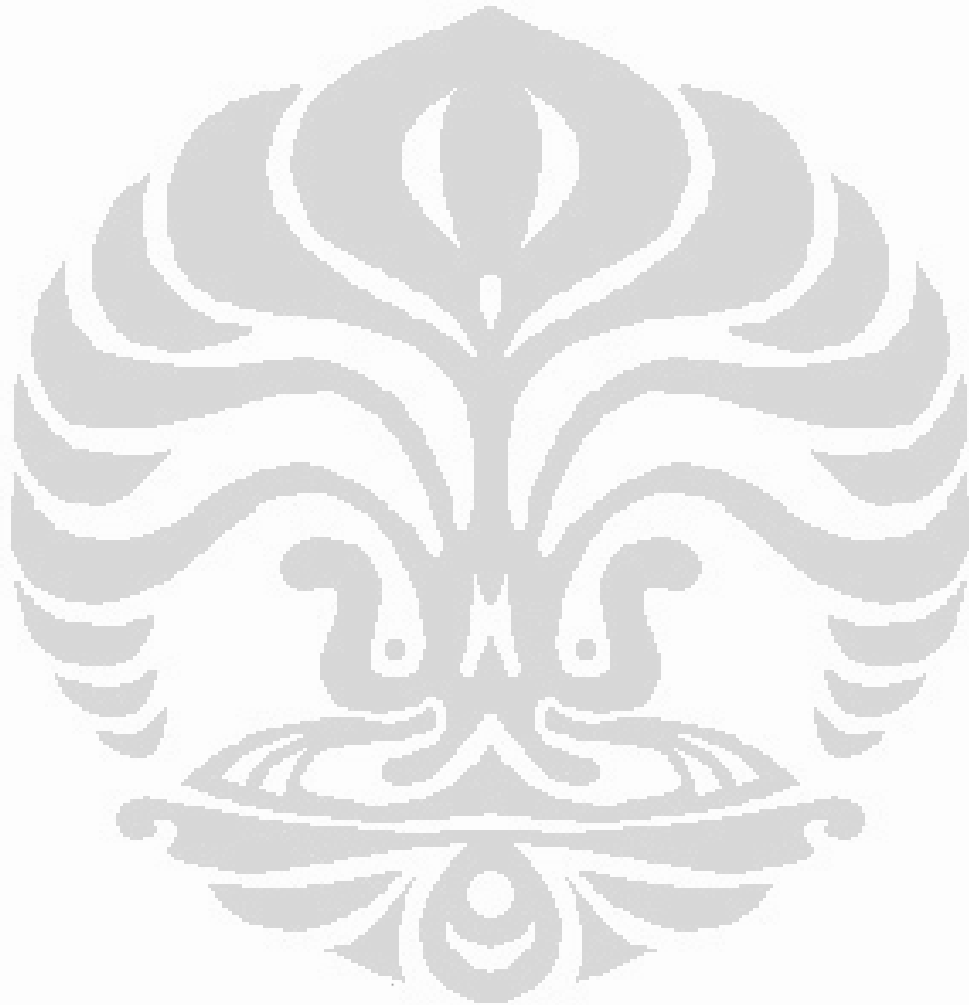


Table 1. Detailed number of respondents join in the exploration part

Activity	n			
	Far-market hamlets		Near-market hamlets	
	Sukamulya	Sanggar	Dusun Pernek	Bubur gadong
Group interview with caregivers	4	2	6	6
Group interview with cadres	2	4	6	3
1 st recipe trial	NA	NA	6	NA
2 nd recipe trial	4	NA	6	NA

Table 2. Detailed number of respondents in the HH/ acceptability trial

Activity	n					
	Far-market hamlets ^a			Near-market hamlets ^a		
	A	B	C	D	E	F
Acceptability trial	2	2	1	4	1	2

^a name of the hamlets. A=Kerumut, B=Mudung barat, C=Mudung timur, D=Gubuk motong, E=Dasan bagek gaek, F=Dasan kedok daye

Detailed results

Table 3. Food list and weekly frequency of animal protein source foods

FOOD GROUP	FOOD ITEM	PORTION (gram)				WEEKLY FREQUENCY	
		I	II	III	IV	Average portion	Minimum Maximum
Animal protein	meatball	15	5	12.7	11.75	11.1	1 14
	chicken egg	13	48	42	20.75	30.9	1 7
	beef	0	0	13.3	11	12.2	2 6
	liver	10	0	15	4	9.7	1 9
	fish	25	9	5	9	12.0	2 15
	anchovy	5	0	3.7	3.5	4.1	1 21
	quail egg	42	16.5	25.7	12	24.1	1 14
	chicken egg yolk	0	13	7	0	10.0	3 21
	quail egg yolk	0	0	7	0	7.0	0 7
	fried chicken	0	0	23	7	15.0	1 21
	fried fish	6.5	6	11.8	10	8.6	1 21
	Small fish	16.7	2	21	0	13.2	1 9
	chicken egg fried	0	19.5	24.5	12.5	18.8	1 14
	duck egg	0	0	26	0	26.0	1 1.5
	duck egg yolk	0	0	5	0	5.0	1 8

I= far-market hamlet (sukamulya, n=4), II= far-market hamlet (sanggar, n=2),
 III= near-market hamlet (pernek, n=6), IV= near-market hamlet (bbigadong,
 n=6)

Table 4. Food list identified by both methods and the frequency categorization for each food (Harper, 2006)

Food	9-11 mo		Food	9-11 mo	
	RNS ^b	QN ^c		RNS ^b	QN ^c
Staple			Fruit		
rice flour	B	B	Apple (s)	B	C
rice flour porridge (MoH)	A	C	Coconut flesh (s)	B	B
purchased baby porridge	B	C	Papaya (s)	B	C
mixed rice porridge	A	B	Fried banana (s)	C	C
rice	A	A	Banana (s)	A	A
noodles	B	B	Orange	D	D
bread	D	C	Rambutan (s)	D	B
			Salak (s)	D	B
			Sawo (s)	C	D
Plant protein			Miscellaneous		
Mungbean porridge	A	C	Coconut oil	B	B
Peanut	C	B	Salt	A	A
Soybean	C	C	Sugar	B	B
Tofu	B	A	Biscuit (s)	A	A
Tempe	B	C	Crackers (s)	B	A
Mungbean	B	D	Cake (s)	D	B
Animal protein			Wheat snacks (s)	D	A
Meatball	B	A	Other snacks (s)	D	C
Beef	B	C	Tea	D	B
Liver	B	D	Jelly (s)	D	B
Fish	B	B			
Anchovy	C	C			
Chicken egg	B	A			
Quail egg	B	C			
Vegetables					
Carrots	B	C			
Boiled corn	C	B			
Green beans	B	B			
Potato	B	C			
Mustard greens	B	B			
Spinach	B	A			
Sweet potato	C	C			
Cassava	C	B			
Cucumber	D	D			
tomato	C	D			

^a RNS = rapid non survey, estimates from focus groups (GI); QN = rapid assessment tool using weighed diet record; QN food list excluded any foods consumed by <2 infants over the two days of measurement; (s) = food consumed as a snack

^b A = food is often consumed (>7 times a week); B = food is sometimes consumed (3-4 times/month); C = food is rarely consumed (<2 times/month); D = food not identified/not consumed

^c A = food consumed by > 20% of study population, B = food consumed by 11-20%; C = <10%; D = not consumed

^d MoH = Indonesian ministry of health instant porridge

Table 5. Food price list per 100 gram based on market survey in 2010 and 2005

Food item	Food price in markets (2010)* (IDR)				Average price per 100gr (2010)* (IDR)	Average price per 100gr (2005) (IDR)
	A	Pgd	Pby	L		
Cereal Staple						
rice	600	600	600	600	600	
noodles	1,736	2,344	1,736		1,939	1,425
rice flour			911	900	905	500
Sticky rice			1,100	950	1025	
<i>talas</i>			244		244	
Plant protein						
peanut		1,190	1,400	1,400	1,330	700
Tofu	625	680		676	660	475
soybean		962	800	750	837	600
tempe	600	712	698	606	654	
mungbean		1,064	2,000	1,300	1,455	
Animal protein						
chicken egg	1,333	1,333	1,389	1,500	1,389	3,575
Beef	7,000	7,200	7,000	7,000	7,050	3,300
chicken liver	1,852	1,543	1,852	2,500	1,862	3,300
anchovy	5,000	5,000	4,505	6,000	5,126	2,900
Quail egg	2,500	2,857	2,778		2,712	1,275
Tuna fish	1,250	1,058		1,285	1,198	1,150
Flying fish		1,136		1,232	1,184	
cucut fish		970			970	
Wet anchovy	833	775	833		814	
chicken	2,800	2,500	2,500	2,400	2,550	
Crab		4,000	4,000		4,000	
beef liver		7,200		7,000	7,100	3,906
Duck egg		2,500	2,500		2,500	3,875
Vegetables						
spinach		177		106	141	175
carrots	700	1,176		900	925	650
Corn				10,000	10,000	
potato		943		1,100	1,022	
sweet potato		227			227	
cassava		154	200		177	125
cucumber		122	250	108	160	
tomato		893	1,190	1,000	1028	450
Long bean		243	266		254	100
Green beans	600	629		400	543	
<i>Kelor</i>		260	291	161	237	175
<i>katuk</i>		538	543		541	225
cassava leaves		224		220	222	175
komak		321	231		276	

Table 5. Continue

Food item	Food price in markets (2010)* (IDR)				Average price per 100gr (2010)* (IDR)	Average price per 100gr (2005) (IDR)
	A	Pgd	Pby	L		
Fruits						
banana		266	362	373	334	
apple	750		1,500	800	1,017	675
coconut flesh			2,000		2,000	
<i>salak</i>	350	500	545	600	499	845
<i>rambutan</i>	500		600	700	600	744
mango			500		500	
coconut		1,000			1000	
avocado		600	417		508	
manggis		900	1,200	1,000	1033	
srikaya			921	1,000	960	
grape		1,000	1,200	1,500	1233	
pineapple			500		500	
orange		800	700	800	767	
Miscellaneous						
coconut oil			1,000	1,000	1000	600
salt			392	392	392	300
sugar		1,200	1,200	1,150	1183	300
palm sugar		965	1,000		983	
flour	600	600	600	600	600	
cassava flour		600	600	600	600	

* Average from four markets in East Lombok; * A=Aptaik, Pgd=Pohgading, Pby=Pringgabaya, L=Labuan Lombok

Table 6. Nutrient content per 100 gram of foods and per energy limit (300kcal) available in the market

Food items	Energy (kcal)	Fe (mg)	Fe (mg/300kcal)	Ca (mg)	Ca (mg/300kcal)	Zn (mg)	Zn (mg/300kcal)
Cereal Staple							
rice	360.9	0.6	0.5	8	6.7	1.1	0.9
noodles	480.4	1.7	1.1	21	13.1	0.5	0.3
rice flour	360.9	0.6	0.5	8	6.7	1.1	0.9
purchased baby porridge	45.9	0.8	5.2	77	503.3	0.4	2.6
beras ketan	360.9	0.6	0.5	8	6.7	1.1	0.9
talas	112.1	0.9	2.4	9	24.1	0.6	1.6
Plant protein							
peanut	566.9	4.6	2.4	92	48.7	3.3	1.7
tofu	76	5.4	21.3	105	414.5	0.8	3.2
soybean	361.1	6.4	5.3	371	308.2	2.3	1.9
tempe	199.1	2.3	3.5	93	140.1	1.8	2.7
mungbean	115.9	2.5	6.5	24	62.1	1.3	3.4
Animal protein							
meatball	194.1	0.7	1.1	8	12.4	0.5	0.8
chicken egg	155.1	1.2	2.3	50	96.7	1.1	2.1
beef	268.9	1.7	1.9	4	4.5	4.1	4.6
chicken liver	157	8.5	16.2	14	26.8	4.3	8.2
anchovy	335.1	2.5	2.2	1700	1521.9	5.2	4.7
quail egg	185	3.9	6.3	64	103.8	1.4	2.3
tongkol fish	110.9	0.7	1.9	17	46.0	0.6	1.6
layang fish	82	0.4	1.5	11	40.2	0.5	1.8
ikan teri segar	112.1	0.9	2.4	48	128.5	0.4	1.1
chicken	284.9	1.4	1.5	13	13.7	1.8	1.9
crab	79.1	2.5	9.5	31	117.6	1.3	4.9
beef liver	161.1	6.8	12.7	7	13.0	6.1	11.4
duck egg	185	3.9	6.3	64	103.8	1.4	2.3
Vegetables							
spinach	37	3.1	25.1	211	1710.8	0.4	3.2
carrots	44.9	0.6	4.0	31	207.1	0.3	2.0
corn	108	0.6	1.7	2	5.6	0.5	1.4
potato	93	0.4	1.3	5	16.1	0.3	1.0
sweet potato (purple)	112.1	0.9	2.4	9	24.1	0.6	1.6
sweet potato (yellow)	102.1	0.8	2.4	11	32.3	0.5	1.5
cassava	131	0.8	1.8	19	43.5	0.3	0.7
cucumber	12.9	0.3	7.0	14	325.6	0.2	4.7
tomato	21	0.5	7.1	5	71.4	0.1	1.4
long bean	34.9	1.3	11.2	46	395.4	0.4	3.4
green beans	34.9	1.3	11.2	46	395.4	0.4	3.4
kelor	60	2.3	11.5	151	755.0	0.5	2.5
katuk	60	2.3	11.5	151	755.0	0.5	2.5
cassava leaves	37	3.1	25.1	211	1710.8	0.4	3.2

