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BIODIVERSITY CONSERVATION FOR ELIMINATION OF MALNUTRITION IN THE DANGS, GUJARAT

V. J. Somani
Mahatma Gandhi Department of Rural Studies, Veer Narmad South Gujarat University, Surat.
vjsomani@vnsgu.ac.in

Absract
Malnutrition is a curse to the humanity. It is a state Malnutrition is lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things, or being unable to use the food that one does eat. India has more malnourished children than the Sub-Saharan countries. The proportion of malnourished children is more in the tribal than in other category of population. The Dang district of Gujarat is having 94 % of its population belonging to Scheduled Tribe. A large number of children below 5 years age are reported to be suffering from chronic malnourishment. The district have rich flora. It has 1276 taxa (1266 species and 10 varieties) belonging to 780 genera and 154 families of Angiosperm. Tribal people use around 32 wild plants as their food in addition to the cultivated verities. Such wild plants and traditional cultivated food plants have potential to eliminate malnourishment. The paper reviews nutritional potentials of some of the wild plants used by the tribals of the Dangs.

Keywords: Malnutrition, tribal children, biodiversity conservation.

Introduction:

In terms of Biodiversity, India is very rich in genetic variability of several economically important plants. Several of its agro-biodiversity hotspots are predominantly inhabited by tribal families and are characterized by culinary and curative (medicinal plants) diversity. These tribals have a conservation ethos that conserve rich genetic variability, a public good, at personal cost, economic and public policy compulsions often lead to a shift in their attention from endemic agrobiodiversity to modern high yielding varieties. The malnutrition situation in India is a cause for concern. As per National Family Health Survey-3 (2007), 47 percent children in the state are under weight and of them 17 percent are wasted. The percentage of anaemic children (80) and women (60.8) is alarming. The rate of infant mortality is 50 per thousand live births. Amongst the malnourished children and women, rural population and the scheduled tribe and scheduled caste community is more affected. The Nutrition Advisory Council has identified 200 high malnutrition burden districts, many of which fall under agro-biodiversity hotspots includes the Dang district of Gujarat. A considerable segment of the local population, particularly women and children, suffer from the following three major kinds of endemic hunger:

- Calorie deprivation arising from poverty induced under-nutrition;
- Protein hunger caused by inadequate consumption of pulses or milk, fish and meat
- Hidden hunger caused by the deficiency of micronutrients in the diet.

In contrast to this stark reality, India is one of the 12 mega-diversity countries of the world and also a major centre for crop plant domestication. In particular, India boasts high levels of agro-biodiversity – the genetic resources required for food and agricultural production. While land conversion to agriculture has increased food production for human consumption, it has come at the expense of biodiversity and the natural functioning of ecosystems; this enigma often leads to decreased food and nutritional security for the local population. As such, while India contains several agro-biodiversity hot spots, ironically many of these regions are characterised by poor socio-economic status, abject poverty and high malnutrition. In Gujarat, as per NFHS III, 47 % of the children were underweight, 42 % stunted and 80 % were anemic. The recent survey by the present author in the Dang district revealed that around 70 % of the children were underweight having Body Mass Index (BMI) less than 16. This indicates the very horrific picture of child malnutrition (Somani, 2015).

Biodiversity in the Dangs:

The floristic diversity of the Dangs (Tadvi, 2013) revealed that there are 1276 taxa (1266 species and 10 varieties) belonging to 710 genera and 154 families of angiosperm. Out of the 1276 known species 914 species are wild in nature while 362 species are cultivated or introduced. It was further noted that 51 Plant species reported earlier from Dangs by Suryanarayana (1968), Shah and Suryanarayna

(1969) and Shah (1978) could not be relocated in the present studies. Out of these 51 plant species 23 are dicots and 28 are monocots. Some of such important plants that were missing included:

1. *Oryza minuta* J. A. PresL. ex C. B. Presl. Syn. *Oryza latifolia* Hk. f. (POACEAE)
2. *Pseeudosorghum fasciculare* (Roxb.) A. Camus Syn. *Andropogon fascicularis* Roxb.; *Andropogon nitidus* Hk. f. (POACEAE)
3. *Sorghum controversum* (Steud.) Snowden Syn. *Andropogon laxum* Roxb.; *Andropogon controversus* Steud. (POACEAE);
4. *Sorghum purpureo - sericeum* (Hochst. ex A. Rich.) Aschers. Syn. *Andropogon purpureo-sericeus* Hochst. ex A. Rich.; *Sorghum deccanense*Sensu Patel (POACEAE).
5. *Amorphophallus commututus* (Schott.) Engler. Syn. *Conophallus commutatus* Schott.; *Amorphophallus sylvaticus* Dalz. & Gibs. (ARACEAE).

These plants are of food value and were used by the local as their food during the recent past. At present the tribal people of Dangs use various plants parts as a food. Of these the underground tubers/rhizome are the best source of food. As many as 11 tubers/ rhizome are used as a source of food. Many of the tender fuits and mature fruits (10) are also used as a source of food. Six members of Dioscoraceae are major source of food as tubers while three members of Anacardiaceae used as a source of fruit/food (Table 1). These are even sold in the market.

