

# Nutrition in low-income-countries

Gunnar Holmgren, Infectious diseases clinic, Ryhov Hospital, Jönköping, Sweden Feb. 2015

Before any nutrition programme is started in an area some underlying factors that affect nutrition and agriculture need to be studied:

1. Study the climate and rainfall, the soil condition and erosion risks, the social and political situation that affects economy, distribution of wealth, land ownership, the position and independence of women to play a role in any agricultural and nutrition programme, the cultural preferences and taboos that exist in food and in type of agriculture, the power balances and how these are affected and respond to change.
2. The disease pattern that especially affects nutrition is important to know. This includes measles, whooping cough, TB, HIV, diarrhoeal diseases, intestinal parasites, malaria.
3. Study the security situation with regard to theft, conflicts, tribal differences, the educational level of the population and especially the level for girls and women, previous experiences of nutrition interventions and whether these were successful or not.

## Needs and resources assessment

Here some simple assessments of nutritional status of the population is made looking especially at children and pregnant women as markers of how things are in the general population. In children it is important to identify the level of *stunting* (to show chronic malnutrition) and *wasting* (to show acute malnutrition), specific deficiencies such as vitamin A (look for *night blindness*), *anaemia* (iron deficiency and malaria).

It is important to identify the best crops and foods that are acceptable and easily grown in this particular setting. Study the traditional types of cultivation and the knowledge about counteracting erosion. See whether there is any functioning government (or NGO) agriculture extension programme that can be brought in to strengthen any nutrition intervention that is embarked upon. See what nutritional and agricultural skills there are available in the local community that can be harnessed in any planned intervention.

Smallholder farmers (500 million with less than 2 hectares) provide most food in low-income-countries.

## Main pillars

**1. Promotion of breast feeding** and, if at all possible, strictly exclusive breast-feeding up to 6 months. Try to remove all the factors that disturb breast-feeding e.g. employment patterns that do not give paid maternity leave or give it for such a short time that breast-feeding is curtailed. Try to launch the idea of "Baby friendly hospitals" with their 10 point criteria for acceptance. Try to remove the damaging effects of promotion of bottle-feeding by multinational formula feeding companies. Human breast milk is sterile and has inhibitory properties to bacterial growth whereas cow's milk facilitates the development of a rumen in the cow and readily supports bacterial growth. Feeding human infants with cow's milk predisposes to the overgrowth of bacteria in their small intestine especially with less than perfect hygiene in bottle feeding. Bottle feeding at full strength is expensive especially for the poorest.

### *Main advantages of breast-milk:*

- a. Natural food at right temp, always available, free from contaminating bacteria.
- b. Contains bacterial and viral antibodies including secretory IgA preventing microorganisms from adhering to intestinal mucosa. Contains substances that inhibit growth of many common viruses.

c. Contains lactoferrin with an inhibitory action on E.coli, and lipase which kills Giardia and amoeba. Furthermore macrophages in human milk synthesize complement, lysozyme and lactoferrin.

d. There is passive transfer of T-cell immunity against TB.

e. Breast milk contains all necessary nutrients for at least the first 6 months of life.

**2. Sound and easily available weaning foods** which are acceptable culturally. These need to be easily cultivated or produced. They need to have some source of dense energy and enough essential amino acids and vitamins so that growth is optimal. Try to see that these foods are prepared to make them as delicious and easily digestible as possible. Some foods are made easier to digest and are better nutritionally when they are fermented briefly.

### **3. Focus on children below 3 years**

In all teaching about nutrition see what level is possible to achieve. Thus in rural Zambia the most important messages were the following:

a. Give each child his/her **own plate at every meal**. The tradition is that children and adults eat from the same plate. Adults eat so fast and have such an expandable stomach that they can very quickly consume large quantities of starchy foods. The children cannot keep up with this pace of eating and can often only get enough quantity if they are given the time to eat at their own pace.

b. Try if at all possible to see that children have **3 meals a day**. Many adults are used to having one mega meal a day and their large stomach can somehow manage this. Children do not have this capacity and so one meal a day is completely inadequate nutritionally for them.

c. Try to find a source of **dense energy** that is readily available. In Zambia this was ground-nuts that are pounded so that the younger children can eat them without any danger of getting them stuck in their windpipe. If cooking oil is available and is affordable this is an excellent source of dense energy. Dried fish give dense energy with its oil.

d. Try to find the **best source of essential amino-acids** that is not too expensive. This may include pounded dried fish, peas, beans, (especially soya beans) and other legumes and occasionally eggs and meat.