Table 6. Continued

Food items	Energy (kcal)	Fe (mg)	Fe (mg/300kcal)	Ca (mg)	Ca (mg/300kcal)	Zn (mg)	Zn (mg/300kcal)
Fruit							
banana (<i>pisang hijau</i>)	115.9	0.6	1.6	2	5.2	0.1	0.3
apple (<i>apel</i>)	59	0.2	1.0	7	35.6	0	0.0
coconut flesh	70	0	0.0	0	0.0	0	0.0
papaya	39	0.1	0.8	24	184.6	0.1	0.8
salak	82	0.2	0.7	7	25.6	0	0.0
rambutan	49	0.4	2.4	7	42.9	0.1	0.6
mango (<i>mangga masak</i>)	65	0.1	0.5	10	46.2	0	0.0
avocado	161.1	1	1.9	11	20.5	0.4	0.7
manggis	59	0.2	1.0	7	35.6	0	0.0
srikaya	79.1	0.5	1.9	21	79.6	0.1	0.4
grape (<i>anggur hulan</i>)	30.1	0.1	1.0	4	39.9	0	0.0
pineapple	49	0.4	2.4	7	42.9	0.1	0.6
orange (<i>jeruk manis</i>)	47.1	0.1	0.6	40	254.8	0.1	0.6
Miscellaneous							
coconut oil	862.1	0	0.0	6	2.1	0	0.0
biskuat coklat energy	460.8	5.2	3.4	500	325.5	7	4.6
biskuat susu	487.6	6.2	3.8	286	176.0	13.3	8.2
jelly	158.9	2.9	5.5	168	317.2	1.2	2.3
flour	364	1.2	1.0	15	12.4	0.7	0.6
cassava flour	381	0.5	0.4	2	1.6	0.1	0.1

Values in shaded cells are higher than the required amount recommended per 300 kcal (WHO, 1998 pp. 103-105)

Table 7. Characteristics of informant in 1st recipe trial

No	Group	Child's age (month)	Feeding type
1	A	9	Breastfeeding and CF
2	A	10	Breastfeeding and CF
3	B	11	Breastfeeding and CF
4	B	10	Breastfeeding and CF
5	C	9	Breastfeeding and CF
6	C	11	Breastfeeding and CF

Table 8. Recipe identified and it's ingredients

Ingredients	Amount used (gr)
Group A	
<i>Sayur bening</i>	
Long bean	93
Spinach	87
Water	826
Masako	
Salt	
Nutrient content per 100 gr : E= 3.85 kkal, P= 0.29 gr, Ca=24.92 mg, Fe= 0.62 mg, Zn= 0.04 mg	
<i>Mix rice porridge A</i>	
Rice	70
Potato	38
Chicken liver	11
Water	526
Nutrient content per 100 gr : E= 47.32 kkal, P= 1.26 gr, Ca=1.4 mg, Fe= 0.23 mg, Zn= 0.22 mg	
<i>Mungbean flour porridge</i>	
Mungbean flour	51
Rice flour	28
Coconut milk	280
Palm sugar	162
Salt	
Nutrient content per 100 gr : E= 173.38 kkal, P= 1.27 gr, Ca=30.56 mg, Fe= 1.11 mg, Zn= 0.33 mg	

Table 8. continue

Ingredients	Amount used (gr)
Group B	
<i>Mix rice porridge B</i>	
Rice	56
Chicken liver	20
Anchovy	16
Tofu	40
Tempe	55
Carrot	44
Potato	38
Spinach	7
Cassava leaves	18
<i>Kangkung</i>	14
Tomato	65
Margarine	9
Salt	38
Water	620
Nutrient content per 100 gr : E= 52.94 kkal, P= 3.33 gr, Ca=45.12 mg, Fe= 0.76 mg, Zn= 0.38 mg	
<i>Biscuit pudding</i>	
Jelly "Hallow"	7
Sweet condense milk	42
Sugar	6
Biscuit	8
Water	160
Nutrient content per 100 gr : E= 187.35 kkal, P= 8.83 gr, Ca=152.11 mg, Fe= 2.74 mg, Zn= 1.17 mg	
Group C	
<i>Cap cay</i>	
Tofu	38
Meatball	45
Carrot	17
Green beans	30
Potato	29
Spinach	37
Water	316
Nutrient content per 100 gr : E= 42.27 kkal, P= 3.03 gr, Ca=30.06 mg, Fe= 1.09 mg, Zn= 0.43 mg	
<i>Banana pudding</i>	
Jelly "Hallow"	7
Banana	38
Margarine Blue band	8
Sugar	8
Water	158
Nutrient content per 100 gr : E= 60.18 kkal, P= 0.14 gr, Ca=0.73 mg, Fe= 0.09 mg, Zn= 0.05 mg	

Detailed results

Table 9. Response of the recipe's by the mothers in 1st recipe trial

Recipe's	Response					Order		
	Serving size & no. of meals	Consistency	Taste	Response of child	Time needed		Ingredients (why it is used and when)	Method (why it is used)
Sayur bening	2-3 spoonful each eat, 3 times a day	It need to be mashed before it	Child like it, the favourite were spinach	Child's eat a lot	10 minutes	Child likes it	To make it well done	Spinach are cooked 3 minutes after the long bean
Mix rice porridge A	3-4 spoonful, 3 times a day	Suitable for the babies, easy to consumed	The babies like it	Babies like it	15 minutes	Rice and potato used so the child can full, chicken liver and potato used because it can make the taste good	It can make the rice soften and good for child	Rice were cooked first and then put the chicken liver and potato. While cooking the rice and potato were mashed
Mungbean flour porridge	52 gr (one little bowl), 1 a day	Suitable for the babies	Some problems happen, it become bitter, maybe because the mungbean flour were mix with coffee	Babies not really like it, usually he can eat twice	15 minutes	Child like the mungbean	Flour are used so it will easily eat by the babies	Cooked the coconut milk and then put the palm sugar and salt, then put the mungbean flour and the last was put the rice flour

Detailed results

Table 9. Continue

Recipe's	Response							
	Serving size & no. of meals	Consistency	Taste	Response of child	Time needed	Ingredients (why it is used and when)	Method (why it is used)	Order
Mix rice porridge B	One portion is 72 gr. 3 times a day. 3 times a week	Most like by the babies, the rice were not to hard and easy to eat	Like by the babies because it's not hot and not too sweet	Babies like it, eat a lot	30 minutes	<p>Rice So the child can full fast Chicken liver Nutritious Anchovy Mother want to try because never try to cook with anchovy before Tofu Child like it Tempe Child like it Carrot Always use when made the porridge Potato Always use when made the porridge Spinach As the vegetables, nutritious and delicious Cassava leaves Nutritious and child likes it Kangkung Nutritious Tomato Nutritious and child likes it Blue band To make the taste good</p>	To make it soft and good for the child	Rice cooked first and put the carrot, potato, kangkung, cassava leave, tofu, tempe, chicken liver, blue band, tomato, anchovy and the last was spinach

Detailed results

Table 9. Continue

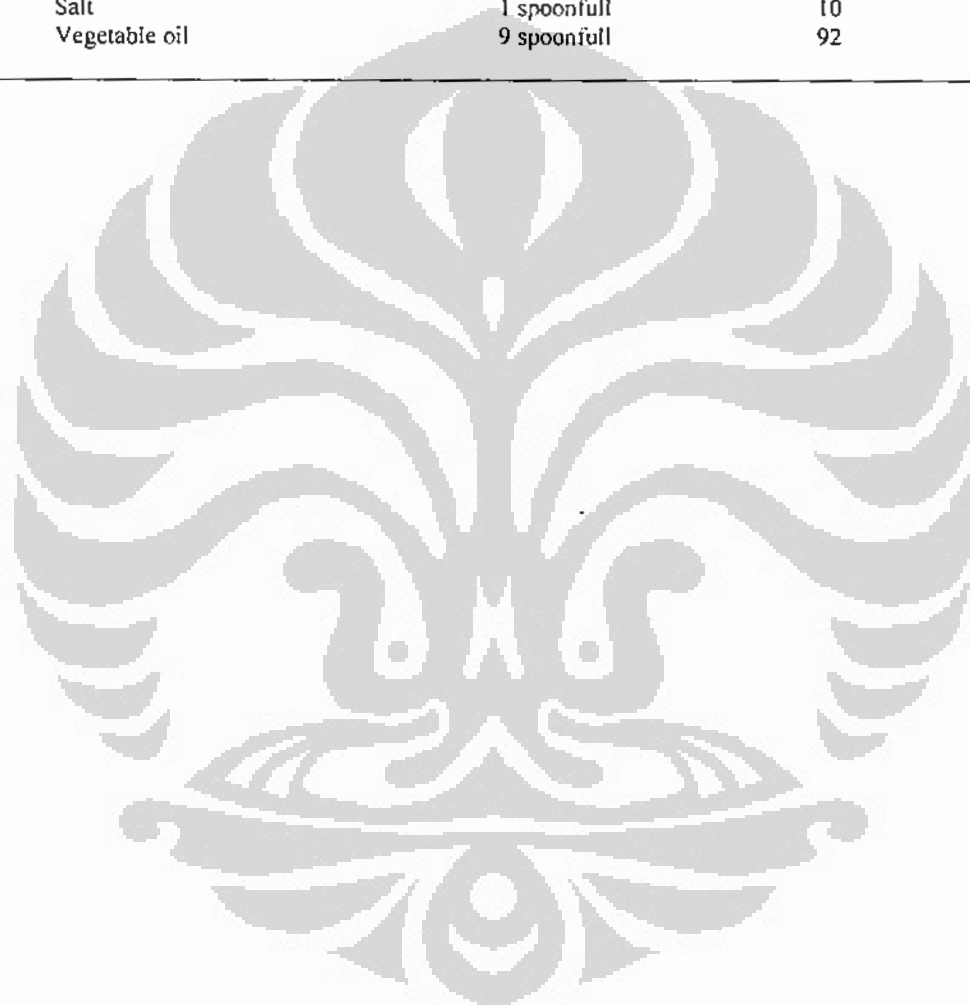
Recipe's	Serving size & no. of meals	Consistency	Taste	Response of child	Time needed	Ingredients (why it is used and when)	Method (why it is used)	Order
Biscuit pudding	4-5 spoonful, 1 times a day, 2 times a week	Not too soft and not too hard/solid	Not too sweet	The babies very like it	10 minutes	Jelly As the main ingredient of the pudding Sugar To make it sweet Milk To make it nutritious Biscuit As the additional ingredients	Like usual cooking method when make pudding	Mix the jelly with sugar and add the water and milk, after it done put the biscuit below it
Cap cay	2-3 spoonful, 3 times a day	On average not too soft	On average not too sweet and tasty	The babies really like with the recipe	10 minutes	Tofu To make the taste good and child like Mentballs Child likes it Blue band To make it more tasty Spinach Child likes it Jelly	It can mix many ingredients, not really need much time and taste good	Carrot → green beans → potato → tofu + mealballs → spinach
Banana pudding	6-7 spoonfull, 1 times a day	Suitable for the babies	Mix with banana taste	Childs like it	10 minutes	As the main ingredients of the pudding Banana To make it more attractive and child's like it	Like usual	Jelly+sugar → put the water and blue band → after it cooked put the banana below it

