OPTIONS AND STRATEGIES TO REACH THE AGE GROUP OF UNDER-TWOS THROUGH COMPLEMENTARY FEEDING IN THE SOUTH ASIAN COUNTRIES

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A commissioned report by MI for the Manila Forum on the Potential For Protecting Populations from Mineral and Vitamin Deficiencies In Asian Countries at the Asian Development Bank, Manila, The Phillipines, February 22 – 24, 2000.

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ACKNOWLEDGEMENTS

I would like to start this report by thanking Mr. Venkatesh Mannar, Executive Director, MI, Ottawa and Dr. Saraswati Balasu, National Programme Officer, MI, India for giving me one more opportunity to expound on **Complementary Foods** in general and my brain-child namely, **Amylase-Rich-Foods (ARF)** in particular. Having had the good fortune in my professional career to have worked in industry, academics and research, I appreciate the crucial need **for an immediate partnership between the three**. **Fortification of Complementary Foods** for the needy, the helpless and the most vulnerable 'Under Two' infant and toddler is the **need of the hour**. It is indeed unfortunate that this has **not** happened in a big way for **Complementary Foods** upto now. I sincerely hope that the Manila Forum to be held at the Asian Development Bank, at Manila, in late February 2000, will kickstart the whole process. Most of our babies (6 months to 24 months of age) in South Asia are in a **chronic state of starvation, for both their macro as well as micro-nutrients**.

February, 2000.

Tara Gopaldas
Director
Tara Consultancy Services,
Bangalore, India.

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INTRODUCTION

Most of the 'malnutrition drama' is already over by the time a South Asian Child is two years of age (**1**). More than half the world's underweight children live in South Asia (**2, 3, 4**). In this report I shall **case study India** which is one of the eight countries participating in this important meeting.

India has about 45 million infants/toddlers (6-24 months) in 2000 A.D. As against India's 45 million Under Twos; Bangladesh would have about 5.6 million; Nepal about 1 million; and Sri Lanka about 0.86 million. The target population for Complementary Foods in just these four South Asian Countries is a staggering **52.5** million per annum.

My former University Department of Foods and Nutrition where I served as Chair for several years, has been a WHO Collaborating Centre for Nutrition (Weaning Technology) since 1992 – continuing. My research group and I were able to bring out a number of research papers and publications from 1980 – 1993. The IDRC funded two international Workshops – one in Seoul, South Korea, at the XIV International Congress in 1990. This was followed by a National and International Workshop on the ARF – Story, at Baroda, in end 1990.

The National Planning Commission of India has strongly endorsed the use of my 'ARF – Technology' in its Ninth Plan period (1996 - continuing). The National Institute of Nutrition (NIN) has endorsed it in its Dietary Guidelines (1998). The Tamilnadu Nutrition Integrated Project (TINP) of the World Bank has been using the 'ARF Technology' for the past decade. So has Rajasthan.

Many countries namely, Iran, Tanzania, Bolivia, Malawi, South Africa, Saudi Arabia, Thailand, Kenya, Sri Lanka, Bangladesh and Nepal have been or are still in touch with us in regard to the ARF – technology.

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This report consists of eleven sections as under :

- **Section A** : Nutritional needs, deficiencies and the role of Supplementary foods in the age group of under 2's (Macro and Micro).
- **Section B** : Options for providing nutrition to overcome deficiencies
- **Section C** : Technology for development of premix/supplementary foods
- **Section D** : Production/Packaging/Storage/Distribution
- **Section E** : Delivery channels and mechanisms to improve outreach
- **Section F** : Cost implications
- **Section G** : Communication and training needs
- **Section H** : Monitoring and Evaluation
- **Section I** : Opportunities for Public/Private/Academia/NGOs – multisectoral collaboration
- **Section J** : Global experiences on food delivery
- **Section K** : Recommendations for programme development and mechanism to strengthen policy

Each section has been developed in a Question and Answer form which I felt would be the best way for an interactive discussion among Senior Public and Private Sector leaders from the eight Asian Countries. Tables, Figures and References are attached section-wise.

India has been case – studied. Wherever possible comparative data have been provided for Bangladesh, Nepal and Sri Lanka.

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Section A : Nutritional needs, deficiencies and the role of Supplementary foods in age group of under Twos (Macro and Micro).

Section A provides answers to three questions as under :

Q. 1 What is the Nutritional Status of Children Under Two in South Asia?

Q.2 What are the Nutritional Requirements for the Under Twos in South Asia?

Q. 3 What is the Role of Supplementary or Complementary Foods for the Under Twos?

Q. 1 What is the Nutritional Status of Children Under Two in South Asia?

It is now well recognized that most of the children in Asia under two years of age, especially children 6 to 18 months old are extremely undernourished, underweight and stunted.

Generally, data on nutritional status is available for the 'Under Fives' and **not for the 'Under Twos'**. From **Table 1**, it is noticed that Underweight, Stunting and Wasting is very high in India, Bangladesh and Nepal. The picture is slightly better in Sri Lanka.

In South Asia there are several factors operating synergestically to hasten the 'Below Twos' rapid decline into undernutrition, especially so from his/her sixth month of life.

These are :

- the child may have been low birth weight (LBW), i.e. below 2500 g at birth;
- lack of and/or total unsuitablility of complementary foods;
- repeated episodes of diarrhoeal & respiratory infections;
- unhygienic personal, maternal & envirnonmental status;
- unsafe drinking water & poor sanitation;
- limited, distant, slow & non-affordable access to preventive & curative health services;
- poor income levels, illiterate, and working parents;

- ignorance of simple & doable caring practices & **large families** with narrow or no birth spacing.

INDIA : India's National Family Health Survey (1992-93) found the prevalence of under-nutrition to be very high in the Under Twos. The Survey found more than half (53%) of all children under the age of four to be underweight and a similar proportion (63%) to be stunted. 21-29% of children were severely undernourished according to weight-for-age and height-for-age measures. One in every six children was found to be excessively thin (wasted). It further documented that undernutrition varied substantially the age of the child, **being highest after first six months.** Undernutrition was particularly high in Bihar and Uttar Pradesh, while the problem of wasting was most evident in Bihar and Orissa, which also have among the highest infant mortality rates in the country (1).

A study by Gopalan et al nearly three decades ago clearly showed that the greatest increase in height in a preschool child (1 – 5 years) was between the age of 1 – 2 years. It was much less there after (2).

BANGLADESH (3) : Improper weaning practices were observed and labelled as a cause of early childhood malnutrition in Bangladesh. Too early commencement of complementary feeding (within a month of the child's birth) was also a problem. Semi-solid and solid food (mostly boiled rice) was given to all children by the time they were a year old – but in tiny amounts. The urban and rural poor were similar as regards prolonged breast feeding. But the urban poor gave more snacks, earlier supplements such as rice, extra milk, fish, egg and vegetables to the infant. More complementary food and a better level of hygiene improved their growth even under **impovrished conditions**. Apparently IEC alone did reduce malnutrition to some extent (4).

NEPAL (3) : A Nepal Nutrition Survey clearly showed that the most critical age in the Nepali child's life was 12-23 months, when 80% were undernourished (weight for age), and 48% had a less than normal height for age (5). Another study indicated that the prevalence of undernutrition in the Under Twos was very high (6).

SRI LANKA (3) : In Sri Lanka about 25% of mothers in urban areas begin giving semisolid food after the fourth month as compared to 6% in

rural areas. Solids such as "rusks' and "biscuits" are offered in significant amounts only after the child is six months (7).
Malnutrition prevalence in children is lower in Sri Lanka than other South Asian countries. Rural children have a better exclusive breastfeeding pattern compared to their urban counterparts. The "Thriposha" project which promotes a high protein fortified food began in 1972, in collaboration with CARE. Wheat from PL480 programme was diverted to prepare a weaning food "Thriposha" is a cereal-based weaning food for the undernourished pre school children, undernourished children in primary grades, anemic, pregnant and lactating women and ward patients. "Thriposha" contains wheat-based products such as flour and wheat protein concentrate, defatted soy flour, refined soy oil, vitamins and minerals, a percentage of pre-cooked local cereal-based flour and soya. The promotion and intensive coverage of the supplement will be a major task for health planners of Sri Lanka.

It can be seen from **Table 2** that the child 1-3 years, of age is most deficient in Vitamin A, Vitamin C, Riboflavin, Calcium, Niacin, Thaimin, Energy and Iron. Since the nutrients are available to the child from the staple cereal, much of the iron would not be available to the child. (**8**). Recent studies indicate that most South Asian children are deficient in zinc. The requirement is 5 mg/day (**9**).

In sum the child needs all the micronutrients to be provided in his complementary food.

Q.2 What are the Nutritional Requirements for the Under Twos in South Asia?

I have considered the Recommended Daily Allowances for the Indian Child to be most applicable for South Asia.

The nutrient requirements for the early infants (6 - 12 months) & children (1 – 3 years) as recommended by the Indian Council of Medical Research, 1992 (**10**) is set out in **Table 3**.

The Dietary Guidelines for the infant (6-12 months) & the 1 - 3 year age group as per the National Institute of Nutrition (NIN), 1998 is repoduced in **Table 4 (11)**. One notes straight away from **Table 4**, that most of our Rural, Tribal & Urban children aged 6 to 24 months are in no way

fortunate enough to receive the balanced diet recommended by NIN. In North & West India the children under two receive miniscule amounts of dal-roti, while in South & East India they receive rice/sambhar/dal. The child, fortunately, is on breast-milk right into his third year. The National Family Health Survey found breast feeding to be universal in India, with 95% of all children born in the four years preceding the survey having been breast fed. However, among children aged 6-9 months, less than one third were receiving solid or mushy food (amount not specified) in addition to breast milk.

Items listed in the NIN Balanced Diet for infants and young children such as top milk, roots & tubers , green leafy vegetables, fruits, fats & oils & sugar are luxuries beyond the means or comprehension of any typical rural or urban, poor Indian household. These expensive items of fruits, vegetables, milk & pluses are the **dietary avenue** to supply vitamins & minerals to the young child which almost all the LIG, or even MIG, urban or rural households **cannot afford**.

Q. 3 What is the Role of Supplementary or Complementary Foods for the Under Twos?

(i) Importance of Complementary Feeding for the Under Twos : Supplementary nutrition is a nutritional intervention, which aims to make up for the deficit in the child's diet. The supplement provides the child with energy, proteins and micronutrients. Various nutritional programs have demonstrated the importance of supplementary nutrition and the difference it has made to the nutritional status of the vulnerable age group.

Data from CARE-India's Project Poshak revealed that:

- The experimental group (6-11 mths; 12-23 mths; and 24-36 mths) which received Instant Corn-Soya-Milk which was fully fortified with vitamins and minerals, significantly improved their nutrient intake status versus a matched control group.
- However, one could see glaring deficits in the control group relating to calories, Vitamin C, calcium and iron, in the infant (6-11 months) The deficit got accentuated with respect to calories, Vitamin A and C, calcium and iron in the **12-23 months old child**. This is because the volume of breast milk drops and the amount of complementary home diet is very

meager. Data show that the 2-3 year old child is able to fend for himself/herself better than the younger age groups as he/she is practically on the home diet. Great deficiencies in Vitamin A and C persist (**12**).

Consequently most infants have to depend on fortified supplementary food to obtain their RDA of vitamins and minerals, at least partially. Every attempt should be made therefore to see that the complementary or supplementary food :

- is fortified with 80% to 100% of the child's RDA, especially that of Vitamin A, B – complex, Vitamin C, iron, zinc;
- is low-bulk (soupy) yet high in nutrient density, so that the child can consume all or atleast almost all of his/her ration in one or two sittings; and
- gets to the home of most children under two, through delivery channels such as Take Home Rations (THR)

(i) These three important conditions need to converge if children are to benefit from supplementary food.

(ii) It is of utmost importance that policy makers, implementers and the public health and nutrition community recognise these facts.

(iii) It is unfortunate that not even nutritionists and deiticians have sufficiently realised that the consistency, nutrient-density and the amounts an infant can consume at a sitting vary enormously for a 6-9 months old; a 9-12 months old; a 12-15 months old and so on till the child reaches his/her second birthday. More operational research and field-testing need to be done in this area.