### **Growth monitoring**

Decide what level of growth monitoring that is achievable in that setting and that community. In a setting of disaster or famine, the very simplest methods should be used such as measuring mid-upper-arm-circumference (MUAC). Remember 3 figures about MUAC: the normal for children between 1-5 yrs is 16.5 cms. 14 cms is moderate wasting and 12.5 cms is severe wasting More focus should be on **strategic food supplementation initially**. Later on and in stable populations introduce the "road-to-health" chart for following the development of each child with regular weighing of the child and comparison with age. However any monitoring that does not lead to good nutrition advice is utterly useless. Some support with good agricultural teaching is often necessary.

### **Nutrition units**

In every health unit there should be a nutrition unit so that every child who is admitted with malnutrition is treated and then the mother and child stay in the nutrition unit to get training in improved feeding patterns and even better production of nutritious foods. Thus there will be a kitchen in this unit where the mothers under supervision are shown how to prepare better foods to keep the child healthy in the future and there is an attached production unit where they are trained in the practice of growing better vegetables and crops that improve the nutrition of the child.

### **“Butcher-shop in your back yard”**

See whether there is capacity and interest in developing an intervention such as the “Butcher-shop in your back yard” programme. This focusses on small animal husbandry (guinea pigs, rabbits, chickens, ducks, and maybe goats) combined with the complementary vegetables that may be suitable. A water-harvesting unit with a large tank for rain water is extremely valuable in some settings. The rain water can be stored and used throughout the dry season.

### **Ox-ploughing**

See if some improvements in cultivation can be introduced. In Zambia this turned out to be ox-ploughing which was the right level for subsistence farming. In this setting four different methods of cultivation were studied: Hoeing, ploughing with own oxen, ploughing with hired oxen, tractor ploughing. The only group that was economically viable when all costs including labour were calculated was ploughing with own oxen.

### **Nil cultivation and Intercropping**

An interesting new innovation is introducing nil cultivation using *mulch* agriculture i.e. organic material (grass, stubble, leaves etc.) is used to cover the field that will be used for planting next season and is allowed to stay covering this field for the whole fallow season. The new crop is planted directly into the undisturbed soil covered by *mulch* and if possible the staple is intercropped with plants or bushes that are known to complement rather than compete with the staple. This intercropping provides shade, leaves to supplement the *mulch*, roots to prevent soil erosion and, if possible, additive nutrients coming from the trees or bushes to stimulate better growth of the staple. In time the quality of the soil is improved immensely even without adding fertilizer. Intercropping of cereals and grain legumes is one example. Maize can be intercropped with potato, beans, pumpkins, cucumber, squash and sesame. In Africa maize and cowpeas, pigeon peas, beans and sun hemp are popular. Groundnuts may also be used but are better grown as a rotation crop. Maize and silverleaf legume (desmodium) suppresses striga parasitic weeds, fixes nitrogen increasing soil fertility and is an excellent forage for animals.

Researchers planted the legume *Gliricidia* in three non-irrigated sites — one in southern Malawi and two in eastern Zambia. The yields from maize–*Gliricidia* intercropped farms were then compared with those from both fertilised and unfertilised monoculture maize farms in the same three sites.

"We found that maize farms with legume trees had, on average, a 50 per cent increase in yields and that the yields were stable, compared with those grown with or without fertilisers," said *Gudeta Sileshi*, lead study author and the World Agroforestry Centre's regional coordinator for Southern Africa, based in Malawi.

The researchers said *Gliricidia* "fixes" nitrogen from the air, converting it into a form ideal for maize growth, thus lessening the need for large doses of manufactured nitrogen fertilisers. *Gliricidia* also sheds leaves, thus returning organic matter to the soil and increasing the soil's structural stability, erosion resistance, and water storage capacity.

Sileshi added that the findings are applicable to regions where farmers mostly rely on rain for growing maize, including East and West Africa.