Table 10. Nutrient-dense recipes tested in 2nd recipe trial

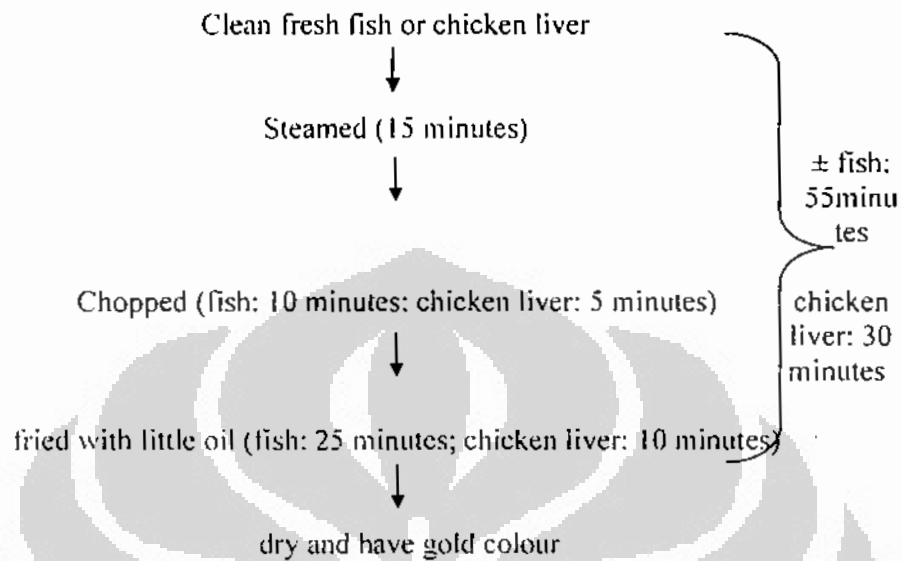
No	Ingredients	Amount used	
		HH measure	Gram
1	<i>Cup cay</i>		
	Quail egg	8 pieces	93
	Meat balls	6 medium pieces	57
	Tofu	4 med pieces	153
	Carrot	3 average	67
	Potato	1 average	60
	Green beans	4 pieces	45
	Spinach	1 bowl	52
	Tomato	2 average	56
	Celery	1 spoonfull	2
	Onion	8 pieces	27
	Garlic	3 pieces	10
	Masako	½ spoonful	5
	Onion Leaves	1 spoonfull	10
	Salt	1 spoonfull	10
Vegetable oil	5 spoonfull	50	
2	<i>Anchovy powder</i>		
	Anchovy		100
	Vegetable oil		
3	<i>Chicken liver abon</i>		
	Chicken liver	3 pair	86
	Garlic	2.5 pieces	9
	Coriander	¼ spoonful	3
	Onion	3 pieces	9
	Lengkuas	1 small pieces	3
	Ginger	1 small pecces	1
	Sugar	2 spoonfull	20
	Salt	1 spoonfull	10
	Vegetable oil	2 spoonfull	21
	4	<i>Fish meatball</i>	
Layang Fish		1 pieces	181
Cassava flour		3 spoonfull	37
Flour		1 spoonfull	10
Garlic		2 pieces	8
Onion		4 pieces	12
Pepper	7 pieces		
5	<i>Tongkol Fish abon</i>		
	Tongkol fish	2 pieces	175
	Garlic	3 pieces	12
	Coriander	¼ spoonfull	3
	Onion	4 pieces	12
	Lengkuas	1 small pieces	5
	Ginger	1 small pieces	3
	Sugar	2 spoonfull	20
	Salt	1 spoonfull	10
Vegetable oil	3 spoonfull	35	

Table 10. Continue

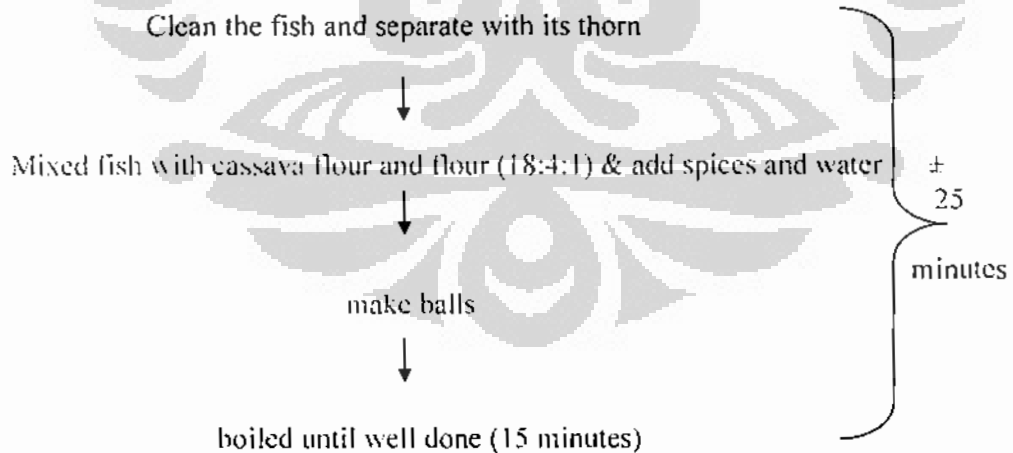
No	Ingredients	Amount used	
		HH measure	Gram
6	<i>Cucut Fish abon</i>		
	Cucut fish	1 pieces	474
	Garlic	4 pieces	18
	Coriander	¼ spoonfull	3
	Onion	5 pieces	15
	Lengkuas	1 small pieces	5
	Ginger	1 small pieces	3
	Sugar	2 spoonfull	20
	Salt	1 spoonfull	10
	Vegetable oil	9 spoonfull	92



FLOW OF ABON COOKING PROCESS



FLOW OF FISH MEATBALLS COOKING PROCESS



TRIAL OF IMPROVED PRACTICED (TIPs)

INITIAL VISIT

Table 11. Number of respondent based on breastfeeding practice

Practices	Total (n=12)
Currently breastfed, n	
Yes	12
Colostrum given, n	
Yes	12
Early initiation, n	
Immediately	6
> 1 hour	4
> 1 day	2
Way of breastfeeding, n	
On demand	12
Exclusive breastfeeding for 6 month, n	
Yes	5
Breastfeeding during illness, n	
Yes	12

Table 12. Number of respondent based on complementary feeding practice

Practices	Total (n =12)
Responsive feeding, n	
Feeding while playing	8
Feeding while carrying	9
Give favourite food	10
Persuade child	7
Other, give vitamin	2
Feeding situation, n	
Child sit (in chair or in mother's hold)	3
Child can move freely	9
Food taboo (prohibited consumed), n	
Pindang ikan,	2
Ice	1
Anchovy	1
Reason of food taboo, n	
Allergy	1
Habit	1
Food that often give for the babies, n	
Biscuit	4
Fruits	1
Rice porridge	3
Instant porridge	1

Table 12. Continue

Practices	Total (n =12)
Egg	3
Fish	1
Noodle	1
Meatball	1
Mungbean porridge	1
Tofu	1
“Good food” for babies, n	
Biscuit	2
Rice/rice porridge	3
Tofu/tempe	1
Egg	2
Breastmilk	1
Instant porridge	2
Food without preservative	1
All food	1
Appetite on last 1 week, n	
Good	5
Usual	7

Table 13. Number of respondents based on hygiene practices

Variables	Total (n=12)
Washing hands, n	
When dirty	8
Before preparing food	6
Before feeding child	6
After defecating	8
After cleaning the child	1
Washing the cooking tools, n	
After it is used	10
If it's dirty	7

Table 14. Number of respondents based on housing sanitation

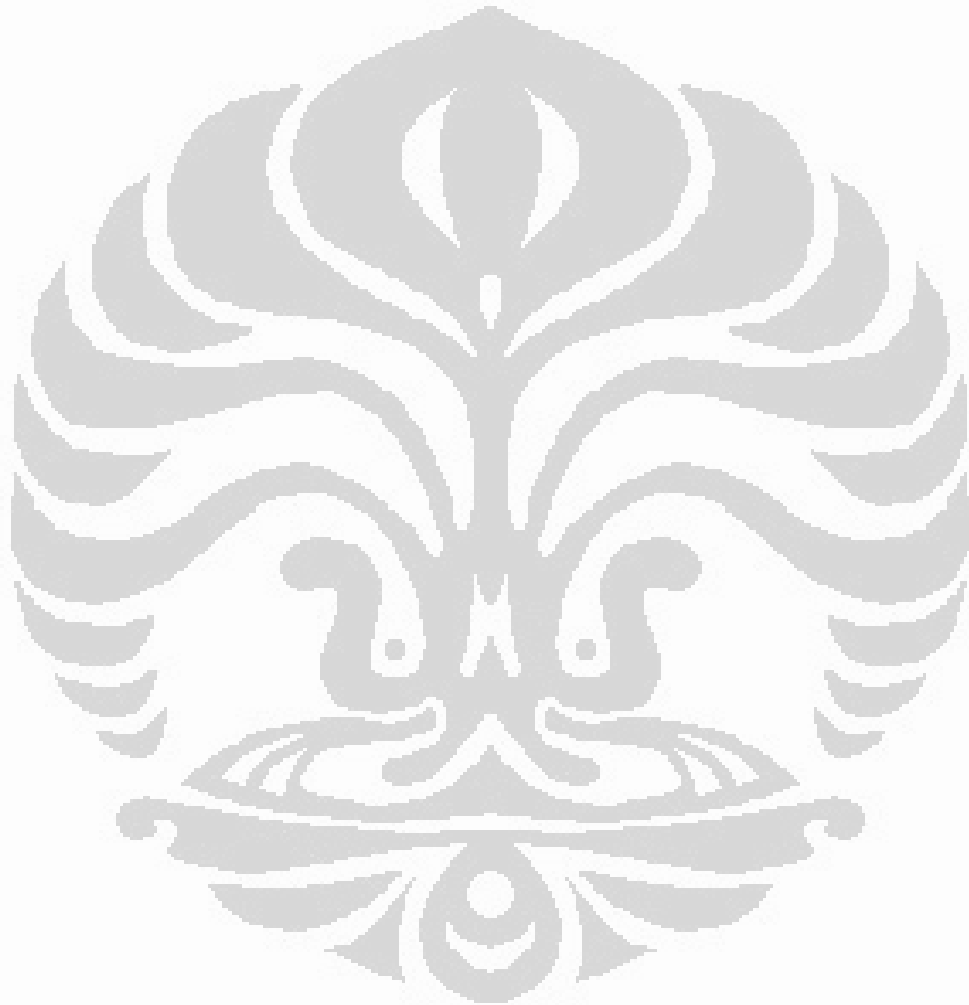
Variables	Total (n=12)
Source of clean water, n	
Opened well	8
Closed well	4
Housing condition, n	
Adequate ventilation	12
Adequate light	10
Permanent floor material	12
Permanent wall material	12
Permanent roof material	12
Availability of latrine	
Latrine with septic tank	8
Latrine without septic tank	1
No latrine	3
Availability of permanent household drainage	5
Distance between drinking water source and septic tank ≥ 10m	4

FOLLOW UP VISIT

Table 15. CF practices before and after follow up visit

VARIABLE	9-11 month (n=12)	
	Before	After
Frequency of meals a day, <i>median(min-max)</i>	3 (2-4)	3 (3-10)
Frequency of snacks a day	1.5 (0-4)	2.5 (1-6)
Responsive feeding, n		
Feeding while playing	8	4
Feeding while carrying	9	4
Give favourite food	10	1
Persuade child	7	2
Other, give vitamin	2	1
Hygiene practice		
Washing hands, n		
When dirty	8	10
Before preparing foods	6	3
Before feeding child	6	9
After defecating	8	8
After cleaning the child	1	2

QUESTIONNAIRES



**GUIDELINE QUESTIONS OF GI WITH CADRES
GIC.2**

- What type of foods (foods and drinks) and preparation usually given by the caregivers to the infants age 9-11 mo in this area?