(ii) Timely Complementary Feeding Rates in India : The Indian National Family Health Survey (1992-93) revealed a wide range among the Indian states as to when food (liquid, semi solid or solid) was first introduced into the diet of an infant 6 – 9 months of age. It ranged from a mere 9% in Rajasthan to relatively high 69% in Kerala. However, no nation-wide survey has been able to **quantify** the amount of complementary food given to the infant. Such a survey is urgently required to be conducted. (The results of the above survey are reproduced in **Table 5**).

We end this section by reproducing relevant parts of the ACC/SCN statement in 1992 on the benefits of preventing **growth failure** in early childhood **(13)**:

(i) "Growth in young children tends to falter very early in many developing country populations, usually beginning by four to six months and ending by two to three years of age. This growth failure is often pronounced, so that by three years of age the size of the majority of children is outside the normal range expected in a well-nourished, healthy population".

"Specially, some significant recent evaluations have shown that supplementary feeding programmes, where enough food is delivered to and consumed by young children in need are effective in :

- Preventing growth failure;
- Protecting against the negative effects of diarrhoeal diseases on child growth;
- Improving educational performance, in later days.

(ii) Programmes that integrate interventions designed to attack the multiple causes of growth failure are most effective in improving child growth. These programmes can be viewed as investments in the future, for they lead to adults with a greater capacity for health, and productive lives. Interventions that prevent growth failure in early childhood, it is now clear, can be expected to have a range of important short and long term benefits".

Table 1 : Selected Indicators of the Nutritional Profile of the 'Under Fives' in India, Bangladesh, Nepal and Sri Lanka :

INDICATOR	INDIA (%)	BANGLADESH (%)	NEPAL (%)	SRI LANKA (%)
Children underweight	50	56	49	31
Children stunted	63	51	51	16
Children wasted	17	15	9	NA
LBW babies (<2500 g)	30	50	33	18
Prevalence of Vitamin A deficiency	0.70 Night Blindness	0.78 Night Blindness	0.33 Bitot's spots	0.6 Bitot's spots
Prevalence of Iron Deficiency Anemia	56	73	78 School Children	45 School Children
Prevalence of Iodine Deficiency Disorder	23 – 65	50	40 School Children	14 School Children
Exclusively Breast fed upto 3rd month	51	54	36	24
Breast fed with complementary food (6-9 month)	31	30	80	60
Breast feeding until 20-23rd month	87	67	NA	66

Note : Adapted from Nutrition in South East Asia, SEARO, New Delhi, 1999, and Malnutrition in South Asia : A Regional Profile, 1997.

Table 2 : Average Nutrient Intake in Indian Under Threes in India Vs their RDA (8) :

Age (years)	Energy (Kcal)	Prot (g)	Ca (mg)	Fe (mg)	Vit A (ug)	Thaimin (mg)	B2 (mg)	Naiun (mg)	Vit C (mg)
1-3	908	23.7	256	10.2	117	0.52	0.37	5.55	14
RDA 1-3	1242	22.0	400	12 0	400	0.60	0.70	8 00	40
% of RDA 1-3	73%	108%	64%	85%	29%	87%	53%	69%	35%

Note Adapted from the National Nutrition Monitoring Bureau Repeat Surveys (1998-90), National Institute of Nutrition, Hyderabad.

Table 3 : Recommended Daily Allowances for the Infant (6 -12 months) & the Child (1 - 3 yrs)

Group	Infants	Children
Particulars	**6-12 (months)**	**1 - 3 (years)**
Body wt (Kg)	8.6	12 2
Net Energy (kcal/d)	843	1240
Protein (g/d)	14	22
Fat (g/d)	25	25
Calcium (mg/d)	500	400
Iron (mg/d)	12	12
Zinc (mg/d)	5	5
Vitamin A (ug/d)	350	400
β - Carotene (ug/d)	1200	1600
Thiamin (mg/d)	0.6	0 6
Riboflavin (mg/d)	0.7	0.7
Nicotinic acid (mg/d)	8.0	8 0
Pyridoxin (mg/d)	0.4	0 9
Ascorbic acid (mg/d)	25	40
Folic acid (ug d)	25	30
Vitamin B - 12 (ug/d)	0.2	0 2-1 0

Source Nutrient Requirements and Recommended Dietary Allowances for Indians The Indian Council of Medical Research. New Delhi, 1992 **(10)**.

Table 4 : Balanced Diet for Infants & Children.

Food Groups	Infants (6-12 months) Amount/ day (g)	Children (1-3 years) Amount/ day (g)
Cereals & Millets	45	120
Pulses	15	30
Milk (ml)	500	500
Roots & Tubers	50	50
Green Leafy Vegetables	25	50
Other Vegetables	25	50
Fruits	100	100
Sugar	25	25
Fats/Oils (visible)	10	20

Note : Top milk of 200 ml has to be given even in case of breastfed infants.

Source : Dietary Guidelines for Indians – A Manual. The National Institute of Nutrition, 1998 (**11**).

Table 5 : Timely Complementary Feeding Rates (%) in Indian States (3) :

STATE	RATE %
Rajasthan	9.4
Assam	39.2
Bihar	18.1
Orissa	30.2
West Bengal	53.6
Andhra Pradesh	47.8
Karnataka	38.2
Kerala	69.3
Tamil Nadu	56.5
Gujarat	22.9
Maharashtra	25.0
Uttar Pradesh	19.4
Madhya Pradesh	27.7
All India	31.4

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Section B : OPTIONS FOR PROVIDING NUTRITION TO OVERCOME DEFICIENCY

To restate from Section A, it is seen that a complementary food for the Under Two has to be :

- fully fortified;
- 'liquefied' or drinkable in consistency and;
- readily available in the home of the child.

This section will address the importance of Consistency of the Complementary Food under the following questions :

Q.1 What is the problem about Feeding the Under Twos?

Q 2. What is the concept of Amylase-Rich-Food (ARF)?

Q.3 What are the advantages of a fully mirconutrient-fortified Ready-To-Eat (RTE) Complementary food with ARF?

Q.1 What is the problem about Feeding the Under Twos?

The vast majority of older infants (7-12 months) and young toddlers (13-24 months) in the developing world are chronically undernourished. Most of the undernutrition is associated with growth faltering that occurs in the so-called weaning period (6-24 months) (1). This condition is associated with a high bulk, low energy diet (2), accompanied with bouts of diarrhea contributed in large measure by the intake of contaminated left over foods (3). The most common and first complementary foods to breast milk, which is fortunately one of the most energy and nutrient dense foods (4), are small amounts of soft boiled rice or mashed chappati or breads or most commonly, viscous cereal gruels or preparations made from rice (Asia); sorghum, finger millet, maize, cassva and plantain (Africa); rice, wheat, millets, tapioca, potato (India) or sweet potato (Papua New Guinea) (5). The problem is that most poor mothers make a 5% gruel (5g of a staple cereal flour cooked in 100 ml of water), which becomes thick and voluminous on cooking due to gelatinization and water-binding capacity of the long chain carbohydrate component in the

cereal flours. Such a gruel would contribute a mere 20 Cal/100 g gruel or it would have an extremely poor nutrient density whilst having a high dietary bulk (**6**). Further, the weaning age child has a poor swallowing reflex and can consume only small portions of semi-solid preparations.

Hence, the dilemma is: how to feed enough of the traditional gruel with a high energy density? How can one modify the form and texture of a solid or semisolid weaning preparation to a pour batter consistency? In fact, how can one literally `thin' an extremely thick preparation and make it swallowable yet energy rich for the weaning child?

Q 2. What is the concept of Amylase-Rich-Food (ARF)?

The concept of Amylase-Rich-Food or ARF (**7**) directly addresses the twin problems of dietary bulk and poor energy density of most weaning gruels of the poor. ARF is nothing but germinated cereal flours which are extremely rich in the enzyme alpha-amylase. Just tiny or catalytic amounts of any germinated cereal flour can instantly liquefy or reduce the dietary bulk of any viscous multi-mix gruel in which cereal flour is the main ingredient. The alpha-amylase cleaves the long carbohydrate chains in the cereal flour into shorter dextrins. However, for enzymatic action three conditions are required in the gruel or porridge, namely, it must be homogenous, it must be moist, and it must be hot (at least 70° C). Just half a flat teaspoon of any ARF can reduce even a very high solid concentration of 45 g made up of 25 g flour, 15 g sweetener and 5 g oil cooked in 100 ml of water to soupy consistency. This remarkable property makes it possible to offer the weaning child a low viscosity yet high energy dense preparation from habitual ingredients that are used for young child feeding even in poor homes. ARF will act equally well on any gruel prepared from homogenized `khichidi', or from `chappati', biscuit or bread powder, or Soya-Fortified-Bulgar-Wheat powder. **The single and unique contribution of ARF is that it can permit the mother to mix in much more flour into the gruel and consequently make it high in energy density, yet low in viscosity and dietary bulk (Table 1).**

Germination of pulses and cereals are part and parcel of the culinary culture of Asia and Africa. ARF preparation is relatively simple as it is broadly based on germination. A small amount of any whole cereal

grain (100 g or so) is steeped overnight in 2-3 times its volume of water, the excess water drained, and the moist swollen seeds germinated in a moist dark environment for 24-48 hours till the sprouts are evident. The further steps are sun-drying for 5 to 8 hours and lightly toasting the grains on a flat skillet to remove any surface moisture. The sprouts are removed by hand abrasion and the grains are milled or powdered. This is stored in an air-tight bottle or plastic container. This small amount of ARF for a cost of about Rs. 2/- to 3/- (in 2000 AD), will suffice for one child's gruel for one month. It need be made also only once a month (8-12). Summing up the advantages of ARF preparations are :

- cheap cost;
- widely known and practiced household technology;
- small amounts to be made only intermitently, and;
- adaptability of making at the household, the community or even at the scaled-up commercial level.

In fact a barley malt which sells from Rs. 16-20 per Kg. at current rates, can be directly purchased from beer breweries, and be milled and packaged into 5 g packets with or without the micronutrients, which the mother can buy (13-18). Germinated soughum flour has been used for the same purpose in Tanzania.

Q. 3 What are the advantages of a fully mirconutrient-fortified Ready -To-Eat (RTE) Complementary food with ARF?

As explained at Answer 2, the transformation from a thick or pasty complementary food to a 'drinkable consistency' is the miracle of ARF. An infant/toddler (6-24 months) can easily consume 3 to 5 times of an isocaloric yet nutrient dense complementary food with ARF Vs one without ARF **(19-22). It stands to reason that unless the child consumes his/her entire ration of the complementary food, the vitamin and mineral fortificants will also go waste. The liquified yet nutrient-dense complementary food, therefore becomes the conduit or channel to deliver the entire RDA of micronutrients to the infant and toddler.**

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Table 1

Reduction in viscosity of 20% hot paste slurries with the addition of 0.8g wheat ARF

Hot paste slurries prepared with	Viscosity in Centipoise Units	
	Control gruel	Experimental gruel
1. Soya Fortified Bulger Wheat	22400	1210
2. Low fat Marie biscuits	8100	2460
3. Medium fat glucose biscuits	15200	5000
4. High fat biscuits (salty)	3800	2520
5. Bread	9200	2360
6 Khichdi	18000	10700
7. Chapati	14800	3600

Note : In all cases 20g of the powdered material was cooked to boiling in 100 ml. water. When ARF was added it was at the expense of the substrate powder.