### **Family training programme**

See if there is interest and support for a “family training programme” bringing in whole families for training in nutrition, improved farming methods and simple health promotion and disease prevention teaching.

### **Micro-credit programmes**

Formal credit still does not reach many small farmers and is in most low income countries, totally

out of reach of women and others lacking any form of security for a loan. Providing small loans to these groups for production purposes is a promising new approach to improve food security, reduce malnutrition and increase income. Successful projects, such as those supported by the Grameen (Rural) Bank in Bangladesh, involve providing small, unsecured loans to small groups of people. The groups, the majority of whom are poor women, receive advice and help until they can fend for themselves. Although relatively high administrative demands tend to limit expansion of such schemes in the short run, they can make an important contribution to reducing hunger and poverty in the longer run and can be especially important for households headed by women. These households spend a significant part of any additional income on food and other needs for their children.

In Bangladesh before a loan was granted to a group there were 16 criteria that had to be fulfilled by the group. These included where possible getting all the children vaccinated, improving water and sanitation, starting family planning, getting all the children to school etc. These criteria had enormous health and educational spin-off effects.

### **Moringa trees: usually *Moringa oleifera***

A fairly new initiative is to encourage communities to plant Moringa trees. Much of the plant is edible by humans or by farm animals. The leaves are rich in protein, vitamin A, vitamin B, vitamin C and minerals. One hundred grams of fresh Moringa leaves have: 2 times the protein of 100 g yogurt (Moringa 8.3 g, yogurt 3.8 g); 4 times the calcium of 100 g milk (Moringa 434 mg, whole cow milk 120 mg); the same potassium as 100 g banana (Moringa 404 mg, banana 376 mg); the same vitamin A as 100 gm carrot (Moringa 738 g, carrot 713 g); 3 times the vitamin C of 100 g orange (Moringa 164 mg, orange 46.9 mg).

Feeding the high protein leaves to cattle has been shown to increase weight gain by up to 32% and milk production by 43 to 65%. The seeds contain 30 to 40% oil that is high in oleic acid, while degreased meal is 61% protein. The defatted meal is a flocculant and can be used in water purification to settle out sediments and undesirable organisms.

### **Global Nutrition Cluster**

The Global Nutrition Cluster (GNC) was established in 2006 with a vision to safeguard and improve the nutritional status of emergency affected populations by ensuring a coordinated, appropriate response that is predictable, timely, effective and at scale. The Nutrition cluster is currently made up of 37 partner organizations at the global level with UNICEF as a key member.

### **Climate change and Nutrition**

Food prices will more than double and the number of malnourished children spiral if climate change is not checked and developing countries are not helped to adapt their farming, food and water experts warned on December 4th 2012 at the UN climate talks in Doha.

As the UK energy secretary, Ed Davey, and ministers from 194 countries arrived for the high-level segment of the talks, the UN's Committee on World Food Security said the world would need a 75-90% increase in food production to feed the extra 2 billion people expected to be alive in 2050. But climate change could reduce yields worldwide by 5-25% over the same period.

"The poor are especially vulnerable. Climate change will increase the number of malnourished children substantially. Smallholder farmers will be particularly hard hit," said Gerald Nelson, a spokesman for the high-level panel of experts convened by the committee to report on food prospects in the coming 30 years.

Research from Oxfam suggests rice, maize and wheat prices could rise by up to 177% in the next 20 years if climate change is not checked. A combination of extreme events like the drought that affected North America this year and the Russian heatwave in 2008 could raise prices further than two decades of long-term prices, it said.

"Extreme weather means extreme prices. Our failure to slash emissions presents a future of greater food price volatility with severe consequences for the precarious lives of the people in poverty," said Tracy Carty of Oxfam. "If developing countries are left alone to deal with the impacts of climate change, we are going to see millions of people lose their lands and livelihoods. Investing in the resilience of the poorest communities is not just a matter of justice, but a smart investment in a better collective future on this small planet."

"What we are seeing already in northern Kenya and parts of Africa is food prices skyrocketing as farmers' production declines in successive droughts," said Mohamed Adow, climate adviser to Christian Aid. "The number of people is growing, putting extra stress on food production."