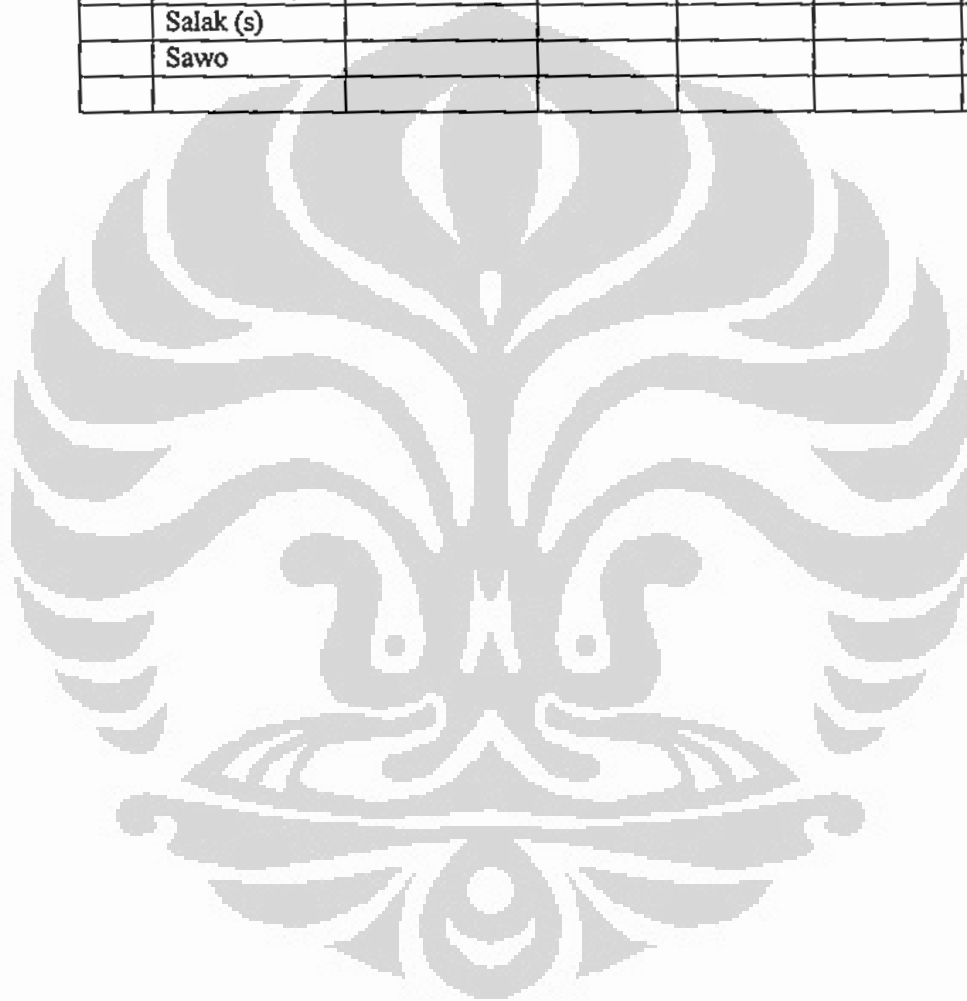
Foods	Preparation (can be more than one)
Staple	
Animal protein	
Plant protein	
Vegetables	
Snacks	
Others	

- Is there any recipe that some caregivers might give to the infants for CF? what are they? What are the favorite recipes?
- Is there any food that avoided giving to your child? If yes, why?
- How is the seasonality pattern of food availability throughout the year?

FOODS AND PREPARATION FOR GI WITH CAREGIVERS

No	Foods	Preparation				
		Grill	Steam	Fried	Boiled	Fresh
	Staple					
	rice flour					
	rice flour porridge (MoH)					
	purchased baby porridge					
	mixed rice porridge					
	rice					
	noodles					
	bread					
	Plant protein					
	Mungbean porridge					
	Peanut					
	Soybean					
	Tofu					
	Tempe					
	Mungbean					
	Animal protein					
	Meatball					
	Beef					
	Liver					
	Fish					
	Anchovy					
	Chicken egg					
	Quail egg					
	Vegetables					
	Carrots					
	Boiled corn					
	Green beans					
	Potato					
	Mustard greens					
	Spinach					
	Sweet potato					
	Cassava					
	Cucumber					
	tomato					

	Fruit					
	Apple (s)					
	Coconut flesh (s)					
	Papaya (s)					
	Fried banana (s)					
	Banana (s)					
	Orange					
	Rambutan (s)					
	Salak (s)					
	Sawo					



**GUIDELINE QUESTIONS OF GI WITH CAREGIVERS
GICR.2**

VARIABLE	INDICATOR	GUIDELINE QUESTIONS
Dietary intake	<ul style="list-style-type: none"> • Type of food consumed by the infants • Meal pattern of children • Eating frequency of CF in a day/week 	<ul style="list-style-type: none"> • What type of foods usually given by the caregivers to the infants age 9-11 mo in this area? Staple : Animal protein : Plant protein : Vegetables : Snacks (including fruits): Other : • Is there any other food that some caregivers might give to the infants for CF? what are they? (write the recipe) • What is the total number of different foods consumed (frequency per day/week) (minimum, average, maximum)? • NOTE: probe especially for nutrient-dense foods and other potential foods observed during market survey • What is the common meal & snacks frequency of the infants in a day given by the caregivers in this area?
Breastfeeding practice	<ul style="list-style-type: none"> • Initiate of breastfeeding within hour after delivery • Length of exclusive breastfeeding practice 	<ul style="list-style-type: none"> • Does the mother practice initiation of breastfeeding within hour after delivery for the infant? • How long was the

	<ul style="list-style-type: none"> • Pre lacteal feeding • Breastfeeding on demand 	<p>infants given breast milk only (EBF)?</p> <ul style="list-style-type: none"> • Was the infant given another feeding before the breast milk come out (pre lacteal) in several day after delivery? • How the breast milk given to the infants: scheduled or on demand?
Complementary feeding practices	<ul style="list-style-type: none"> • Age of introduction of solid, semi solid and soft food • Strategies when child refuse to eat • Situation of feeding • Feeding during illness 	<ul style="list-style-type: none"> • At what age the infants was introduced with: Soft foods : Semi solid foods : Solid foods : How about the introduction of CF of other infants in the area? (Age) • What will the caregivers do if the infants refuse to eat? How about the other caregivers practice when child refuse to eat? • Where and how usually the caregivers give meals to the infants? • How do you feed your children when they are ill?
Hygiene practice	Utilization of boiled drinking water	<ul style="list-style-type: none"> • Do you always use boiled drinking water? Specially for infants? What about the other caregivers do?
Food belief/taboo	Type of food taboo/belief related to child feeding practice	* Is there any food that avoided (taboo) to give to your child? If yes, why? Is there any people who still consume those foods?
HH accessibility to food	<ul style="list-style-type: none"> • Constraints in the HH (distance and, transportation to the market, seasonality 	<ul style="list-style-type: none"> • How far is it to reach the market from your house? Do you think is it difficult to reach it?

	<p>effect on food availability and purchasing power)</p> <ul style="list-style-type: none"> • Food production at HH level • Food donation • Weekly food expenditure 	<ul style="list-style-type: none"> • How often do you go to the market in a week? • How is the seasonality effect on food supply and income generation? • Do you have food that produced in your own house or garden?if yes,what? • Do you or your child accep the food donation? If yes specify what, when, amount and frequency, from whom • How much money in a week you spend for food?for family and for your infant?
--	--	---

Additional :

* If we would like to introduce new recipe, would the caregivers accept it? If yes, what criteria of recipe that acceptable? In term of:

- * Texture
- * Taste
- * Ingredient
- * Price

1st RECIPE TRIAL RECORDING FORM
Registration Form (RT.1.1)

Village : _____ **Hamlet** : _____
Location : _____ **Date** : ___ / ___ / ___
Facilitator : _____ **Note Taker** : 1.
 2.

Name of participants	Age of Child (months)	Usual feeding	
		Breastfeeding (Yes/No)	Complementary feeding (Yes/No)
1.			
2.			
3.			
4.			
5.			
6.			

General instructions :

1. Introduce yourself, and the member of the team and the purpose of the activity

The purpose of 1st recipe trial : To get insight on kind of existing CF recipes, the way of preparation and cooking method, ingredients or recipes that mostly preferred by infants on the existing recipes

2. Split into two or three small groups for simultaneous cooking
3. Ask for a few volunteers to cook while the others watch, comment, and make suggestions
4. The mothers should cook infant porridge with the available ingredients, that consist of :

Staple, Animal Protein (chicken liver, fish and anchovy), Plant Protein, and Vegetables

5. As mothers prepare each dish, note-takers (2 persons) observe and record the amounts of ingredients added, procedures, and amount of time used. If utensils (cups and spoons) are provided in standard local sizes, the observed volumes are recorded during the trial, and the same amount is weighed later to calculate the nutrient composition.
6. After the cooking process done, the facilitator asks why a food is added, reasons for preparation methods, whether anyone else in the group does it the same way or differently, whether they add additional ingredients, and so on.
7. Ask permission to use tape recorder

Instruction for caregivers:

Please cook the infant porridge with the available ingredients (the way they do in their home), should consist one kind of Staple, Animal Protein (chicken liver or fish or anchovy), Plant Protein, and Vegetables

1st RECIPE TRIAL RECORDING FORM
Focus Group Discussion (RT.1.2)

Recipe for usual method preparing infant porridge

Recipe No : _____

Ingredients	Amount of used (local measure)	Amount used (gram)
Size of servings		

Time began : _____ Time ended : _____
(only record the time taken to prepare the recipe)

Probe on serving size and number of meals

How other mothers compare it with their usual porridge in terms of Consistency

Taste

Response of child

Amount of time for preparation

RT.1.2

Probes:

Ask why, when, and how much ingredients used

Ingredients	Why it is used	When it is used	Amount used (gram)	Order

Ask why, when, and how the method used

Method	Why it is used	When it is used

How do other mothers do it differently? Why?

2nd RECIPE TRIAL RECORDING FORM
Registration Form (RT.2.1)

Village : _____ **Hamlet** : _____
Location : _____ **Date** : ___/___/___
Facilitator : _____ **Note Taker** : 1.
 2.

Name of participants	Age of Child (months)	Usual feeding	
		Breastfeeding (Yes/No)	Complementary feeding (Yes/No)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

General instructions :

1. Introduce yourself, and the member of the team and what is expected during the session

The purpose of 2nd recipe trial : to introduce the modified recipes and to choose the most popular recipes (2-4 recipes) which will be used for the TIPs.