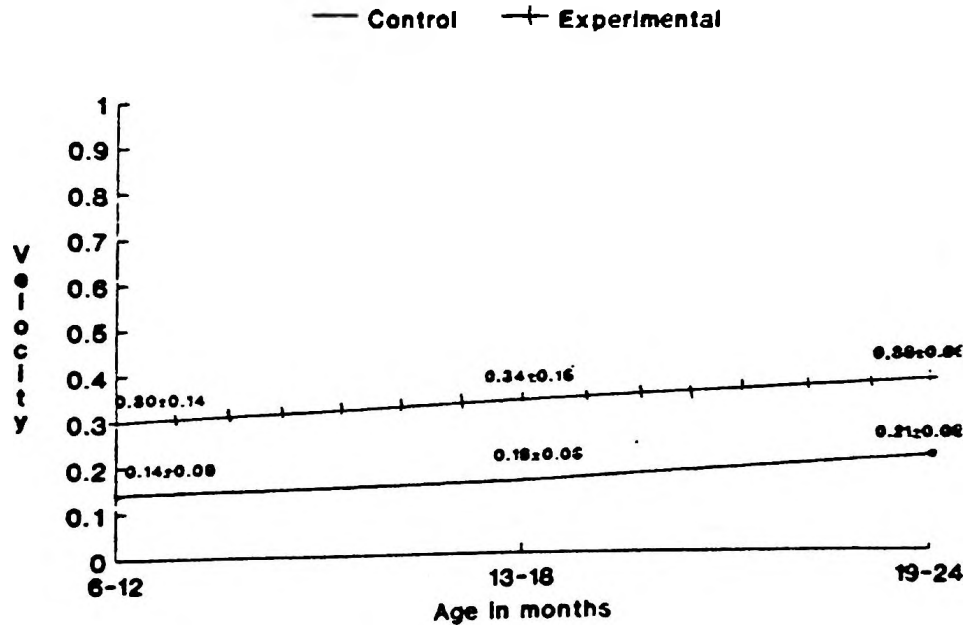

Fig 1 Weight velocity of 6-24 months old children

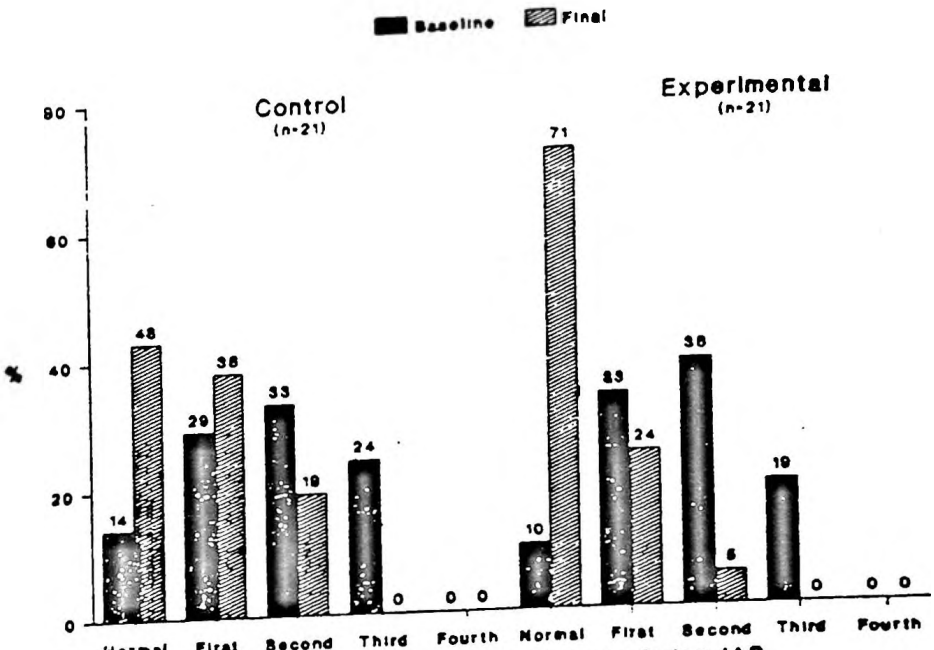

Fig 2. Nutritional status by weight for age index-IAP classification of 6-24 months old children

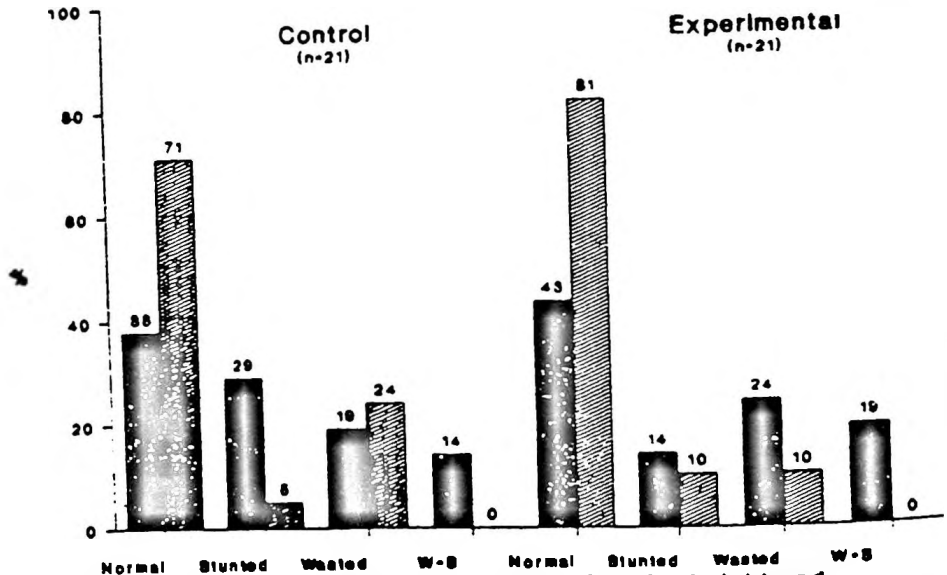

Fig 3. Nutritional status by combined weight for height and height for age-Waterlow classification of 6-24 months old children

SECTION C : TECHNOLOGY FOR DEVELOPMENT OF PREMIXES AND SUPLLEMENTARY FOODS :

The above will be answered through the following questions :

Q 1. What was India's experience with making complementary foods in the seventies?
Q 2. What is India's expertise in the commercialization of these technologies in 2000 A.D.?
Q 3. What were the major findings of the Baroda group (1980-1993)on the ARF technology?
Q 4. How can the Baroda group's findings be applied to move forward to the commercial production of approximate RTE complementary foods and/or sachets that include micronutrients and ARF?
Q 5. Who are currently the large manufacturers of vitamin-mineral premixes in India?
Q 6. Who are currently the large manufacturers of Commercial Barley Malt in India?
Q 7. Who are the manufacturers who would be interested in the Sachet idea?

Q 1. What was India's experience with making complementary foods in the seventies?

In India the technology for preparing simple roasted mixtures from cereals, pulses, oilseeds and jaggery (brown sugar) or sugar have been formulated by many research groups for decades. Almost all have been field tested, were found to promote growth in the child, and many have found their way into community level or state level programmes. (**Table 1**). However, the great lacunae in these early attempts at formulating these RTEs for infants, toddlers and preshcool children were :

- The concept of ARF the 'liquefier' was not even born.
- The mixes were solid. Hence, the most vulnerable Under Twos could consume very little of his/her ration.
- None of them were fortified with vitamin-mineral premixes.

Q 2. What is India's expertise in the commercialization of these technologies in 2000 A.D.?

In the present scenario of 2000 A.D., India and other countries have advanced tremendously. Linear programming is used routinely for evolving nutritious low-cost complementary foods. It has the state-of-the art plants or factories in both the Private and Public sector with large capacities for making complementary or weaning foods. Technologies such as extrusion; roller/drum drying; spray drying; addition of the entire or a large proportion of the RDA of vitamins-minerals requirements; and the ARF technology (**Table 2**). In addition, the technique of Linear Programming to obtain least cost multimixes to deliver a stated amount of energy and protein is also possible.

Q 3. What were the major findings of the Baroda group (1980 - 1993) on the ARF technology?

Between 1980 and 1993, my research team in Baroda established the following findings :

- Toddlers consumed significantly greater amounts of fully malted mixes of wheat flour, chick pea flour and powdered groundnut flour than equivalent roasted mixes. However, the task of germinating, drying and powdering large quantities of cereal and pulses was cumbersome and laborious (**1**).
- Catalytic amounts of any germinated cereal grain (malt) powder, such as wheat, millet and barley, can liquefy virtually any cereal based viscous gruel. This is because of their high content of alpha-amylase, which has the power to break down starches into smaller units almost instantly at boiling temperatures. These malt powders were named amylase-rich-food (ARF).
- By virtue of the drinkable consistency, a child could consume three to five times more of the treated food per sitting. Hence, the child received more food energy/nutrients (**2,3**).
  Traditional gruels were made more energy-dense by cooking 40 g of staple flour + 5 g of ARF + 200 ml water. Toddlers were easily able to consume this amount, so obtaining 180 calories from a typical traditional gruel. Addition of oil and sugar raised the calorie intake to 200-250 Kcal/200ml (**4**).

- The addition of ARF to donated foods such as soya-fortified bulgar wheat powder significantly increased calorie density and intake in infants/toddlers 6-24 months old (**5**).
- Mothers in urban slums were taught to make wheat ARF. They found the germination process laborious. However, they were more than willing to buy 5 g of ready-made ARF as an additive, even at Rs 2/- per packet or Rs. 60/- per month (1 USD = 43 Rs.). Nevertheless, they preferred to buy ARF-treated "fullfeed" packets of 50 g or 100 g for Rs. 3/- or Rs. 5/- each respectively. (**6**).
- ARF was found to liquefy khichadi (a boiled rice/lentil food), chappati pieces soaked in water, corn-soya mix and soya-fortified bulgar wheat powders (**7**).
- In a controlled six-month trial of infants and toddlers fed a high-energy, low-bulk gruel (with ARF) or an isocaloric high energy, high-bulk gruel (without ARF) in addition to their habitual home diet, intakes of the low-bulk gruel were significantly higher (91 ± 28 ml or 148 ± 46 Kcal per ad-lib feed) than intakes of the high bulk gruel (26 ±11 ml or 42 ± 18 Kcal) (**8**). Children on the low-bulk gruels also grew faster (**9**) .
- The ARF technology was very successful in nutritional rehabilitation (**10**). A major breakthrough was achieved when commercial barley malt powder was shown to have the most powerful ARF activity (**11**).

Q 4. How can the Baroda group findings be applied to move forward to the commercial production of appropriate RTE complementary foods and/or sachets that include micronutrients and ARF?

Liquefication of complementary weaning foods with ARF promises to be a valuable technology to reduce the burden of malnutrition in infants and toddlers in developing countries. In India, for example, parents from an enormous pool of increasingly mobile, low-income families are looking for moderately priced weaning foods they can buy on a regular and sustained basis. They currently buy expensive brands but feed them in very small quantities. There is a strong habit among most Indians to buy food commodities such as milk and condiments in small amounts for the day. Preliminary participatory research assessments have shown that even low-income couples are earning total incomes of Rs. 4000/ - 5000/- per month (100 – 125 USD). They are more than prepared to pay Rs. 3/- for a single feed of 50 g right through a child's weaning period (6-24

months). **The concept of "sachets of CBM + the entire RDA of micronutrients" also appeals to them very much.**

CBM can be sourced like any of the other ingredients in weaning foods in the open market or from the local liquor or malt food industry. With CBM at Rs. 20/- per Kg as against Rs. 16/- per Kg for sugar, there would be hardly any extra cost. In fact the fuel costs of extrusion can be greatly reduced if ARF is added to the slurry prior to extrusion as shown by Buffa in 1971(**12**). CBM sells at only 20 US cents per Kg in USA; so USAID, CARE and WFP should seriously consider sourcing this food commodity in addition to soya oil, CSB and SFBW. The Government – run ICDS weaning food plants would only require 2000 tonnes of CBM for the 100000 tonnes of weaning food they produce per annum. The ARF can be blended or mixed into the complementary food with the vitamin-mineral mix at the last stage of processing.

The question might be posed as to why more research with commercial barley malt ARF is needed? **We feel there are cogent reasons for large multi-country operational research studies in South Asia :**

- Commercial barley malt is by far the most powerful ARF we have tested. Just 5% CBM can liquefy a ready-to-eat ration (50 g in 100 ml boiling water) which wheat ARF can not do. Hence, a 50 g complementary food in 100 ml of water can deliver an extra 200 Kcal + 6 g protein.
- An infant or toddler can easily consume about 100 ml of ARF – treated complementary feed at one sitting.
- A low-bulk or "drinkable" feed fortified with the child's entire RDA of micronutrients (**Table3**) would also improve the child's micronutrient and nutritional status.
- The concept of a measurable and adequate amount of complementary feed could be introduced through the concept of a daily 50 g packet per day. The concept of hygiene could be introduced through the "daily packed ration". Since the entire amount can be consumed at one sitting, much of the problem of microbial contamination will not arise.
- Extrusion and individual packing are recommended to ensure a shelf life of more than a year. Simple roasted mixes have a shelf life of only 3-4 months.

- Rice and green gram are accepted all over South Asia as being the most digestible cereals for the infant.

- The economic position of the low-income group is much better now. The expectations are higher. They are prepared to pay for their child's nutrition and health, provided such complementary food packets or sachets are affordable and easily available.

The concept could be extended to any population or condition requiring a high-energy, low-bulk food (e.g. geriatrics, tubal feedings, refugees, pregnancy). What is now needed is an organisation or company that is ready to take this initiative and bring the technology to a level that will allow this complementary food to be produced commercially.

Q 5. Who are currently the large manufacturers of vitamin-mineral premixes in India?

They are :

- Nicholas Piramal (I) Ltd
  Vitamin and Fine Chemicals Division,
  100, Center Point, Dr. Ambedkar road,
  Parel, Mumbai 400 012.
  Tel : 4134653, Fax : 4172881

- Jeevee Foods (P) Ltd.
  No. 259, Tejas Arcade,
  Sanjay Nagar Main road,
  Ashwathnagar,
  Bangalore 560 084
  Tel : 3410394, 3416310, 3410552

- Locost
  1st floor, Premanand Sahitya Sabha Hall,
  Dandiya Bazar, Baroda 390 001
  Tel : 553319, Gram : LOCOST

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- Locost
  1st floor, Premanand Sahitya Sabha Hall,
  Dandiya Bazar, Baroda 390 001
  Tel : 553319, Gram : LOCOST

Q 6. Who are currently the large manufacturers of Commercial Barley Malt in India?

- Mr. P.K. Jain or Mohit Jain
  Malt Company
  Khandsa road,
  Gurgaon, Haryana.

- Mr Puran Chand
  Bar Malt
  Jharsa road,
  Gurgaon, Haryana.

- United Breweries
  Bangalore.

Q 7. Who are the manufacturers who would be interested in the Sachet idea?

- Jeevee Foods, Bangalore.
- Biocon, Bangalore.
- Hoffman-La Roche, Mumbai.
- Ranabaxy, Delhi.
- Hindustan Lever Ltd., Mumbai.

Table 1 : Protein enriched RTEs for infants, toddlers and pre-school children at the community and industrial level :

REFERENCE	PRODUCT	INGREDIENTS
COMMUNITY LEVEL :		
1. Pasricha et al (1973)	Ready-to-mix powder	60g cereal (wheat, bajri or ragi) 15g pulse (roasted bengal-gram), an oilseed and 40g sugar jaggery
2. Devadas et al (1974)	Weaning mix	Cereal (cholam, ragi or maize), pulse (roasted greengram or bengal gram dal), oil seed (roasted groundnut) and jaggery
3. Gopaldas et al (1975)	Poshak (a)	Cereal (wheat, maize, rice or jowar), pulse (chana dal or mung dal), an oil seed (groundnut) and jaggery in the proportion of 4 2 1 2
	Poshak (b)	Same ingredients as Poshak (a) but in the proportion of 60 17 14 9
5. Chandrashekhara et al (1976)	Kerala indigenous food (KIF)	Tapioca rava, soya fortified bulgar wheat (SFBW) rava and groundnut flour
6. ICMR (1977)	Ready-to-consume mixture	Roasted cereal (cholam, maize, ragi or bajra). Pulse (roasted or sprouted bengalgram, greengram or foxgram), oil seed (groundnut, groundnut/sesame cake flour.)

Table 2 : Weaning food formulations developed in various countries

Product	Country	Primary Ingredients
Balanced malt food	India (CFTRI)	Cereal, malt, pulses, and skim milk powder
Bal-ahar (dry-blend)	India ((FCI formulated by CFTRI)	Wheat flour, groundnut flour, Bengalgram flour and skim milk powder
Flakes (Macaroni process)	India (CFTRI)	Edible groundnut cake flour, Bengalgram flour, greengram flour, wheat flour
Precooked weaning food of different formulae (Roller dried)	India (CFTRI)	Cereal flours, pulses and oilseed cakes
Bal-Amul and Bal-Amul cereal with milk (Roller dried)	India (NDDB formulated by CFTRI)	Cereal flours, pulses, soya flour, skim milk powder
Nestum	India	Soyabean flour, milk powder
Farex	India (Glaxo)	Cereals and milk powder
Lactogen	India (Nestle)	Wheat flour, milk
Incaparina	Columbia	Maize flour, cottonseed flour, soyabean flour, vitamin A, calcium cabonate
Pronutro	S. Africa	Maize flour, soya, groundnut wheat germ, skim milk powder, fish flour
Corn soya milk	U.S.A.	Precooked maize, defatted soya flour, skim milk powder, $CaCO_3$, vitamins
Caplapro	U.S.A.	De-germinated maize flour, wheat flour, soya flour, skim milk powder, $CaCO_3$, vitamins
Superamine	Algeria & Turkey	Hard wheat flour, chick-pea lentil flour, skim milk powder, vitamins
Faffa	Ethiopia	Wheat flour, field pea flour, skim milk powder, chick-pea lentil
Duryea	Columbia	Defatted soya flour, high lysine corn flour, corn starch, milk powder, vitamins, minerals
Peruvita	Peru	Cottonseed flour, Quinoa flour, skim milk powder, sugar, spices, vitamins
Laubina	Beirut	Wheat, chick-pea, and skim milk powder

TABLE 3 : Nutrient value of CSB and Oil

65g Ration of CSB + 8g of Oil	Nutrient Value	Percentage RDA
Food Energy	319 Kcal	26
Protein	11.7 g	53
Vitamin-A	1105 IU	69
Riboflavin	0.33 mg	47
Folic acid	13.00 mcg	43
Vitamin C	26.00 mg	65
Calcium	520.00 mg	130
Iron	11.70 mg	98
Zinc	1.95 mg	39
Iodine	32.50 ppm	108

Source: Nutrient Requirements and Recommended Dietary Allowances for Indians, The Council of Medical Research, New Delhi, 1992.

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SECTION D : PRODUCTION/PACKAGING/STORAGE AND DISTRIBUTION

This section will describe a 2000 AD effort to deliver a Complementary Food + ARF + the RDA of all the required micronutrients for an Indian child Under Two years of age.

The Food Manufacturer (in question) is Jeevee Foods Pvt. Ltd., Bangalore. Please refer to **Table 1** in this Section for details of the composition used for the production of one of the variants of the Complementary Foods. Jeevee Foods is the first manufacturer who is prepared to make tailormade complementary foods at reasonable cost. The responses as listed have been given by the CEO himself.

However, a daily cost of some Rs. 14/- to deliver 400 Kcal + the RDA of micronutrients, may well be unaffordable by the LIG and MIG families. They may revert to their habit of making the product stretch by feeding the child quantities well below the optimum.

Q 1. How is the complementary food produced ?
Q 2. How is of the complementary food packaged ?
Q 3 How is the complementary food stored?
Q 4. How will the product be distributed ?
Q 5. How much RTE or complementary food does the Public Sector produce per annum?
Q 6. What are the other countries/parties involved in Food Production?

Q 1. How is the complementary food produced ?

Please refer to Fig. 1 for a flow sheet of the Extruded Complementary Food. Jeevee Foods also has a plant that produces 500 kg. of the Roasted variety of the RTE/day. The Plant can produce 500 Kg of complementary food or a total of 1 MT/day x 300 working days/annum = 300 MT. It has the capacity to go to 3 shifts/day if distribution and sales are upto expectation. The launch date is 15th February, 2000.

They are test marketing their product in Bangalore city and six other districts in the state of Karnataka. The complementary food (roasted) will be sold at Rs. 52/- for a packet of 400g. The instant or Extruded variety

will sell for Rs. 56/-. This price is the **Market Retail Price** and includes all costs of production, advertising, marketing etc.

Q 2. How about packaging of the complementary food?

The product is packed into 12 micron aluminium foiled laminate pouches. The pouch is automatically sealed. The product at ambient temperature has a shelf life of one year. Trials with 9 micron laminate did not give a shelf life of one year.

The CEO of the company stated that they did try other packaging materials such as paper, light to heavy density polythene etc. but these did not have the desired shelf life. Type of packaging does push up costs but the CEO is not prepared to compromise on this.

Q 3 How is the complementary food stored?

The complementary food was stored in clean, air conditioned and a dehumidified warehouse till it was ready to go out to the market place. Since Bangalore has a cool climate, the product may well last for a year or more. Simulated shelf life tests for hot climates was not done.

Q 4. How will the product be distributed ?

The usual distribution system of using reputed salesmen/dealers will be employed. They will receive a commission.

Q 5. How much RTE or complementary food does the Public Sector produce per annum?

The ten RTE weaning food plants in India produce RTE food for the ICDS. The exact figure is not known but is about 100,000 MT per annum. The annual production of the Private Sector giants namely, Heinz Pvt. Ltd and Nestle Pvt. Ltd. is not known to us.

Q 6. What are the other countries/parties involved in Food Production?

Bangladesh and Nepal, two of the other countries under review in this report, have received the necessary equipment and grants from WFP. It

may be noted that 300 MT is the annual capacity that the Bangalore manufacturer will produce for just 6 districts out of 20 in just one state of India. Sri Lanka has received food aid, equipment and grants for setting up the `Triposha' plant.

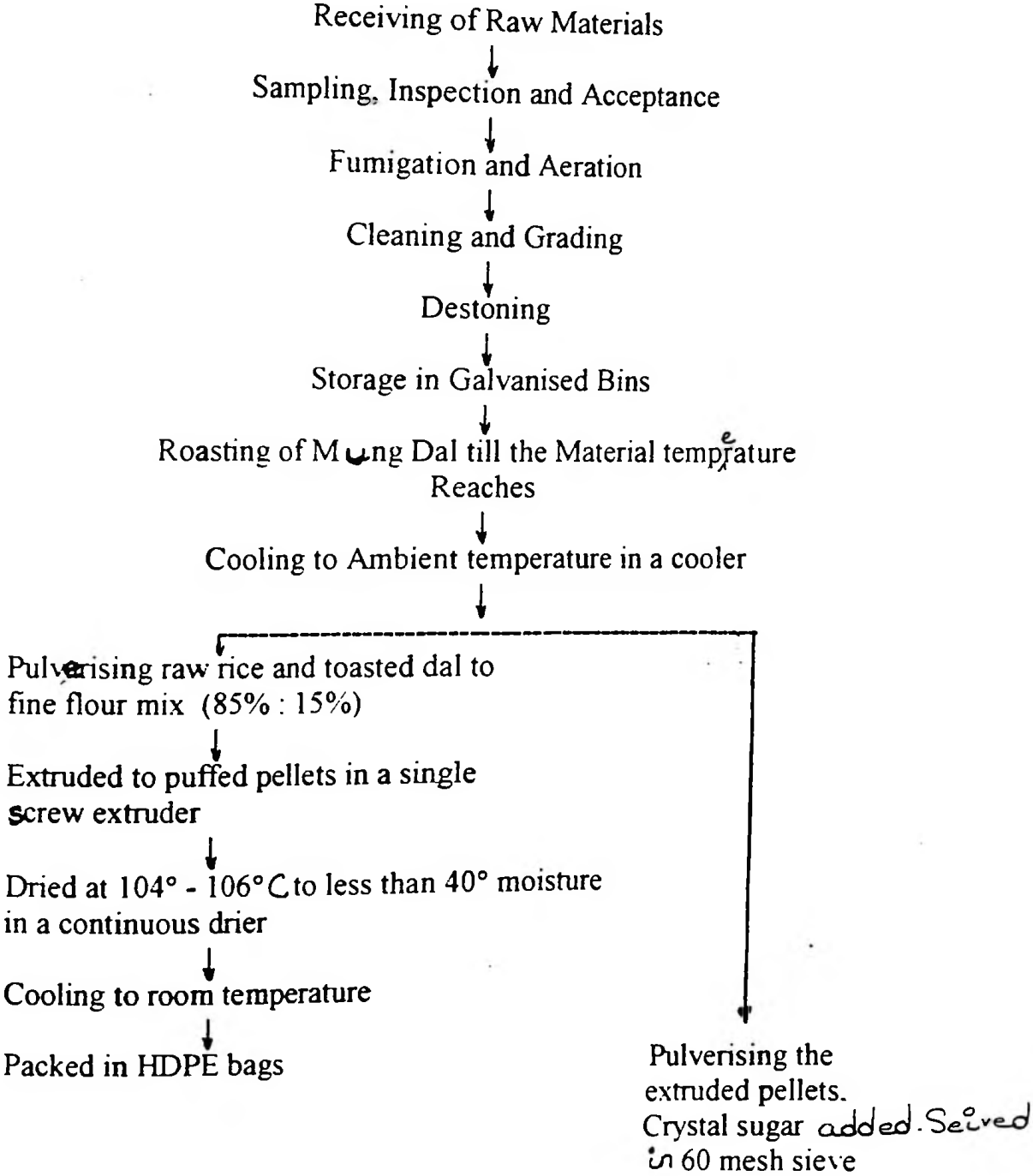
Table 1 : A simple daily "Take-Home" ration for children below two years of age, providing about 200 Kcal energy + 6 g protein for the early infant, and 400 Kcal energy + 12 g protein for the late infant, as well as a complete RDA of key micronutrients

Item	Infants 6-12 months (g)	Infants 12-24 months (g)
Ragi or rice flour	30	60
Green gram flour	10	20
Sugar	8	16
CBM powder	2	4
TOTAL* :	50	100

* Plus micronutrient mix : calcium (500 mg), iron (20 mg), zinc (5 mg), retinol (500 ug), thiamin (0.9 mg), riboflavin (1 mg), nicotinic acid (11 mg), pyridoxine (0.9 mg), ascorbic acid (40 mg), folic acid (30 ug), vitamin B (1 ug).