2. The researcher team demonstrate the modified recipes to the mother
3. When the food is ready, the facilitator will guide a focus group discussion to discuss serving and feeding methods, and asks whether the recipe can be prepared easily at home using the same ingredients and quantities.in the end of the session each mother tastes and serves the recipes to her child. The facilitator asks for opinions on taste and acceptability of the recipes,

**2nd RECIPE TRIAL RECORDING FORM
ASSESSMENT FORM (RT.2.3)**

Location : _____ Date : ___/___/___

Instruction:

1. In the end of the session, the facilitator show the modified recipe, each mother tastes and serves the recipes to her child. The facilitator asks for opinions on taste and acceptability of the recipes
2. Divide the mothers/caregivers into 3 groups that each group will be lead by one research team, ask mother individually to give score using available color (NOTE : 1 = unacceptable, 2= less acceptable, 3 = acceptable, 4=likeable, 5=very likeable)

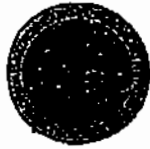
Recipe No : _____

Caregivers name	Score						Willing to prepare
	Thickness	Taste by mother	Taste by child	Feed to sick	Availability of items	Preparation time	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
Total score							

Development of Food-based Complementary Feeding Recommendations of 9-11 Month Old Infants in East Lombok Using Linear Programming with The Formulation of Local Nutrient-dense Complementary Food Recipes, 2009

South East Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TROPMED) Regional Center for Community Nutrition (RCCN) - University of Indonesia (UI)

Jl. Salemba Raya 6 Jakarta Pusat
Phone : (021) 3913932 / 330205, Fax : (021) 3913933



SCREENING FORM

A. FOOD SECURITY

Pertanyaan umum untuk kecukupan pangan/penyaring: Pertanyaan 1, 1a, 1b

(PILIHAN: Pertanyaan ini tidak digunakan untuk mengukur kecukupan pangan/Skala kelaparan). Pertanyaan 1 dapat digunakan sebagai penyaring: (a) dalam hubungannya sebagai penyaringan awal untuk mengurangi beban dari responden dari keluarga dengan pendapatan tinggi; dan/atau (b) dalam hubungannya dengan penyaringan internal tahap pertama yang membuat penyaringan terlalu terbuka – sebagai contoh memerlukan rute lain untuk mencapainya.

1. Saya akan membacakan beberapa kalimat, menurut ibu manakah kalimat yang menggambarkan keadaan makanan dirumah ibu, dalam 12 bulan terakhir?

- (1) Jumlahnya cukup dan jenisnya sesuai dengan yang ingin ibu makan (kualitas dan kuantitas terpenuhi) (LEWATI 1a dan 1b)
- (2) Jumlahnya cukup, tetapi bukan selalu jenis makanan yang ingin ibu makan (kuantitas saja yang terpenuhi) (LEWATI 1a; Tanya 1b)
- (3) Kadang-kadang jumlah yang dimakan tidak cukup (Tanya 1a; LEWATI 1b)
- (4) Sering tidak cukup (Tanya 1a; LEWATI 1b)
- (5) Tidak tahu (TT) atau menolak (LEWATI 1a dan 1b)

1a. Apakah hal tersebut terjadi karena..... (Bacakan pilihannya satu persatu)

Ya	Tidak	TT		
[01]	[02]	[88]	Tidak punya cukup uang untuk membeli makanan	<input type="checkbox"/>
[01]	[02]	[88]	Tidak punya cukup waktu untuk membeli atau memasak makanan	<input type="checkbox"/>
[01]	[02]	[88]	Terlalu sukar untuk mencapai toko bahan pangan/pasar	<input type="checkbox"/>
[01]	[02]	[88]	Sedang diet	<input type="checkbox"/>
[01]	[02]	[88]	Kompor sedang rusak	<input type="checkbox"/>
[01]	[02]	[88]	Tidak bisa memasak atau makan karena masalah kesehatan	<input type="checkbox"/>

1b. Apakah hal tersebut terjadi karena.....(Bacakan pilihan satu persatu).

Ya	Tidak	TT		
[01]	[02]	[88]	Tidak punya cukup uang untuk membeli makanan	<input type="checkbox"/>
[01]	[02]	[88]	Jenis makanan yang ibu inginkan tidak tersedia	<input type="checkbox"/>
[01]	[02]	[88]	Tidak punya cukup waktu untuk membeli atau memasak makanan	<input type="checkbox"/>
[01]	[02]	[88]	Terlalu sukar untuk mencapai toko	<input type="checkbox"/>
[01]	[02]	[88]	Sedang diet khusus	<input type="checkbox"/>

MODUL INTI KETERSEDIAAN PANGAN (i.e. Skala items)

Tahap 1 : Pertanyaan 2-6

Sekarang saya akan membacakan pada ibu beberapa pernyataan yang dikemukakan orang tentang situasi makanan. Untuk setiap pernyataan tolong beritahu saya apakah keadaan itu benar, kadang benar atau tidak benar dengan keadaan keluarga ibu selama 12 bulan terakhir

2. "**Ibu cemas persediaan makanan sudah habis sebelum ibu punya uang untuk membeli lagi**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?

[01] Sering benar [03] Tidak benar
[02] Kadang benar [88] Tidak tahu atau tidak mau menjawab
3. "**Makanan yang ibu beli sudah habis, dan ibu tidak punya uang untuk membeli lagi**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?

[01] Sering benar [03] Tidak benar
[02] Kadang benar [88] Tidak tahu atau tidak mau menjawab
4. "**Ibu tidak sanggup mengupayakan makan makanan yang seimbang (nasi dengan sayur dan lauk/pauk) untuk keluarga**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?

[01] Sering benar [03] Tidak benar
[02] Kadang benar [88] Tidak tahu atau tidak mau menjawab
5. "**Ibu hanya membeli beberapa jenis makanan yang murah untuk memberi makan anak-anak karena sering kehabisan uang untuk membeli makanan**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?

[01] Sering benar [03] Tidak benar
[02] Kadang benar [88] Tidak tahu atau tidak mau menjawab
6. "**Ibu tidak bisa memberi makan anak ibu dengan makanan yang seimbang (terdiri dari nasi, lauk nabati atau hewan, sayur), karena ibu tidak sanggup untuk membelinya**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?

- [01] Sering benar [03] Tidak benar
 [02] Kadang benar [88] Tidak tahu atau tidak mau menjawab

Penyaringan tahap pertama (Saringan tahap 2)

(Penyaringan untuk tahap2): JIKA ADA JAWABAN MENGIYAKAN untuk SALAH SATU pertanyaan 2-6 (misalnya "sering benar" atau kadang benar") ATAU memberi tanggapan [3] atau [4] untuk pertanyaan 1, lanjut ketahap 2, jika tidak akhiri wawancara.

Tahap 2 : Pertanyaan 7-11

Tanya keluarga yang melewati penyaringan tahap 1 (Perkiraan 40% keluarga <185% miskin, 5.5% keluarga > 185% miskin, 19% dari seluruh keluarga).

7. "**Anak ibu tidak bisa mendapat cukup makan karena ibu tidak mampu membeli cukup makanan**". Dalam 12 bulan terakhir, apakah pernyataan tersebut sering benar, kadang benar, atau tidak benar bagi keluarga ibu?
- [01] Sering benar [03] Tidak benar
 [02] Kadang benar [88] Tidak tahu atau tidak mau menjawab
8. Dalam 12 bulan terakhir, apakah **ibu atau orang dewasa lain di keluarga ibu pernah mengurangi jumlah makan atau tidak makan karena tidak cukup uang untuk membeli makanan?**
- [01] Ya
 [02] Tidak (Lewati pertanyaan 8a)
 [88] Tidak tahu atau tidak mau menjawab
- 8a. JIKA YA, Berapa sering hal ini terjadi -- hampir setiap bulan, dalam beberapa bulan tapi tidak setiap bulan, atau hanya dalam 1 atau 2 bulan saja?
- [01] Hampir setiap bulan [03] Hanya 1 atau 2 bulan saja
 [02] Beberapa bulan, tidak setiap bulan [88] Tidak tahu atau tidak mau menjawab
9. Dalam 12 bulan terakhir, apakah **ibu pernah makan kurang dari porsi yang seharusnya (menurut ibu) dimakan karena tidak punya uang untuk membeli makanan ?**
- [01] Ya
 [02] Tidak
 [88] Tidak tahu atau tidak mau menjawab
10. Dalam 12 bulan terakhir, apakah **ibu pernah merasa lapar tapi tidak makan karena ibu tidak punya uang untuk membeli makanan?**
- [01] Ya
 [02] Tidak
 [88] Tidak tahu atau tidak mau menjawab
11. Dalam 12 bulan terakhir, apakah ibu mengalami **penurunan berat badan akibat tidak punya uang untuk membeli makanan?**
- [01] Ya, *Apakah ibu sedang diet? Ya [01] Tidak [02]*
Apakah ibu sedang sakit? Ya [01] Tidak [02]
 [02] Tidak
 [88] Tidak tahu atau tidak mau menjawab

Penyaringan tingkat 2

(Penyaringan tahap 3): JIKA ADA JAWABAN YANG MENGIYAKAN pada SALAH SATU pertanyaan no.7 sampai 11, kemudian lanjutkan ke tahap 3, jika tidak, akhiri wawancara.

Tahap 3: Pertanyaan 12-16: Tanya keluarga-keluarga yang melewati penyaringan tahap pertama: (Perkiraan 40% keluarga \leq 185% kemiskinan, 5.5% keluarga $>$ 185% kemiskinan, 19% dari seluruh keluarga)

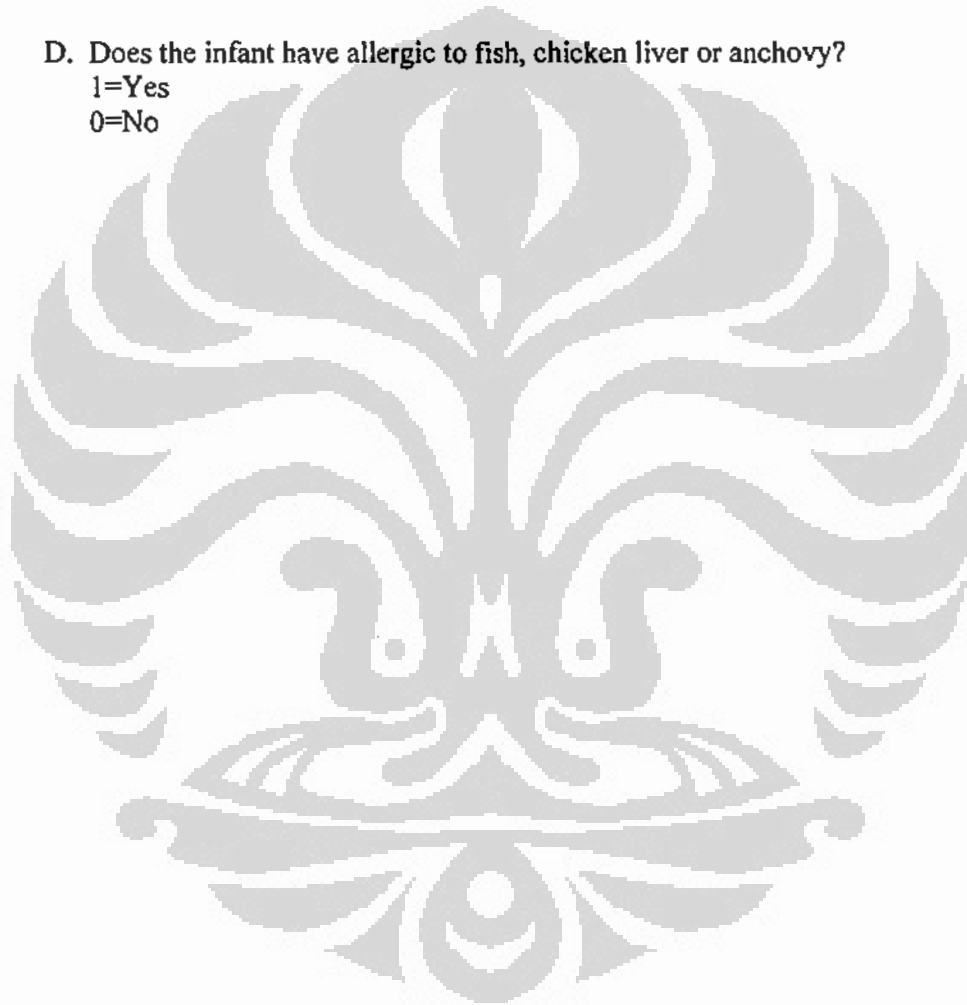
12. Dalam 12 bulan terakhir, apakah ibu atau orang dewasa lain di keluarga pernah tidak makan sehari penuh karena ketiadaan uang untuk membeli makanan?
 [01] Ya
 [02] Tidak (Lewati pertanyaan 12a)
 [88] Tidak tahu atau tidak mau menjawab (Lewati pertanyaan 12a)
- 12a. JIKA YA, Berapa sering hal ini terjadi – hampir setiap bulan, dalam beberapa bulan tapi tidak setiap bulan, atau hanya dalam 1 atau 2 bulan saja?
 [01] Hampir setiap bulan [03] Hanya 1 atau 2 bulan saja
 [02] Beberapa bulan, tidak setiap bulan [88] Tidak tahu atau tidak mau menjawab
13. Dalam 12 bulan terakhir, apakah ibu mengurangi porsi makan anak ibu karena ibu tidak punya cukup uang untuk membeli makanan?
 [01] Ya [88] Tidak tahu atau tidak mau menjawab
 [02] Tidak
14. Dalam 12 bulan terakhir, apakah anak-anak ibu pernah melewatkan waktu makan (misalnya makan menjadi satu kali sehari) (*skip meals*) akibat tidak ada uang untuk membeli makanan?
 [01] Ya
 [02] Tidak (Lewati no 14a)
 [03] Tidak tahu atau tidak mau menjawab (Lewati no 14a)
- 14a. JIKA YA. Berapa sering hal ini terjadi – hampir setiap bulan, beberapa bulan tapi tidak setiap bulan, atau hanya 1 atau 2 bulan saja?
 [01] Hampir setiap bulan [03] Hanya 1 atau 2 bulan saja
 [02] Beberapa bulan, tidak setiap bulan [88] Tidak tahu atau tidak mau menjawab
15. Dalam 12 bulan terakhir, apakah anak-anak ibu pernah merasa lapar tetapi ibu tidak sanggup mengusahakan makanan?
 [01] Ya
 [02] Tidak
 [88] Tidak tahu atau tidak mau menjawab
16. Dalam 12 bulan terakhir, pernahkah anak-anak ibu tidak makan sehari penuh karena tidak ada uang membeli makanan?
 [01] Ya
 [02] Tidak
 [88] Tidak tahu atau tidak mau menjawab