FIGURE - 1

Process Flow Chart For Instant Variety



Continued

Blending whole milk powder, skim milk powder, vitamin mineral premix, malt powder and a planetary mixer For 10 minutes

Collecting the powder in SS bins

↓

Weighed (calculated) quantities put into ribbon blender

↓

Blending for 15 minutes

↓

Unloading bulk SS bins/poly bags

↓

Storage at air conditioned and dehumidified room until used for bulk blending

↓

Thorough mixing/blending of all the lots of the days production in blending tank by a mechanical mixer for 20 minutes

↓

Unloading into poly bags

↓

Filling into aluminium foiled laminate and sealing the mouth

↓

Packing and duplex carton and sealing

↓

Printing of month and year of manufacture and batch code

↓

Packaging in a preprinted master corrugated fibre board carton

↓

Sealing of the master carton

↓

Strapping

↓

Warehousing

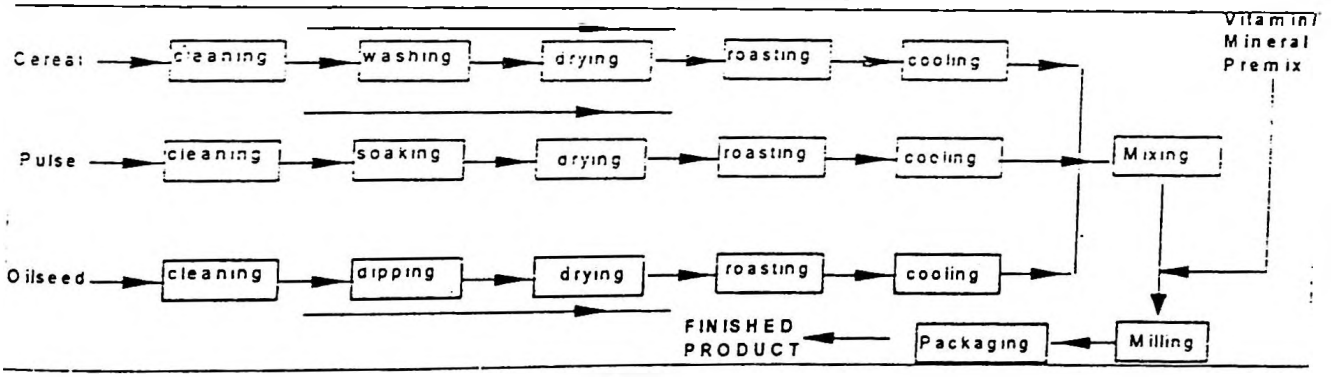
FIGURE - 2

COUNTRIES AND PARTIES INVOLVED IN INFANT FOOD PRODUCTION

Country	Product Name	No. of units & annual capacity (ton)	Technical assistance	Year of implementation
Africa				
Benn	Farine Bebe	1/100	KIT/DGIS	1979 -
Burundi	Musaiac	6/800	KIT/DGIS	1985 -
Ghana	Vitamix	1/100	KIT/NOVIB	1987 -
	Nutrimix	1/25-75	KIT/Caritas	1987 -
Kenya	U-mix	2/1,000	KIT/WFP	1992 -
Malawi	Linkundi Phala	4/600-800	KIT/WFP	1991 -
Mozambique	Farina Lactea	1/500-1,000	KIT/DGIS	1993 -
Niger	Bitamin	1/30-100	KIT/DGIS	1990 -
Sierra Leone	Bennimix	1/250-250	KIT/EC	1989 -
Asia				
Bangladash	Unknown	1/250	KIT/WFP	1994 -
Nepal	Unknown	1/250	KIT/WFP	1993 -
Latin America				
Dom.Republic	Prosur	1/30-100	KIT/Caritas	1990 -
Jamaica	Unknown	1/500-1000	KIT/Caritas	1993 -

Note: KIT = Royal Tropical Institute; DGIS = Dutch Directorate General International; NOVIB = Nethenands Organisation for International Development Cooperation; EC = European Community; WPF = World Food Programme

FLOW CHART "KIT APPROACH" INFANT FOOD MANUFACTURING



Note - This diagram has been reproduced from the report on Micronutrient fortification of foods: Current practices, research and opportunities. MI, Ottawa, Canada.

SECTION E: MECHANISMS TO IMPROVE ACCEPTABILITY, PALATABILITY, UTILIZATION AND OUTREACH OF THE DONATED COMPLEMENTARY FOOD IN THE PUBLIC SECTOR

This section will be addressed through the following questions. Corn-Soya-Blend (CSB) is a food that is widely donated in all the four countries under review to the Public Sector. I have therefore, taken it as an example from a recent consultancy I had done for CARE – India.

Q 1. How can the **acceptability** of CSB which is fully fortified with the micronutrients be improved?
Q 2. How can the **palatability** of cooked CSB rations be improved?
Q 3. How can the **utilization** of CSB be improved?
Q 4. How can the **outreach** of donated foods be improved?

Q 1. How can the acceptability of CSB which is fully fortified with the micronutrients be improved?

CARE – India supplies Corn-Soya-Blend (CSB) and Salad oil (SO) to the ICDS programme. **Table 3, Section C,** depicts the percentage contribution of a single ration of 65 g CSB + 8 g salad oil to the RDA of a child Under Two years of age.

Assuming the child 6 – 24 months consumes his/her entire ration, this would satisfy the GOI requirements of delivering 300 Kcal and 12 g protein per child per feeding day and address the nutrient gap of calories in their usual diet. However, the nutritional gap in vitamins and minerals remains.

1. CSB + Soya oil are excellent complementary foods. The only problem with the CSB is that it is gritty or grainy in texture. When cooked - it becomes pasty and non-homogenous to the touch and taste. It is not appropriate for the early infant or even the late infant. Due to its bulk and pastiness, the ' Below 2' cannot eat his full ration. Further, children upto one year of age, and even upto two, have a poor swallowing reflex and are slow feeders. Hence, feeds that are nutrient dense but 'liquidy' go down faster, without spillage or waste. There are many options to enhance its acceptability.

- Fine grind it. This could be done in the USA itself.
- Extrude CSB rather than roast it. Extrusion will powder the product & will thoroughly cook it. This could be done in the USA too.
- Blend in Soya oil, extra vitamins, minerals & 5% ARF (Amylase-Rich-Food). This should be done at the final stage.
- All these processing actions can be done at the manufacturing end and the specially processed food can be separately bagged and demarcated for children Under Two.

2. If this is not possible, the composition of the RTE complementary food, which is usually sweetened with sugar (25%), can be slightly modified as under. 5% of the sugar can be replaced by 5% of CBM. The entire micronutrient RDA of a one year-old-Indian-child (1) or 80% of it should also be incorporated into the RTE.

3. Both Project Poshak (2) & M/s IESSCO Pvt. Ltd. (3), have noted that most Indians like a fried/roasted/caramelized smell & flavour. If within manufacturing &/or processing costs, the addition of a synthetic smell/flavour could be considered.

4. M/s IESSCO Pvt. Ltd, (3) have also reported that about half the U.P. mothers in Focus Group Discussions, felt that the CSB-RTE was not suitable for the `Below Two'. They felt it was too dry, caused diarrhea, & the `Below Two' could not consume his ration. The RTE had to be made semi-solid with milk or water. They felt the dry RTE choked the young child. However, the CSB-RTE in **gruel, halwa or dalia form was suitable.**

5. The concept of `hot' & `cold' foods are firmly entrenched in most rural & tribal populations. For instance, especially in M.P. & U.P. home-diets made out of wheat, ghee, milk, jaggery & pulses, all considered `hot' would be appropriate for the cold & rainy seasons. Whereas rice, curd, lassi, goundnuts & sugar (cold foods) could be fed to the child in summer. CSB/oil recipies & ingredients likewise could be adapted to the seasons (4).

Q 2. How can the palatability of cooked CSB rations be improved?

1. The Regional Profile for 'Malnutrition in South Asia', UNICEF, 1997 strongly recommends the use of the ARF technology as a manageble, practical & traditional technology to increase energy intake of traditional low energy-gruels (5). **We would go a step further & strongly endorse the adoption of the 'ARF Technology' for the immediate improvement of the CSB - THR ration (6). CSB – THR ration without ARF are extremely bulky and pasty.** Hence, the THR becomes smooth and semi liquid while retaining all its good nutrition. Adding amylase rich food to the CSB enables children under two to drink the cooked ration in **one or two feeds (Table 1).**

2. For the 'Below Twos', especially the 'Below One', it is the **consistency & texture of the complementary food** that are of paramount importance. But to a mother-child dyad, it is she who decides. Most Indian mothers like a caramelized or roasted taste & flavouring. Both the mothers & the babies like it sweet. Intakes by children definitely are better with a sweet tasting preparation.

3. Sweet tasting or 'liquidy' dalia, rabadi or kheer type of recipes would be most suitable for the early-infant in M.P. & U.P. It would be the payasam counterpart in A.P.

4. The older child (1 - 2 years) may like laddu, which the mother can make by roasting the grainy CSB in the Soya-oil, add some jaggery & fashion into laddus, halwa, sattu or prashad. Salty prepartions would be chappati, paratha, dosai or uppumav. Our interactions with the mothers in U.P. (particularly in U.P.) , M.P. & A.P. showed that most of the mothers generally wanted **to cook only** twice **(morning & evening)** perhaps **due to fuel & time constraints.** They usually chose to make the same dish that was most convenient for them to make, For instance, roti in U.P. & M.P., & uppumav in A.P. Even sweetening the CSM with jaggery or sugar was a special treat. **In short, the mothers were not enterprising about varying the CBM-oil recipes for the 'Below Twos'.**

Q 3. How can the utilization of CSB be improved?

Although there is **clear evidence** that **THR** has **reached the homes** of the 'Below Twos', it is still a question mark as to how much of the **THR** gets into the stomachs of the 'Below Twos'. **This is the current problem.** There is a lack of sufficient appreciation among all concerned, namely, the ICDS Health & Non - Health Staff, the INHP - CARE Staff, the community & the mothers, that unless **a major portion** of the **THR** is fed to the intended 'Below Two', he/she will **not** improve in **weight or health.** At the moment, about a fourth to third of the ration may be consumed by the 'Below Two', while the rest is consumed by other siblings & the family.

Possible solutions :

1. The concept of a **full THR** for the 'Below Two' has to be actively promoted by the ICDS - Staff , Health Staff, Panchayat, Village Health Practitioners, Village School Teachers, Change Agents & adolescent girls.

2. Change Agents, & adolescent girls can advice & ensure that the **THR** is given to the 'Below Two', when the 'Above Two' is at the Aanganwadi. This will greatly minimize sharing.

3. On the **Nutrition Health days,** repeated **cooking demonstration or 'demos'** of the cooked up **THR** may be done. A single demo 'baby' of 6, 9, 12 months etc. can be fed **in front** of the mother group. They will then learn two important facts :

   a) the amount that can be consumed by the infant;

   b) that the **amount** consumed per sitting will increase with age. Even a few months difference in age would make a big difference in consumption. Probably by 18 months, the **entire THR ration would be consumed by the child at a sitting.**

4. Mothers can be requested to bring their home-tumblers or katoris. These can be calibrated for CSB & oil **single rations.**

5. The mother should be encouraged &.counselled to give the **full THR ration over 2-4 feeds.** She usually gives **small amounts** twice a day. She must be told to feed the 'Below Two' when the 'Above Two' is

at the Anganwadi Centre (AWC) - preschool. Minimization in 'sharing' can be achieved in this way. The above concept was not found to be strong at any level (ICDS, NGO, Health Staff or even the CARE - INHP Staff). It needs to be built into Training/Capacity Building.

6. All concerned should become familiar with the number of pieces a particular **Single Ration would yield** e.g. how many laddoos, dosais or the **amount** of halwa, sheera, payasam etc. This concept does not exist at present.

Q 4. How can the outreach of donated foods be improved?

As of March, 1996, 5614 ICDS - Projects covering 21.3 lakhs of beneficiaries have been sanctioned by the GOI. The seven states where CARE is assisting the ICDS have particularly **large numbers of projects.Interrupted delivery** of supplementary nutrition has been a **perrenial problem** in the ICDS. Delivering the food component from the Block to the AWCs especially the farflung ones has also been a perrenial logistical & monitoring problem. Even **within the village**, the generally 'invisible' categories of beneficiaries at the AWC have been the Pregnant and Lactating & 'Below Threes'. The problem of **outreach & contact** becomes aggravated during the peak agriculturally Months/ Seasons.

The Planning Evaluation Organization (PEO), 1976, (7) and the ICDS National Evaluation in 1992 (8), pointed out that children under three could not make it on their own to the AWC. Project Poshak in MP, 1975 (2), also showed that the children below three could not be transported every day to a feeding center for spot feeding. The problem is even more accentuated for children Under Two especially in scattered tribal hamlets, hilly areas or even within a village. CARE – India's baseline survey, 1997 reports that 40% children Under Two years of age were brought to the AWC in the past one week for spot feeding, a figure often grossly over-reported by the AWC workers (9).

Possible solutions :

1. The mode of delivery has to be '**THR**' especially for the 'Below Twos'.

2. However, the **THR** has to be made **attractive & meaningful** to the mothers in order **that they come regularly** to collect the **THR** for the 'Below Twos'.

3. As stated earlier the **THR** has to be **appropriate & demarcated** for the 'Below Twos'.

4. CARE has shown the way by organizing **Nutrition - Health Days**, where both the functionaries of the ICDS (AWW & Supervisors) & Health (ANM) are present. The 'Below Twos' are weighed & the **THR** is distributed. Mothers willingly help & participate. This is an **excellent mechanism & strategy that needs to be taken-up by the entire National ICDS.**

5. Possible areas that can be strengthened are **counselling** on the child's weight **& repeated demonstrations of cooking & feeding THR rations to infants 6 - 9 mts; 9 -12 mts; 12 - 15 mts & so on.** The Nutrition Health Staff as well as the mothers will realise how much a **cooked portion of a single ration** will be & how much of this an infant of a **specific age group** can consume over a reasonable period of time (say 20 minutes). This is the kind of **practical & visual education** that will **immediately communicate** to both ICDS staff & mothers.

6. It would be useful if the NH days are held **every 15 days** rather than **every month.** One of the NH days should be exclusively for the 'Below Twos' & one exclusively for the mothers (P & L). The village elders & members of the village Panchayat, should be encouraged to participate & get actively involved.

7. The strategy of Change Agents to ensure that the services of ICDS are understood by all; & to roundup all the 'Below Twos', & their moms is an excellent strategy for outreach. **It could be universalized in the ICDS.**

8. The setting up of 'seasonal creches' & enchancing the THR may be considered for both mothers & child beneficiaries. Since, mothers will have to stay back on NH day/s, some monetary compensation for doing so may be considered by the Village Panchayat.

Table 1 : Nutrient Value of CSB & Oil :

65g Ration of CSB + 8g of Oil	Nutrient Value	Percentage RDA
Food Energy	319 Kcal	26
Protein	11.7 g	53
Vitamin – A	1105 IU	69
Riboflavin	0.33 mg	47
Folic Acid	13.00 mg	43
Vitamin C	26.00 mg	65
Calcium	520.00 mg	130
Iron	11.70 mg	98
Zinc	1.95 mg	39
Iodine	32.50 ppm	108

Note : Source ICMR 1992(2).

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SECTION F : COST IMPLICATIONS

Fortifying foods of mass consumption with vitamins – minerals costs from a mere 0.5 to 2% of the total cost of the commodity. It would consequently be to the benefit of the Private Sector which has the production, distribution, management and marketing expertise, to demonstrate its **social conscience** and come to the aid of the Public Sector.

This section deals with the following :

Q. 1 What is the cost of premium complementary foods in the Indian market as of January, 2000?

Q. 2 What is the cost of the sachet or additive in the Indian market with or without the child's entire RDA (ICMR, 1992) as of January, 2000?

Q. 1 What is the cost of premium complementary foods in the Indian market as of January, 2000?

Costs of all goods and services have risen very sharply during the last three years in India. Even a LIG or MIG family knows it will have to spend about Rs. 10/- to 15/- per day on medicines, doctors visits, baby food (milk formula, if the child is off the breast), complementary food, family food, feeding bottles, toiletries, infant clothing etc. About a third at the very most will be set aside for its food. **Hence, it is imperative that an alternative, affordable and adequate complementary food bridge the gap between the `haves' who can purchase the premium brands in adequate amounts to nourish their child Vs the `have nots' who virtually starve their child on miniscule amounts of the very same premium brands - be manufactured as soon as possible.**

Table 1 sets out the current prices of (January 20, 2000), of cereal based complementary foods in the Bangalore market. Of the three lots, Jevee Foods may fit the purse of most LIG and MIG families. However, it is yet to market its complementary food (with CBM – ARF + all micronutrients) in a big way. Cerelac (Nestle) and Farex (Heinz India Pvt. Ltd) certainly have the lion's share of the market despite the relatively high cost of their products. We would request the Manila Forum to seriously consider our suggestion of `**one full feed pouch**' for

Rs. 5/- per pouch of 100 g that will deliver the infant's **entire RDA of micronutrients in a drinkable or soupy form.** In the urban setting such a complementary 'full-feed pouch' will be a veritible boon to those mothers who have to leave their infants at creches or day care centers. All that the mother would have to do is to make up the feed by adding 200 ml boiling water and put it in a thermos flask.

Q. 2 What is the cost of the sachet or additive in the Indian market with or without the child's entire RDA (ICMR, 1992) as of January, 2000?

The following were the costs of the ARF alone, ARF + the micronutrients in bulk, or in sachet form.

Many small entreprenurial enterprises or small scale industries can be set up. All that has to be done is to source commercial barley malt powder (CBM). Source the vitamin-mineral premix. Mix well and package it hygienically in small sachets. A local manufacturer has done this for me for lecture cum demonstration purposes. The cost per sachet in aluminium foil with a shelf life of one year is as follows :

- A 5 g sachet with only 5 g commercial barley malt (CBM) is estimated to cost Rs. 1.50/- per sachet.
- A 5 g sachet of CBM with the entire micronutrient RDA of a one-year-old child, would cost Rs. 2.50/- per sachet.
- A 1 Kg can ister of CBM – ARF which would last one child for 200 days would cost Rs. 25/- a cannister. Or a mere 12.50 paise per day.
- A 1 Kg can ister of CBM – ARF with all the micronutrients would cost Rs. 300/-. This would again last the 'Under Two' for 200 days. The cost would be Rs. 1.50/- per day.
- A 1 Kg can .ister of ragi (*Eleusine coracana*) powder or ARF would cost Rs. 40/- or 8 paise per day. It would last a child for 200 days.
- A 1 Kg cannister of wheat ARF would cost Rs. 50/- per Kg or 10 paise per day. It would last a child for 200 days.

Informal Participatory Research Assessments (PRAs) among HIG, MIG and LIG mothers showed a very positive response to the sachet of CBM – ARF + the micronutrients.

For Public Sector Feeding Programmes :

- Perhaps the well established food manufacturers could adopt ICDS projects in a particular state or district and supply the `full feeds' or `sachets'. They should not only be prepared to supply but also to manage the whole operation through production, distribution and measure its impact! The Government should waive all taxes, levies/duties (manufacturing, corporate etc). This would certainly be a partnership.
- **The Public Sector should realize that no RTE worth its name or even local foods can be given at the assigned price of Re. 1/- per child per day in the ICDS.**
- In the poor non-ICDS rural settings perhaps partnerships could be set up between the Village Panchayat, the Food Manufacturer and the parent of the 'under two'. The Village Panchayat, the Food Manufacturer and the parent can share the costs in the proportion of 40 : 40 : 20. Operational Research on the financial viability and sustainability of such arrangements should be tested out.

Table 1 : The cost of Complementary Foods (400 g) at the Current Market Retail Price :

Manufacturer	Price
I. Jeevee Foods Pvt. Ltd.	
1. Cost of Sujeevi Instant	Rs. 56/-
2. Cost of Sujeevi Roasted	Rs. 52/-
II. Cerelac (Nestle)	
1. Cerelac rice	Rs. 76/-
2. Cerelac rice and dal	Rs. 79/-
3. Cerelac wheat	Rs. 76/-
4. Cerelac wheat and Honey	Rs. 82/-
5. Cerelac wheat and Apple	Rs. 82/-
6. Cerelac wheat and Orange	Rs. 82/-
7. Cerelac wheat and Vegetable	Rs. 79/-
8. Cerelac banana	Rs. 79/-
III. Farex (Heinz India Pvt. Ltd.)	
1. Farex rice	Rs. 68/-
2. Farex wheat	Rs. 79/-
3. Farex wheat vegetable	Rs. 85/-
4. Farex wheat apple	Rs. 85/-
5. Farex wheat fruit	Rs. 85/-
6. Farex wheat egg	Rs. 90/-

SECTION G : COMMUNICATION AND TRAINING NEEDS :

Short, relevant and pitty communication is required at **every level** with respect to **complementary foods.** A disproportionate amount of Information, Education and Communication (IEC) is given regarding **breast milk.** By way of contrast, hardly any IEC is offered regarding **complementary foods in general and `nutrient dense-low bulk and fully fortified foods' in particular.** This is unfortunate **as most South Asian mothers feed their infants/toddlers as long as they possibly can (2 to 3 years from the infant's birth).**

What everyone needs to know - (the Policy Maker, the Implementor, the Master Trainers, the field functionaries and the father/mother dyad) is how very important the **intake of adequate amounts of energy, protein, vitamins and minerals every day, are for the Under Two. Breast milk and tiny amounts of complementary food just will not do. A balance has to be struck between Breast Milk and Complementary Food.**

One's IEC has to be **country, region** and **culture sensitive** and **specific.** Even to this day most of the experts for **South Asia** come from the Developed World. This needs to be changed. Use South Asian Nutrition-Health IEC experts for South Asia, South East Asian experts for South East Asia and so on.

The communication and training needs of the Public and Private Sector are quite different. Hence, a different set of questions have been posed for the Public Sector (ICDS in India), and the Private Sector (hypothetical as no Private Sector food manufacturer has exhibited the social commitment or conscience to **`sell' a complementary food** as discussed in the previous section) to the LIG and MIG families.

The Public Sector :

Q 1. How potent an influencer is .. TV in India and South Asia?
Q 2. Who are the most important groups to be communicated with and how?
Q 3. Are there any success stories about IEC towards improving infant feeding practices or the use of complementary foods?

Q 4. What about repeated demonstrations with the complementary food with children aged 6, 9, 12 and 24 months?

Q 5. What are the usual advertising techniques used by the Private Sector?

Q 6. Can the Public and Private Sector come together in IEC?

The Public Sector :

Q 1. How potent an influencer is TV in India and South Asia?

- The electronic media or TV is and probably will be the most potent influencer for behaviour change at the household level. In our most recent project on "An Information-Education–Communication (IEC) Project For Working Girls (18-23 years) On Cultural Dietary Practices To Increase The Iron Content Of Their Every-Day Diets", in peri-urban Bangalore, in 2000 AD, we found that **over 90% of our households (LIG & MIG) were using a brand of iodized salt. The great influencer was TV.** However, behaviour change can only be sustained if **the product advertised on TV, is readily available on the shop shelf and is found affordable by the target population.**
- At the present time (2000 AD) in India, the Central and State Governments are **strongly encouraging** Public and Private Sectors to beam **generic messages on population, health and nutrition** to the lay public. In the case of **Complementary Foods**, actual demonstrations of feeding infants 6, 9, 12 and 24 months **with and without fully micronutrient fortified complementary foods and with and without ARF** can dessimate vital information very fast. TV is being used for flour, , fat/oils and milk. The same can be used for the other commodities/products such as rice and sugar also.
- Village Panchayats **do possess television sets.** Hence, donors should think of not only **donating or giving computers but also TV sets to the Village and Hamlet Panchayats**

Q 2. Who are the most important groups to be communicated with and how?