CATEGORY OF FOOD SECURITY []

B. Does the mother/caregiver literate? (give some sentence to read.)
1=Yes
0=No []

C. Does the family has food belief/taboo on fish, chicken liver or anchovy for the infants?
1=Yes
0=No []

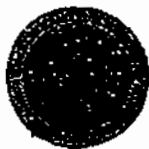
D. Does the infant have allergic to fish, chicken liver or anchovy?
1=Yes
0=No []



Development of Food-based Complementary Feeding Recommendations of 9-11 Month Old Infants in East Lombok Using Linear Programming with The Formulation of Local Nutrient-dense Complementary Food Recipes, 2009

South East Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TROPMED) Regional Center for Community Nutrition (RCCN) - University of Indonesia (UI)

Jl. Salemba Raya 6 Jakarta Pusat
Phone : (021) 3913932 / 330205, Fax : (021) 3913933



TRIAL OF IMPROVED PRACTICE

HOUSEHOLD TRIALS: INITIAL VISIT (Day 1)

Note: *"(greeting).... I am (name) from SEAMEO Tropmed RCCN university of Indonesia. We are visiting East Lombok for conducting study on Development of Food-based CFRs of 9-11 mo Infants. You are randomly selected to participate in Household trials as part of the study. Your answer will be purely confidential and can only be access by us.*

inform consent:

Before I start, I will ask for your permission to participate in this trial, by signing this form.

In this household trial, the research team will visit you 3 times, the 1st and 3rd we will visit you in home while in the 2nd visit we will gather you with the other randomly selected household. In the 1st visit we will ask several questions related to infant feeding practices. In the 2nd visit we will introduce some modified recipes to be given to the infants, and in the last visit we will check the implementation of the recommendation/modified recipes to the infants.

There will be no risk result in this household trials. Your participation is voluntary. The confidentiality of your information is assured by SEAMEO-TROPMED RCCN University of Indonesia. By signing this form, you are agree to participate in this trials.

(Signature) _____ (name) _____ (date) _____

We highly appreciate your participation

Respondent's Identity		Code	
A. Sub District Pringgabaya			
Date of interview:/...../.....(dd/mm/yy)		Time of interview:until.....	
Interviewer		Code	
1. Nur H.U	2.	3.	[]
Supervisor			
1.	2.	[]	
B. Village			
01.	02.	03.	04. []
C. Contact number			
D. Respondent number		[]	
Name of mother/ caretaker:		Name of the infant:	
Age yr		Agemo	
Sex: 1) Male 2) Female []		Sex: 1) Male 2) Female []	
Relation of the respondent with the children: 1. Mother 2. Other (specify)..... []			

DEMOGRAPHIC DATA						Code	
1	Fill in this table with data of the household member						
No ^(a)	Name of the family member	Sex 1. M 2. F	Date of birth (dd/mm/yy)	Education ^(b)	Occupation ^(c)	contribute to household income? (1.Yes/ 0.No)	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
<p>Note:</p> <p>^(a) (1) US children (subject) (2) Mother (3) father (4) Caregiver (5) Sibling 1 (6) Sibling 2 (7) Sibling 3 (8) sibling 4 (9) sibling 5 (10) others</p> <p>^(b) Education: (1) Never go to school (2) Elementary school (<3 years) (3) Elementary school (graduated) (4) Junior high school (graduate) (5) Senior high school (graduate) (6) University (graduated) (66) Not applicable (for underfive children) (88) Do not know</p> <p>^(c) Main Occupation (Currently): (1) Farmer (land owner) (2) Farmer (not land owner) (3) Fisherman (boat owner) (4) Fisherman (not boat owner) (5) Animal Husbandary (6) Government employee (7) Private employee (8) Enterprenuer (9) Driver/ Ojek (10) Laborer (11) Housewife (12) Unemployed (13) Student (14) Retired (77) Others (specify)..... (66) Not applicable (88) Do not know (99) No answer</p>							

Note: For questions no A1-A3, no need to read the questions. The answer will be drawn from demographic data table				
1	Number of household member			
2	Number of the underfive children in a household.....			[]
3	Number of household member aged <15 years old and >60 years old			[]
4	What is the religion of the mother?	1. Moslem 2. Catholic 3. Protestant	4. Hindu 5. Budhist 6. Others	[]
5	What is the religion of the father?			[]
6	What is the ethnicity of the mother?	1. Lombok	3.	[]
7	What is the ethnicity of the father?	2.	4. Others.....	[]
B. SECTION: ECONOMIC STATUS				CODE
Note: For questions no B1-B5, no need to read the questions. The answer will be drawn from demographic data table				
1	Father's education			[]
2	Mother's education			[]
3	Father's occupation			[]
4	Mother's occupation			[]
5	Number of household member who earn regular income			
C. SECTION: FEEDING PRACTICES				
1	How much money do you spend for foods in a week a. Rice			
	b. Other staple (e.g corn)			
	c. Vegetables			
	d. Animal protein.....			
	e. Legumes, nuts, bean and bean products.....			
	f. Snacks for family.....			
	g. Snacks for child.....			

Instructions :

- In this section, several questions will be asked about infant feeding practices
- Fill the answers in the space provided

D. INFANT FEEDING PRACTICES				CODE
1.	Do you currently breastfed your infant?	1. Yes 0. No	66. Not applicable 99. No answer	[]
2.	Have you ever breastfed your infant?	1. Yes 0. No (go to part C2)	66. Not applicable 99. No answer	
3.	Did your child receive colostrum (the first yellowish liquid that come out from the breast after delivery)?	1. Yes 0. No	66. Not applicable 99. No answer	[]
4.	How long after delivery did you start breastfeed?	1. Immediately 2. >1 hour 3. > 1 day	66. Not applicable 99. No answer	[]
5.	What was the child's age when you stopped giving the breast milk?	1. < 6 months 2. 6 mo-1 year 3. 1-2 year 4. > 2 year	66. Not applicable 77. Other..... 99. No answer	[]
6.	How do/did you breastfeed your child?	1. On child's demand 2. On a thight feeding schedule	66. Not applicable 99. No answer	[]
7.	Have you ever give any additional food/fluid in addition to breastmilk to a baby before 6 months?	1. Yes 0. No	66. Not applicable 99. No answer	[]
8.	When the child gets diarrhea or common cold, do you still breastfeed your child?	1. Yes 0. No	66. Not applicable 99. No answer	[]

D2: Only asked to the non breastfed infants			CODE
9	What fluid/food did you give to your child since the baby was born?	1. Infant formula 2. Fresh milk 3. Other fluid (specify) 4. Other food (specify).....	66. Not applicable 99. No answer []
10	Do you provide food separately for your child?	1. Yes 0. No (go to no.F3)	66. Not applicable 99. No answer []
11	If yes, why?	1. Child needs special nutrient requirement 2. Different taste/spice with adult 3. Different preference/dislike	66. Not applicable 77. Other 99. No answer []
12	Why was the child never breastfed?	1. Mother ill/have disease 2. Child is ill 3. No milk come out from the breast 4. Not allowed by husband/family 5. Influence breast shape/appearance	6. Busy/work away from home 66. Not applicable 77. Other 99. No answer []

E. Complementary Feeding Practices	
1. When did for the first time you introduce CF to the children?	
Soft food	[] mo
Semi solid food	[] mo
Solid food	[] [] mo
2. What the first CF introduced to the infant?	
3. Did yesterday your children consume...	
Household member	1. Yes 0. No
Grains, roots and tubers	
Legumes and nuts	
Dairy products (milk, yogurt, cheese)	
Flesh foods (meat, fish, poultry and liver/organ meats)	
Eggs	
Vitamin-A rich fruits and vegetables	
Other fruits and vegetables	
Total	
4. How often does your children eat everyday (Mean Meals)? (Not including breast milk and formula milk) Times/day	
5. How often does your child eat Snacks everyday? (Not including breast milk and formula milk) Times/day	

F. Responsive Feeding	
1. What do you do if your child doesn't want to eat?	
Strategy	1. Yes 0. No
1. Feed while playing	
2. Feed while carrying the child	
3. Give child's favorite food	
4. Persuade the child to eat	

5. Have no eating problem	
6. More than one answer	
66. Not applicable (if child < 1 year)	
77. Other	
99. No Answer	

2. How is usually the feeding situation of your infant?

- The children is fed in the prescribe place (i.e sitting in the chair or on the mother's lap)
- The children is fed while he/she is wandering around

Food Habits

1. Is there any food you consider as 'bad food' (food taboo) for your children for the child?

- Yes, specify 88. DNK
- No (Go to No. 34) 99. No Answer

2. Why it consider as 'bad food' or food taboo?

Reason	1. Yes 0. No
Allergy	
Message from parents/older people	
Habit from the past	
DNK	

3. What kind of food do you prefer to give to your children?
Specify.....Why.....

4. Is there any food you consider as 'good food' for your children?

- Yes, specify 88. DNK
- No 99. No Answer

MOTHER'S/CAREGIVER'S KNOWLEDGE IN HEALTH AND NUTRITION				CODING
1	In your opinion, what kind of healthy food that your children has to eat everyday? (Do not mention the options! *Could mention at least 1 source of food!)	1. Carbohydrate sources *Mention..... 2. Animal protein sources *Mention..... 3. Plant protein sources *Mention..... 4. Vegetables *Mention..... 5. Fruits *Mention..... 6. Milk and milk product *Mention..... 7. Other (specify).....	1) Mention 0) Not mention 1) Mention 0) Not mention 1) Mention 0) Not mention 1) Mention 0) Not mention 1) Mention 0) Not mention 1) Mention 0) Not mention 1) Mention 0) Not mention	[]
2	In your opinion, what is the benefit of colostrum (the first yellowish liquid that comes out from the breast after delivery)?	a) to prevent children from sickness/to keep healthy/to increase immunity b) other, specify..... 88) Do not know 99) No answer	1) True 0) False	[]