Every population group in all the four countries need to know in simple layman's language as to why the 'Under Two' is so vulnerable, why he needs not only calories and protein, but also a **whole array of**

vitamins/minerals every day. The enormous advantage of having such a **complementary food** is that not only does it have all these advantages but can also be drunk up happily by the child.

- **The Policy-making Segment** : From the Prime Minister to the Ministers and high ranking officials in the concerned departments of Women and Child; Health; Welfare; and Labour (many women carry their 'Under Twos' to the field or factory or employer's home). **Special workshops and seminars with video-cassettes and demonstrations should be arranged.**
- **The Influencer Group** : **The medical world reigns supreme,** especially the **pediatrician** at the state level to the Primary Health Centre level in India. **They need IEC regarding complementary foods, more than anyone else.** Medical students should be exposed to much more practical **nutrition** including the need for **a whole complementary food for the 'Under Twos'.** The Indian Academy of Pediatrics should **strongly** support the concept of the **whole complementary food** . Most of them appear to get grounded in **neonatology, breast feeding and immunization schedules.**
- **The paramedicals** : Such as the Lady Health Visitor, the Auxiliary Nurse, Midwife do profit from IEC regarding child care and nutrition (1). However, our experience is that the end receiver, namely, the poor mother, does not (2,3). However, it is these grass root level workers who are the **real implementors** of any Public Sector program. Hence, it is a tremendous step forward if atleast they are aware of facts such as "An infant of a year requires half what his father eats".
- **Elementary School or primary school education** is going to become **universal in India.** It already has in Sri Lanka. No doubt it will also be so in a few years in Bangladesh and Nepal. The potential for change is enormous if the primary schooler (6 – 14 years) can become a **childcare messenger and tutor** to his **illiterate family.** In India alone there are 200 million in this age group. **This avenue for delivering Nutrition and Health Education (NHE) should be fully exploited.**

Q 3. Are there any success stories about IEC done for improving infant feeding practices or the use of complementary foods?

- **The Weaning Food Project** was carried out by the Manoff group in several countries in the late 1980s with the objective of developing nutritionally sound, low-cost and sustainable methods to improve young child feeding in several countries. The Indonesian project targetted the "Under Twos". The Baseline and Endline surveys did show that **IEC alone** had brought about small yet significant changes in increased home made weaning food intake and in weight-for-age and height-for-age (4).
- **The Bangladesh complementary feeding education programme,** is also an example of **IEC alone** being fairly successful in bringing about a positive behaviour change with respect to feeding more home made weaning foods to infants above 5 – 6 months of age. It was concluded that culturally appropriate nutrition messages **were successful** in changing complementary feeding practices. However, my research group and I had noted on several occassions in our IEC projects, that mothers stated that they were **unable** to make separate food for their infants on a daily basis (5).

Q 4. What about repeated demonstrations with the complementary food with children aged 6, 9, 12 and 24 months?

In our experience, this approach worked with the senior managers of CARE-India, the field workers, the literate and illiterate families. The unanimous opinion was that "We were **not** aware that children in the age group of 6 – 36 months were actually three different population segments as far as the dietary habits and problems were concerned. Now we are(6)".

The Private Sector :

Q 5. What are the usual advertising techniques used by the Private Sector?

The Private Sector relies a great deal on Market Research even before it commences on the manufacture of a product. In the case of a product like Complementary Foods, the Private Sector would find out from **Habits Surveys** and **Motivation Research** as to what the lay public expects

from the `**new Complementary Food**'. What could be the cutting edge of its visual and copy? Then would come the **Package Designs; Product Tests** with different **Package Designs; and Focus Group Discussions** with different income groups.

Assuming an acceptable complementary food was available, a **Test launch** would be planned in an urban setting. Here, the **point-of-sale display** plays an important role. The **package itself** as well as its arrangements and its various promotional aids are important in assessing its off-take, purchase and repurchase. The electronic and print media would announce the launch; promotion would continue on this front also. Again, **Market Research Surveys** and **Shop audits** would give an ongoing picture of the Complementary Food's acceptance or otherwise. In short, the Private Sector is prepared to spend a great deal on Market Research and Advertising. The Public Sector usually does not.

Q 6. Can the Public and Private Sector come together in IEC?

- They certainly should. On the 25th January, 2000, Hindustan Lever Ltd., has acquired 14 units of Modern Foods which are located in different States of the Country. This venture should be a learning lesson to both the sectors.
- The big Advertising Agencies could also show their social commitment and conscience by adopting a country, say Bangladesh, Nepal and Sri Lanka, or a State (in India) for Advertising the `new Complementary Food'. The advertising agencies should only charge actual costs. The Public Sector should **waive all taxes** in respect to the said complementary food for a stipulated period of time. It should also **recognize** and **reward** the best advertising agencies in this endevour.

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SECTION H : MONITORING AND EVALUATION :

Monitoring : Monitoring or **Process Evaluation** as it is now called is probably of even greater use in the case of a product such as **Complementary Food**. For example if the sequential steps in a Process Evaluation show that the off-take of the product was extremely poor; or if the feed-back received from the field showed poor shelf life and/or poor acceptability by the purchaser or target population, then there is hardly any point in proceeding to an Impact Evaluation. On the other hand if the Process Evaluation showed a good off-take and a purchase/repurchase picture over a reasonable period of time, say one year, then one could opt for an Impact Evaluation in a representative sample of the target population.

Impact Evaluation : Impact Evaluations are expensive and require technical and trained teams. Especially so when the target population are the **`Under Twos'**. This is generally not realized by the Public or Private Sectors.

Monitoring and Evaluation with respect to Complementary Foods can be explained with the help of following questions :

Q 1. For a commercial complementary food what would be the sequential monitoring steps?
Q 2. In the case of a donated food such as fortified Corn-Soya-Blend which generally goes into India's ICDS programme, what would be the Monitoring or Process Indicators?
Q 3. Are there any Market Research or other agencies that could collect the Monitoring Data for the manufacturer of a commercial complementary food?
Q 4. What would the Impact Indicators be?

Q 1. For a commercial complementary food what might be the sequential monitoring steps?

The major indicators of Monitoring or Process for a Commercial Complementary Food might be :

- Acceptability of the product by the general public as judged by its off-take from a representative % of stockists.
- What are the purchase/repurchase patterns over a reasonable period of time (1 year) in the High, Middle and Low Income Groups?
- If the product is stocked with institutions such as Children's Hospitals, Orphanages/Foundling Homes or Schools, what is its acceptability and purchase/repurchase picture?
- What is its shelf life at the shop, household and institutional level?
- If advertised on TV or in the print media, whether the frequency and reach schedules were adhered to?
- Feed back, especially about the **ease of use** and **cost-effectiveness** from a representative number of stockists, Institutions and a representative number of households?

Q 2. In the case of a donated food such as fortified Corn-Soya-Blend which generally goes into India's ICDS programme, what would be the Monitoring or Process Indicators?

The Evaluation Indicators could be as under :

- Anthropometric weight and length for age.
- Dietary and Nutrient Intake Surveys.
- Clinical assessment especially for micronutrient status of Vitamin A, Vitamin C, Riboflavin, Iron and Zinc.
- Biochemical status. This would be the most difficult to do as anywhere from 2 to 5 ml of blood will have to be drawn from the infant. Most parents vehemently object to this. If blood samples are available the autoan alysers of today can give a complete picture of the infant's micronutrient status.
- KAP or behaviour change in the parents and their willingness to spend regularly on the complementary food.

Pre-post surveys will have to be done on large and representative samples of mother-child dyads drawn from households or institutions that have been known to purchase the complementary food fairly regularly over the immediate past year.

A search of the literature for this report for the four countries under review revealed the urgent need to build a data-base of relevant

information for the 'Under Two'. Most often it is far more economical and useful to hire a professional agency to do the Pre-Post Surveys.

Q 3. Are there any Market Research or other agencies that could collect the Monitoring Data for a commercial complementary food?

The Operations Research Group (ORG), Baroda collects information on various commodities of common use, namely, food stuffs, detergents, common medicines etc. through a continuous process of shop audit throughout India. ORG is a consultancy firm and charges a fee for its services. For instance, this is how I came to know that Cerelac of Heinz Pvt. Ltd., India and Nestle Pvt. Ltd., India have about 70% and 30% share of the Commercial Complementary Food Market, respectively.

Q 4. What would the Impact Indicators be?

Please refer to an example of an ICDS Evaluation Matrix for Nutrition, Health and Hygiene in Children (0 – 6 years) developed by me (**Table 1**) for a M. S. Swaminathan Foundation brain-storming meeting.

TABLE - 1

EVALUATION MATRIX FOR NUTRITION, HEALTH AND HYGIENE IN CHILDREN (0-6 YRS) IN THE ICDS

INPUT INDICATORS	PROCESS INDICATORS			IMPACT INDICATORS	MEASUREMENT OF IMPACT
A. NUTRITION :	DELIVERY	COVERAGE	PARTICIPATION		
1. Supplementary food 2. Nutrition-Health Education 3. Iron Supplement 4. Vitamin A supplement 5. Use of iodized salt 6. Growth monitoring 7. Safe water availability	% efficiency in timely procurement and delivery on time, in adequate amounts to the AWCs	% efficiency in coverage : • 0-1 yrs • 1-2 yrs • 2-3 yrs • 3-4 yrs • 4-5 yrs • 5-6 yrs children	% participation by the child - mother dyads • 0-1 yrs • 1-2 yrs • 2-3 yrs • 3-4 yrs • 4-5 yrs • 5-6 yrs children	+ Anthropometry + Dietary - Clinical + Biochemical + Knowledge - Attitude - Practice	• Wt and Ht for age • Consumption of ration • For PEM, I, FE & Vit A • For Hb • By participatory research assessment

SECTION I : OPPORTUNITIES FOR PUBLIC/PRIVATE ACADEMIA/NGOS MULTISECTORAL COLLABORATION

It has become apparent from the foregoing sections of this report that unless the **Public Sector** and **Private Sector** join hands there is not going to be much discernible improvement in any sector, especially the one concerning the young child. Much precious time will be saved if Academia and NGOs with experience and expertise are included.

Some examples of collaborations are in operation in the four South Asian Countries in this report. The questions that arise are as under :

Q 1. Can Public – Private sector collaborations make a dent in reducing the Hidden Hunger for Micronutrients in the Under Twos?
Q 2. To what extent has the Private sector played a significant role with respect to complementary foods in South Asia?

Q 1. Can Public – Private sector collaborations make a dent in reducing the Hidden Hunger for Micronutrients in the Under Twos?

A recent meeting was held in Ottawa in end 1995 on Sharing Risk and Reward, where representatives of the Public Sector, Private Sector, International Agencies, Food Technologists got together to address the problem of global malnutrition and see how it could be resolved. Fortifying foods of mass consumption with vitamins-minerals at 0.5 to 2% of the total cost of the commodity, emerged as the front runner (1). The Mircronutrient Initiative, Ottawa has been organizing and bringing out publications on how crucial it is to forge these Partnerships (2,3). The other important Conferences held in this regard are the International conference on Nutrition held in Rome in 1992; and the World Summit for children held in New York in 1990. The Programme Against Micronutrient Malnutrition (PAMM) is another excellent example of the Task Force for Child Survival and Development (Academia), UNICEF (International), USAID (bi-lateral) and the World Bank (International) forging a partnership.

Q 2. To what extent has Private sector played a significant role with respect to complementary foods in South Asia?

India : In the seventies there was a spurt in setting-up Complementary Food Plants. The Government of India (Public Sector) set up ten such plants all over the country with funding from UNICEF, WFP, CARE etc. CARE – India sought the help of Amul Pvt. Ltd. to make RTE–school snacks fortified with micronutrients. This NGO–Private Collaboration did very well for about a decade in the eighties and nineties. As an example the Karnataka Corn Agro Pvt. Ltd. (KCP), a state owned (Public Sector) was identified to make RTE-complementary food fortified with micronutrients, named Energy-Food, for the 'Under Threes' in the ICDS. It also obtained sizable funding for plant and machinery and Food Aid (CSB, SFBW etc) from CARE-India. It is in the red now due to numerous reasons. No major multinational food manufacturer in Karnataka has come into this collaboration upto now.

Sri Lanka : The Triposha project again was a Public (Government of Sri Lanka) USAID (bi-lateral) and CARE – Sri Lanka (NGO) collaboration. Wheat from PL 480 was used to make a RTE food which was fortified with vitamins and minerals for a whole range of undernourished populations that included the preschool child, the primary schooler, pregnant and lactating women etc.

Bangladesh : A collaboration has been forged between the Ministry of Health and Family Welfare (Public) with the Bangladesh Rural Advancement Committee (NGO). The focus of this well-known partnership to reduce malnutrition among children and mothers.

Nepal : The Nepalese Department of Health (Public) and the Shanta Bhawan Committee Health Project (NGO) has developed and propagated a traditional weaning food called "Sarbottam Pitho". The Central Food Research Laboratory, the Nutrition Research and Development Division (Public) has been developing low-cost weaning food recipies based on cereal legume multimixes and using the ARF – Technology for making nutrient dense, yet 'soupy' feeds for the 'Under Two'. Since Nepal is a barley crop grower, it could become the source country to supply CBM – ARF to the other countries of South Asia. Net-working among these four countries itself will bring many rewards.

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SECTION J : GLOBAL AND NATIONAL EXPERIENCE OF THE DELIVERY OF COMPLEMENTARY FOODS :

There are virtually only three types of delivery systems for complementary foods to the Under Twos. These are :

- The Public Distribution System/ the Food Stamp System
- The Fed-on Site System
- The Take-Home-Rations (THR) System

The above issue is discussed under the questions of :

Q 1. How about delivering complementary foods through India's Public Distribution System (PDS) or through Foods Stamps?

Q 2. What is the Global and National experience of the Fed-On-Site Vs the Take-Home Delivery Systems with regard to the Under Twos?

Q 1. How about delivering complementary foods through India's Public Distribution System (PDS) or through Foods Stamps?

The performance of the PDS in India, depends on the level of governance in the country. It could certainly serve as an effective channel to deliver the `fully processed and fortified' complementary foods to those holding ration cards.

Sri Lanka has introduced the Food Stamps Plan. It gives much greater freedom to the recipient family to buy their food entitlements as per convenience.

Q 2. What is the Global and National experience of the Fed-On-Site Vs the Take-Home Delivery Systems with regard to the Under Twos?

Beaton and Ghassemi in their excellent review of Supplementary Feeding Programmes for Young Children in Developing Countries, 1982 concluded that `Take Home' food delivery systems were effective in achieving greater coverage of children under two at much lower cost (1). In the seventies, there was a spurt in testing various types of

supplementary feeding programmes, namely, On-Site, Take-Home and Nutritional Rehabilitation Programmes. Anthropometric gains attributable to 'Take-Home' feeding programms ranged from 21% to 75% (2). Moffat, in Uganda and Alderman et al in Jamaica; The Asia Research Organization in the Phillippines; Khare et al in Maharashtra; and Gopaldas et al in MP(3), were able to show extremely impressive reduction in grade II and III degree malnutrition ranging from 27% to 75%. The major Indian studies on THR are : CARE – India's Project 'Poshak' in MP, (4); The Sidney Cantor/ATAC Study on 'Take-Home' dry food as a distribution system in Tamil Nadu (5); The Evaluation of the India Population Project, Karnataka (6); and the Maharashtra study by Khare et al (7). The findings of all the national and international studies went heavily in favor of the THR for the children under three, except for the one fact that there was some 'sharing' or dilution of the THR at home.

Advantages of the THR :

- Very high geographic outreach
- Covers majority of under two population
- Convenient for the mothers
- Less expensive than fed-on-site
- Minimizes cross infections
- More realistic child care education and caring practices for the mother
- Mother can feed what the child likes in frequent feeds
- Treats malnutrition in its milieu
- Child is more emotionally secure at home
- Ensures weight gain in spite of 'sharing' of the THR

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SECTION K : RECOMMENDATIONS FOR PROGRAMME DEVEOPMENT AND MECHANISM TO STRENGTHEN POLICY ·

There are approximately 56 million children/annum in the most vulnerable age group of 6-24 months in just the four countries under review in this report. India alone would have about 45 million; Bangladesh about 6 million; Nepal and Sri Lanka about 1 million each. Most of these children (90%) would be outside the welfare net of the Public Sector programmes. Hence, the recommendations that follow are essentially for the children (6-24 months) **outside** this welfare net. There would be about 80% or some 40 million 'Under Twos', of LIG and MIG families who would greatly benefit from an appropriate and affordable complementary food.

- **Advocacy :** The Public Sector of the four countries under review do have MCH programmes with strong compenents of Nutrition. However, there is little knowledge or realization at any level that the 'mighty micros' (vitamins and minerals) are as important as the 'mighty macros', namely. calories and protein. Also, even very good programmes, be it India's ICDS, only cover about 10% of the target population. A series of sensitization workshop/seminars could be held on the importance of fully fortified, adequate and suitable complementary foods for representatives of both the Public and Private Sector. This is where Academia, Food Technologists, Field and Operational Researchers should also be roped in as lecturers or as organizers of such fora. Advocacy should not fight shy of proving how fortification of complementary foods in the Developed World is the cheapest and most cost-effective way of eradicating the Hidden Hunger for the 'micros'. At these 'advocacy fora' the participants must be made aware that 'micros' are not just 'iron, iodine and Vitamin A' but a whole array of other vitamins, minerals and trace elements. Nor should Advocacy fight shy of painting a grim picture of the consequences to the helpless child, or taking an immediate, unanimous and positive view followed by immediate action for the full fortification of complementary foods.
- **Show of Commitment from the Private Sector :** In India, the two giants in the complementary food area are Heinz India (Pvt.) Ltd. and Nestle India (Pvt.) Ltd.. Very recently Hindustan Lever Ltd. has

taken over 14 units of Modern Foods from the Government of India. The National Dairy Development Board is another formidable and socially committed giant in the cooperative sector. If a consortium could be formed for a social product, even between these four corporates, tremendous strides in producing a suitable nutrient dense, low bulk, and fully fortified complementary food could be manufactured in no time. Further there would be no price wars as all four would be operating together.

- **Show of commitment from the Public Sector :** The Public Sector on its part should fully endorse and support the Private Sector's social commitment in concrete ways. It could waive all taxes/duties/levies connected with the category of complementary foods. It could simplify the present Food Protection Standards. It could recognize and reward the committed and the achievers in this area.
- **Show of commitment from the Parents of the Under Twos :** If the product is good and affordable it will sell. This enormous grey market of neither the 'not desperately poor' nor the 'rich' has been waiting for a long, long time for such a complementary food (described in detail in the previous sections).
- **Private Sector's sponsorship of relevant operational-research on complementary foods :** This has hardly received any support. Net-working and multi-centric studies within the region should be strongly supported.
- **Private and Public Sector's Support to Social Market Research and Social Marketing :** What has been proposed in this report is a large social-marketing programme for complementary foods linking the four countries under review. For example, Hindustan Lever Ltd., invests huge amounts on Market Research and Advertising Research. It could spear-head a movement to determine what are the opportunities or barriers to the two new concepts of :

    - A single feed, fortified, high-nutrient-density, low-bulk cereal-pulse-based-complementary foods in South Asia for a reasonable cost of say Rs. 3/- for a 50 g single feed pouch; and Rs. 5/- for a 100 g pouch.
    - The idea of a sachet of 5 g Barley Malt Powder(ARF) + the entire RDA of micronutrients for a one year old child (ICMR, 1992) for a cost of Rs. 2/- per sachet.

- **A Systems approach for the Producation of Complementary Foods :** Both Private and Public Sector should join hands to ensure an integrated approach to cover the entire system of production, packaging, transportation, storage and marketing of complementary foods. Procurement of raw materials especially of the vitamin-mineral premixes and/or ARF may be difficult to obtain on an uninterrupted basis in some of the countries of the region. Market Research should precede and follow the production of the complementary food. Reasonable levels of food safety and hygiene should be followed. Reasonable levels of cleanliness during transportation, storage and use have to be adhered to.
- It is suggested that a high powered committee headed by the Prime Minister of the Nation, head the Complementary Food Mission. Only then does any Mission get some clout and aura!
- It is suggested that the International Agencies namely, MI, WHO, WFP, UNICEF or bi-lateral agenices such as USAID, CIDA, DANIDA etc. or NGOs like CARE, fund and support the Complementary Food Programme in a big way.
- Primary Education is going to be made compulsory in most of the South Asian countries. In India alone there would be 200 million girls and boys in school. The Private and Public Sector could set-up cooperatives in the District Primary Education Programme (DPEP) schools where all basic necessities of life, namely, fully fortified food items like salt, flour, sugar, fats/oils, common medicines and complementary foods could be stocked or displayed. IEC on the benefits of each item could be explained or even given as a subject to the schooler. The potential for behaviour change could be substantial. Parents listen to their child, not to outsiders however learned. The parents could then go and purchase the said item/s from the PDS or ration shop.
- The Public Sector should permit free of cost, generic themes and advertisements in the electronic and print media on all social sector fortified food items, including complementary foods.
- Public Policy should elevate Human Resource Development rather than just Defence or Information Technology as is currently being done in many countries of South Asia.
- The emphasis on just the pregnant woman and the adolescent girl for Nutritional Improvement, should be toned down. The Primary Schoolers and the Secondary Schoolers are going to be the parents of tomorrow, very soon. They are a huge captive audience and target

population themselves. The Private and Public Sector would do well by joining hands and concentrating on `the horses that have not bolted their stables (yet)' namely, the school boy and girl. In impoverished households, everyone is undernourished for macro as well as micro nutrients. Fortification effortlessly improves the health and nutritional status of the entire family. Fortification is a dietary intervention. Government Policy (Public Sector) should give status to this type of Dietary Intervention.

This section is not intended to be nor is it exhaustive. Some of the points made above is from my practical experience of working with the Planning Commission of India (Public); Hindustan Lever Ltd. (Private), and M.S. University Baroda (academia and research). The intention of this report was to give some insights into the present-day-situation (2000 A.D.) with respect to Complementary Foods, in India. **There is a tremendous unmet demand for a Complementary Food for the common man's `Under Twos'. The Public Sector has not and cannot entirely meet this demand. Will the Private Sector take up the challenge?**

ABBREVIATIONS

ACC/SCN	:	Administrative Committee on Coordination / Sub – Committee on Nutrition.
ARF	:	Amylase-Rich-Food.
AWC	:	Anganwadi Centre.
CARE	:	Cooperative for Relief Everywhere.
CFTRI	:	Central Food Technical Research Institute.
CIDA	:	Canadian International Aid.
CSM	:	Corn Soya Blend.
DANIDA	:	Danish International Aid.
DPEP	:	District Primary Education Programme.
FCI	:	Food Corporation of India.
HDPE	:	High Density Poly Ethylene.
HIG	:	High Income Group.
ICDS	:	Integrated Child Development Services.
ICMR	:	Indian Council of Medical Research.
IDRC	:	International Development Research Centre.
IEC	:	Information Education Communication.
INHP	:	Integrate & Nutrition Health Programme.
KCP	:	Karnataka Corn-Agro Pvt. Ltd.
KIF	:	Kerala Indigenous Food.
LBW	:	Low Birth Weight.
LIG	:	Low Income Group.
MCH	:	Maternal Child Health.
MI	:	Micronutrient Initiative, Ottawa.
MIG	:	Middle Income Group.
NDDB	:	National Dairy Development Board.
NHE	:	Nutrition Health Education.
NIN	:	National Institute of Nutrition.
PAMM	:	Programme Against Micronutrient Malnutrition.
PDS	:	Public Distribution System.
PEO	:	Programme Evaluation Organisation.
PRA	:	Participatory Research Assessment.
RDA	:	Recommended Daily Allowances.
RTE	:	Ready-To-Eat.
SFBW	:	Soya Fortified Bulger Wheat.
THR	:	Take Home Rations.
TINP	:	Tamilnadu Nutrition Integrated Project.
USAID	:	United Status Aid.

USD	:	US Dollar
WFP	:	World Food Programme.
WHO	:	World Health Organisation.