3	In your opinion, how long you should give breast milk only without anything else to babies?	a) 6 months b) other, specify..... 88) Do not know 99) No answer	1) True 0) False	[]
4	In your opinion, until what age should the children give breast milk?	a) 2 years old b) others, specify... 88) Do not know 99) No answer	1) True 0) False	[]
5	In your opinion, at what age should the infants introduce with the complementary food?	a) 6 months b) other, specify..... 88) Do not know 99) No answer	1) True 0) False	[]
6	In your opinion, how many times a day should your infants have: - meals? - snacks	a) 3-4 times b) other, specify..... 88) Do not know 99) No answer	1) True 0) False	[]
7	In your opinion, in what age can the children be introduced with: - semi liquid (saring) Semi solid (funak) family food?	a) 12 mo b) other, specify..... 88) Do not know 99) No answer	1) True 0) False	[]
8	What types of snacks should be given to the child?	1. snacks with energy & protein 2. fruits 3. none of the above		

MORBIDITY			CODE
1.	Is the child suffer from the following illness today?	Diarrhea (frequency of defecate is >3 times/day and have loose stool consistency)	0. No 1. Yes []
2.		ARI (Acute Respiratory Infection) (common cough, cold, fever)	0. No 1. Yes []
3.	Did the child suffer from the following illness in the last 2 weeks?	Diarrhea (frequency of defecate is >3 times/day and have loose stool consistency)	0. No 1. Yes []
4.		ARI (Acute Respiratory Infection) (common cough, cold, fever)	0. No 1. Yes []
5.	How is the child eating		
	Quality		
	a. What foods usually the infants prefer	
	b. What food usually the infants dislike	
	Quantity		
	a. Frequency of eating in a day		
	Meals	
	Snacks	
	b. Portion in each meal	
6.	How is the child appetite in the last 1 week?		[]
	2. Good		
	1. Average		
	0. Poor		

PERSONAL HYGIENE PRACTICE			CODE
1	When do you wash your hands with soap? (Do not mention the options, more than one answer may be given)	1. When the hands are dirty 2. Before preparing the food 3. Before feeding the child	1) Yes 0) No 1) Yes 0) No 1) Yes 0) No [] [] []

		4. After defecate 5. After cleaning child's genital 77. Other, 99. No answer	1) Yes 0) No 1) Yes 0) No	[] []
2	When do you wash your cooking utensils? (Do not mention the options, more than one answer may be given)	1. Before & After using 2. When it is dirty 77. Other, 99. No answer	1) Yes 0) No 1) Yes 0) No 1) Yes 0) No 1) Yes 0) No	[] [] [] []

Instruction :

1. This is an observation part, include the feeding and environment condition
2. For feeding observation, ask the mother to shown the meals of the infants and the research team will observe it. It's a critical part of this trial because we will introduce the modified CF recipes

ENVIRONMENT CONDITION (observation)

- Describe the source of water used by the family for drinking?
- Housing condition?
 - * Floor type :
 - * Wall type :
 - * Roof type :

FOOD FREQUENCY FORM

INTERVIEWER :
 CHILD'S NAME /I.D. :
 Age in months : Birthdate:
 Sex :

Instruction:

Please recall the foods consume in the last 7 days, frequency and amount of each consume

FOOD GROUP	FOOD ITEM	FREQUENCY	AMOUNT EACH CONSUME	TOTAL
Staple	Rice			
	Rice porridge			
	Final recipe			
	Other			
Plant Protein	Tempe			
	Tofu			
	Other			
Animal protein	Chicken liver			
	Anchovy			
	Fish			
	Other			
Vegetable	Green leavy vegetables			
	Carrot			
	Other			
Fruit				
Other snack				
Other				

Does the infant ill in the last 7 days that will affect their food intake?

- 1. Yes
- 0. No

[]

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Phone : (021) 3913932 / 330205, Fax : (021) 3913933



TRIAL OF IMPROVED PRACTICE

HOUSEHOLD TRIALS: COUNSELING VISIT

Village : _____ Hamlet : _____
 Location : _____ Date : ___ / ___ / ___
 Facilitator : _____ Note Taker : 1.
 2.

Name of participants	Name of infant	Relation to child	Age of Child (months)	Adress
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

General instructions :

1. Introduce yourself, and the member of the team
2. Let the participants introduce themselves
3. Explain that this meeting is the continuation of the previous household visit
4. Ask permission to use tape recorder and inform them that their answer are confidential and only be used for the purpose of the study
5. The facilitator will guide the discussion on dietary assessment that include infant feeding practices and how the mother/caregivers could improve the health condition of the infants with several recommendations

6. Introduction of modified recipes as one of recommendation offered with cooking demonstration
7. The negotiation process will lead the caregivers to agreed on applying one of the recipes in home until the next visit
8. Consider the time spent
9. Ask their additional comments (if any) and thanks to them in the end of the session
10. Confirm their answers and summarize the session

1. DISCUSSION OF DIETARY ASSESSMENT

Explain your assessment of the child's diet to the mother, remembering to praise her for any positive practices.

(According to the dietary assessment results from the initial visit → explain generally)

2. PROBLEM SOLVING

- Ask the mother if she would be willing to try something new to improve the diet for the child's health and strength.
- Ask if she has any ideas? make general suggestions and try to get her to come up with some possible improvements.
- One of the recommendations of improving infants health and nutritional status is by making more nutritious CF recipe

3. RECIPE DEMONSTRATION

(The facilitators will demonstrate the final recipes with cooking demonstration)

- On the following forms, record as much detail as possible about the mother's responses to the recommendations (how does she react, why is she willing or unwilling to try?)

4. NEGOTIATION

Negotiate with the mother so that she chooses one new practice she would be willing to try for a few days. Explain that you will be coming back to get her opinion on the new practice.

RECOMMENDATION SHEET

INTERVIEWER :
CHILD'S NAME /I.D. :
Age in months : Birthdate:
Sex :
Interviewer :
Supervisor :

Instruction :

- 1. This sheet is to gather the response and commitment of mothers/caregivers on what recommendations she is willing to implement for the next several days**
- 2. It will be individually answer by the caregivers**

Recommendation No.1
Apply the recipe No. ...

Mother's/caregivers initial response

Willing to try? Why/why not?

Any other circumstances under which she would try the recommendations? When? What modifications?

Ask the mother to explain to you the new practice she will try. Make sure she understands and agrees. Summarize (in her own words) what the mother has agreed to try:

Ask if she has any questions or comments (record them). Make sure that all the details of preparation are clear.

As she agree to implement one of the new practice/recipe, get her consent.

INFORM CONSENT

Name of mother/caregiver :
Name of infant :
Address :

I am willing to implementfor the next 7 days.
This participation is voluntarily.

Signature,

()

Arrange a date for follow-up in about 7 days (see schedule). Ask the mother when is a convenient time of day to meet her and try to arrange that she will be home when you come.

Follow-up visit arranged for: __ / __ / __

Thank mother for spending time answering your questions and encourage her to really try the new practice.

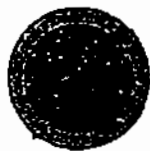
TIME FINISHED :

Development of Food-based Complementary Feeding Recommendations of 9-11 Month Old Infants in East Lombok Using Linear Programming with The Formulation of Local Nutrient-dense Complementary Food Recipes, 2009

South East Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TROPMED) Regional Center for Community Nutrition (RCCN) - University of Indonesia (UI)

Jl. Salemba Raya 6 Jakarta Pusat

Phone : (021) 3913932 / 330205, Fax : (021) 3913933



TRIAL OF IMPROVED PRACTICE

HOUSEHOLD TRIALS: FOLLOW UP VISIT

Date of interview:/...../.....(dd/mm/yy)			Time of interview:until.....		
Interviewer					Code
1. Nur H.U	2.	3.	[]	[]	[]
Supervisor					[]
1.	2.	[]	[]	[]	[]
Respondent Identity					Code
A. Sub District					
Pringgabaya					
B. Village					
01.	02.	03.	04.	[]	[]
C. Contact number					
D. Respondent number					[]
Name of mother/ caretaker:			Name of the infant:		
Age yr			Agemo		
Sex: 1) Male 2) Female []			Sex: 1) Male 2) Female []		
Relation of the respondent with the children:					
2. Mother	2. Other (specify)	[]	[]	[]	[]

FOOD FREQUENCY FORM

INTERVIEWER :
 CHILD'S NAME /I.D. :
 Age in months : Birthdate:
 Sex :

Instruction:

Please recall the foods consume in the last 7 days, frequency and amount of each consume

FOOD GROUP	FOOD ITEM	FREQUENCY	AMOUNT EACH CONSUME	TOTAL
Staple	Rice			
	Rice porridge			
	Final recipe			
	Other			
Plant Protein	Tempe			
	Tofu			
	Other			
Animal protein	Chicken liver			
	Anchovy			
	Fish			
	Other			
Vegetable	Green leavy vegetables			
	Carrot			
	Other			
Fruit				
Other snack				
Other				

Does the infant ill in the last 7 days that will affect their food intake?

1. Yes

0. No

[]

Analyze the dietary information and note any differences since the first visit. Is there any indication that the mother has added the new practices that were recommended?

OUTCOME OF TRIAL:

Instructions :

1. Refer to summary of the agreement made with the mother during the second visit (after counselling). Using the following forms, note each practice she agreed to try, and ask the questions listed. Probe for reasons why and make detailed notes.
2. Fill in separate forms for each practice she agreed to try, or for what she tried instead.
3. Have a permission to record the discussion with tape recorder

Recommendation :

1. Does the mother still remember with the final recipes?(y=1/n=0) []

2. Has the mother tried the recipe? (y/n), if yes, which recipe? []

3. If no, what are her reasons? Probe why not, for what recipe?

4. If yes, did she like the recipes? (y/n) []

5. What did she like about the recipes?

6. What didn't she like about the recipes?

7. How does the child response about the recipes?

8. Did she modify the recommendation? How and why?

9. Did other people say anything about the recipes? Who? (Husband, in-laws, friends?)
What did they say?

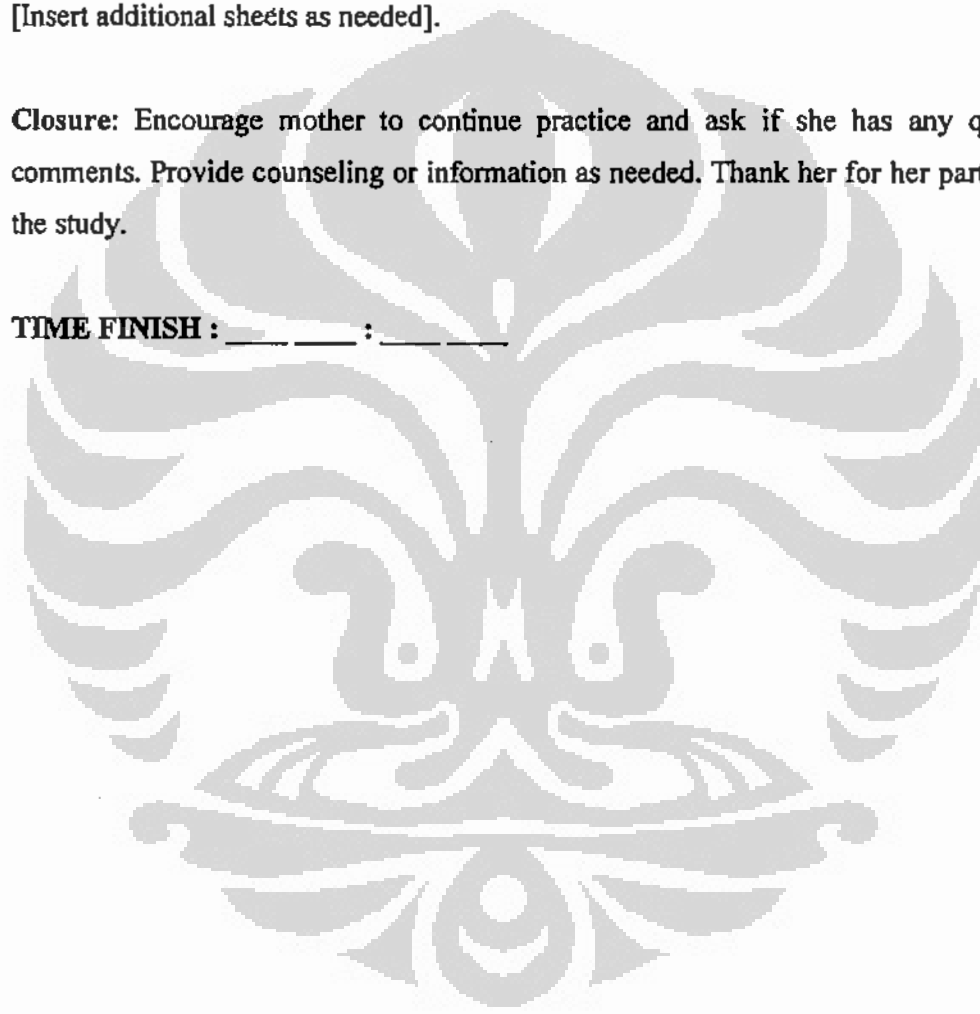
10. Will she continue the recommended practice? Why or why not? Will it be every day?

11. Would she recommend the recipes to others? How would she convince them to try the recipes? (in her own words?)

[Insert additional sheets as needed].

Closure: Encourage mother to continue practice and ask if she has any questions or comments. Provide counseling or information as needed. Thank her for her participation in the study.

TIME FINISH : _____ : _____



FORM FOR MARKET SURVEY

Date : __/__/__

Market :

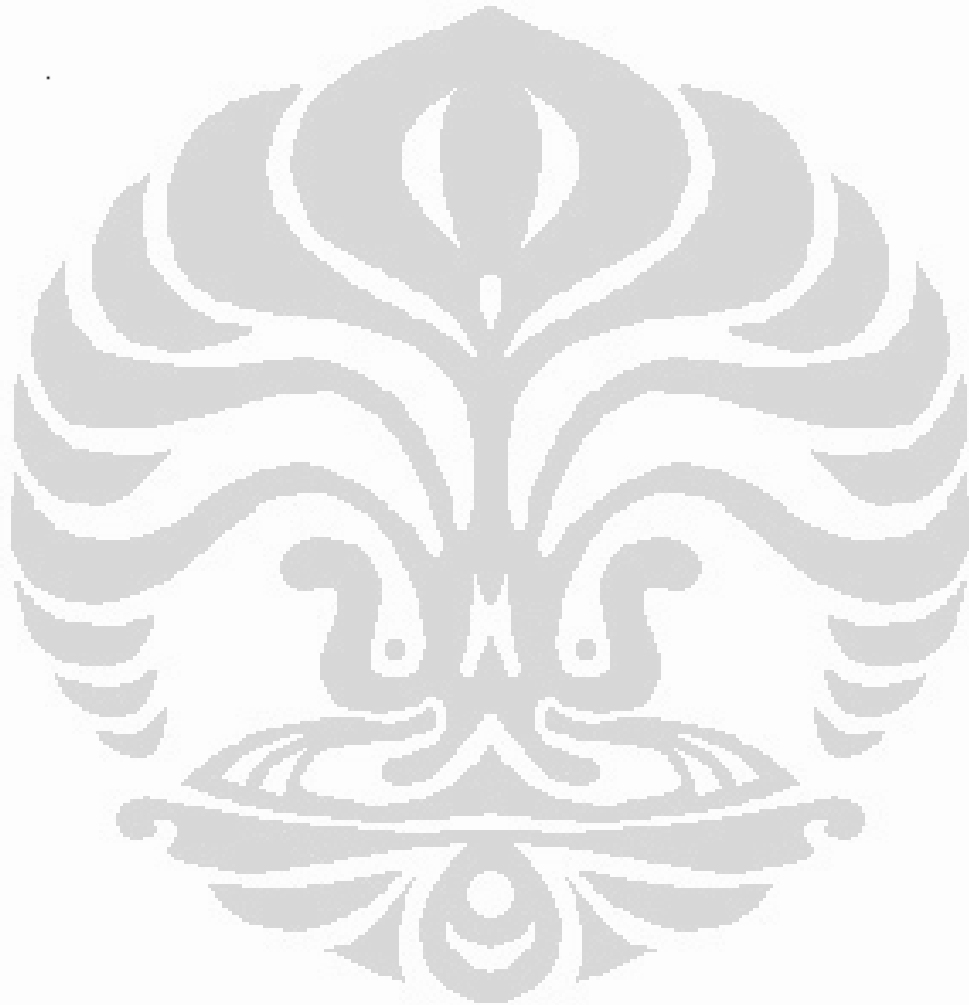
Instruction :

Put the price of foods from market then convert it into the edible portion price (look at Food Composition Table of Indonesia to see the edible portion of each food)

No	Food Groups	Food List	Measure	Price
1	Staple			
2				
3				
4				
1	Plant Protein			
2				
3				
4				
1	Animal protein			
2				
3				
4				
1	Vegetables			
2				
3				
4				
1	Fruits			
2				
3				
4				
1	Other snacks			
2				
3				

Appendix 5

ETHICAL CLEARANCE





UNIVERSITAS INDONESIA FAKULTAS KEDOKTERAN

Jalan Salemba Raya No. 6 Jakarta Pusat
Pos Box 1158 Jakarta 10430
Kantor Sekeloa Telp: 31530371, 31530375, 31530377, 31530361, 3912477, 3153236 Fax: 31530574, 3153728 e-mail: office@fki.ui.ac.id

NOMOR : 959 /PT02.FK/ETIK/2009

KETERANGAN LOLOS KAJI ETIK

ETHICAL CLEARANCE

Panitia Tetap Penilai Etik Penelitian, Fakultas Kedokteran Universitas Indonesia, dalam upaya melindungi hak asasi dan kesejahteraan subjek penelitian kedokteran, telah mengkaji dengan teliti protokol berjudul:
The Committee of The Medical research Ethics of the Faculty of Medicine, University of Indonesia, will regards of the Protection of human rights and welfare in medical research, has carefully reviewed the proposal entitled:

"Local Food-Based Intervention and Psychosocial Stimulation to Improve Growth and Development of Under-two-year-old Indonesia Children (Intervensi Komunitas dengan Asupan Berbasis Pangan Lokal dan Stimulasi Psikososial untuk Tumbuh-Kembang Anak Bawah Dua Tahun)"

Peneliti Utama : Dr. Ir. Umi Rahmida, MSc
Name of the principal investigator

Nama Institusi : Seameo-Tropmed UI

dan telah menyetujui protocol tersebut di atas
and approved the above mentioned proposal

Jakarta, 27 Mei 2009

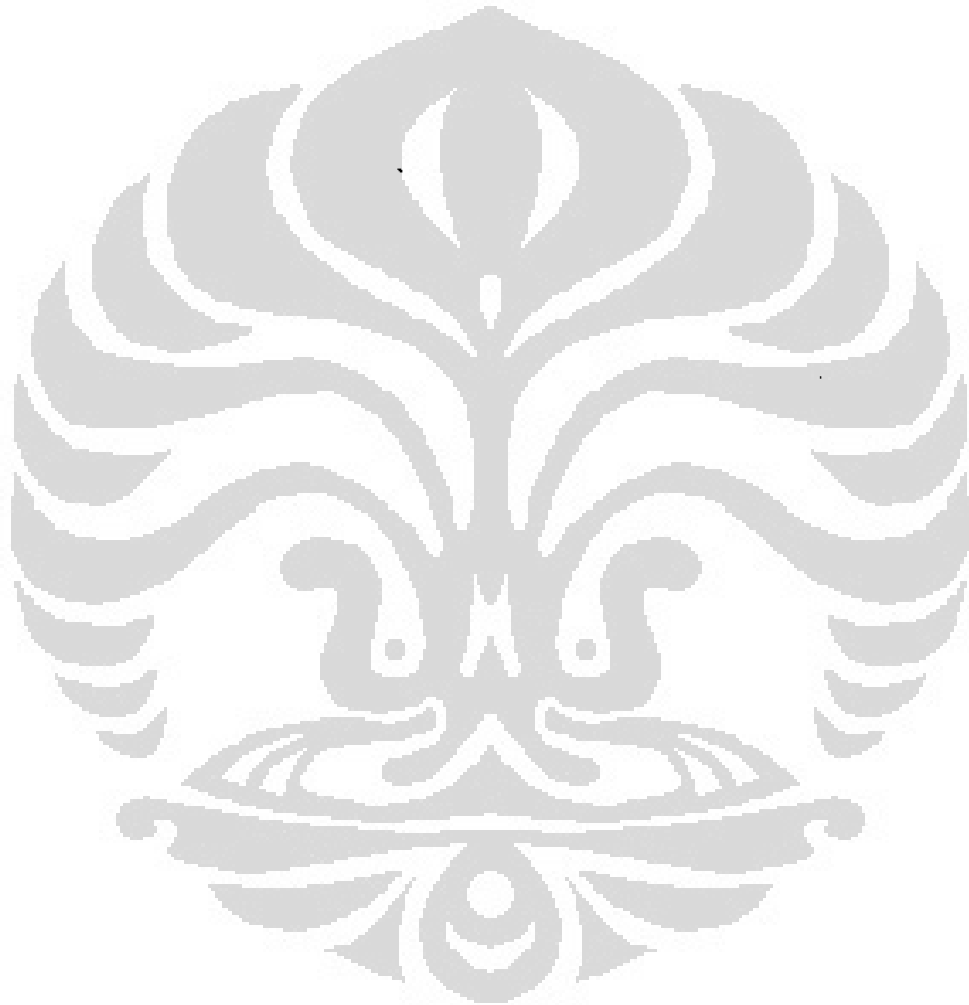


Chairman
Ketua

Prof. Dr. Agus Firmansyah, SpA(K)

-Peneliti wajib menjaga kerahasiaan identitas subjek penelitian.

Appendix 6
CURRICULUM VITAE



CURRICULUM VITAE

PERSONAL INFORMATION

Name : Nur Handayani Utami
Place and Date of Birth : Jakarta, 11th November 1980
Marital Status : Married
Religion : Islam
Nationality : Indonesia
Address : Komp. DDN Blok C No 16 RT 04/006
Bintara Jaya Bekasi Barat, 17136
Phone Number : 021 865 1783 / 0818 0604 1915
Email Address : nur_handayani80@yahoo.com
nurhandayani@litbang.depkes.go.id

FORMAL EDUCATION

1999 – 2003 : Bogor University of Agriculture (Bachelor Degree
of Community Nutrition and Family Resources,
GPA 3.13)
1996 – 1999 : SMUN 12, East Jakarta
1993 – 1996 : SMPN 252, East Jakarta
1987 – 1993 : SDN 10, East Jakarta

WORKING EXPERIENCES

2005 – now : As a Junior Researcher in The Center of Food and
Nutrition Research and Development, Ministry of
Health
2009-2010 : As a lecture (Epidemiology) in Andalusia
Academy of Nutrition, Jakarta

2004 ~ 2005 : As a Lecture (Math and English) and Staff of Academic Administration in UHAMKA Academy of Nutrition, Jakarta

TRAININGS AND COURSES

2009 : Health Promotion in Nutrition Program, SEAMEO
 2007 : IELTS Preparation Course, ELS, Jakarta
 2006 : Geographic Information System, NIHRD, Jakarta
 2006 : Training of Junior Researcher, LIPI, Cibinong
 2006 : Training of Research Methodology, NIHRD, Bogor

RESEARCH EXPERIENCE

2002 : As a researcher in The study of nutrition and menstrual complaint in Girls, Jakarta and Bogor
 2005 : As a research assistant in The study of the effect of masive iodium intervention in endemic area of iodium deficiency, Karawang, Ngawi and Magelang (PI by Basuki Budiman, MKes)
 2005 : As an enumerator in The study of nutritional status among students in Jakarta (PI by DR. Susilowati Herman)
 2006 : As an enumerator in The study of micronutrients deficiency among children: focused on vitamin A deficiency, Pandeglang (PI by DR. Susilowati Herman)
 2006 : As a research assistant in The study of model development of posyandu revitalization in karawang (PI by DR. Iman Sumarno)
 2008 : As an enumerator in The effectiveness study on Taburia, North Jakarta (PI by DR. Abas Basuni Jahari)
 2009 : As a researcher in The study of nutritional status and it's determinant factors among under five children in gorontalo district, Gorontalo province