A majority of these plants are now not used routinely a food as cheaper and reliable alternatives are available to the tribal population through cultivation and through government interventions. Even during the traditional period of food shortage alternatives are available and hence the plants mentioned above are forgotten menu of the tribal. Moreover, the staple food of the people of the Dangs is now Wheat/Rice instead of earlier ragi or jowar. This shift in the staple food has come through large scale cultivation of improved varieties of rice (where irrigation facility and/or plain land is available). In addition to this the public distribution system (PDS) provides wheat at a very cheap rate in this area. As a result of which there is loss of germplasm of traditional rice and ragi varieties. The traditional varieties of rice (Table 2) grown in the Dangs had characteristics like early maturity, scented etc.

As per the estimates there were more than 50 cultivated varieties of rice in the Dangs. Today only a few can be found as these varieties have slowly been replaced by hybrid and high yielding varieties.

Nutritional value of some of the plants:

To indicate the potentials of the forgotten food plants of the tribal people a summary of nutritional values of some of the plants available in the Dangs is presented below.

1. **Portulaca olerecea:** The plant is found throughout Dangs in wet areas. Entire plant is used as vegetable. The nutritional values of 100 g. of leaves is Carbohydrate: 3.39 g., Fat 0.36 g, protein 2.03 g, Vitamin A 1320 IU, riboflavin 0.112 mg, thiamine 0.047 mg, niacin 0.48 mg, Vitamin C 21 mg, Vitamin E 12.2 mg, Calcium 65 mg, Iron 1.99 mg, Phosphorous 44 mg, potassium 494 mg.
2. **Dioscoria Sp.:** There are six species of Dioscoria consumed by the tribals of this area. The nutritional values of 100 g. of tubers is Carbohydrate: 27.5 g., Fat 1.2 g, protein 3.4 g, crude fiber 7.5 g, Calcium 82 mg, Phosphorous 38 mg, potassium 53 mg. (Chandra *et.al.,* 2012).
3. **Amorphophallus sp.** : The tubers of this plant is used as food. The nutritional values of 100 g. of tubers is Carbohydrate: 70.75 g., Fat 3.52 g, protein 11.53 g, crude fibre 14.32 g, Calcium 82 mg, Phosphorous 45.3 mg, Iron 340 µg/g potassium 53 mg, Iron 5.57 mg. (Singh and Wadhwa, 2014).
4. **Schleichera oleosa:** The seeds of this tree are roasted and consumed. The nutritional values of 100 g. of seeds is: Carbohydrate: 3.6 g., Fat 3.52 g, protein 15.53 g, crude fibre 5.54 g, Vitamin C 124.6, Phenolic content 5.64 mg.
5. **Spondias pinnata:** The seeds of this plant are used as food. It has a high content of protein (18.92 %), total sugars (4.35 %) and Vitamin C (87.47 mg/g) makes this plant as a very good candidate for wild food alternative (Khomdram et.al, 2014).
6. **Morinda citrifolia:** Commonly known as Noni fruits of this plants are consumed by tribals. The nutritional values of 100 g. of fruits is Carbohydrate: 34.6 g., dietary fiber 5.1 g, Fat 0.11 g, protein 0.52 g, riboflavin 0.028 mg, thiamine 0.107 mg, niacin 0.51 mg, Vitamin C 5 mg, Vitamin E 2.93 mg, Calcium 18 mg, Iron 0.72 mg, Phosphorous 76 mg, potassium 484 mg.
7. **Madhuca longifolia:** The flowers and seeds of **mahuva** has still retained its importance among the tribal families of the Dang. The seeds are rich source of fat and seeds are of carbohydrate. The flowers are used as food by the tribals living in the interior areas of forest that are not easily accessible by road and for

country liquor making by almost all the tribals. Similarly the oil obtained from the seeds is used as food by the tribals living in the dense forest. The nutritional values of flowers and seeds are given below:

Flowers: 100 g flowers contain Protein 6.37 %, total sugars 54.6 %, calcium 8 % and phosphorous 2 %.

Seeds: The oil from the seeds contain Palmitic acid 24.5 %, Stearic acid 22.7 %, Oleic acid 37 %, and linolic acid 14.3 %.

Medicinal plants:

The flora of the Dangs includes a large number of plants having medicinal value. These plants have been used since long, directly by the tribal population or by the Bhagats (Local healers) for the treatment of various ailments of man and animals. A long list of such plants exists (Vanparia, 2010). The local healers have developed a system of using these plants with least impact on the future availability. Thus they have been using the medicinal plants with conservative approach. However, in recent past, due to intervention of several government and private agencies there are irreparable losses to the flora of the Dangs.

Use of Biodiversity for averting malnutrition and its impacts:

The effect of undernutrition on young children (ages 0-6) can be devastating and long lasting. It can affect behavioral and cognitive development, educability, and reproductive health, thereby undermining future work productivity. As growth failure occurs almost exclusively during the intrauterine period and in the first two years of life, prevention of stunting, anemia, or xerophthalmia requires special attention during the younger age. The malnourished children are more prone to various infectious diseases of stomach and lungs and their immunity is reduced. This might culminate in to death of the child before he/she completes his/her fifth birthday. In technical terms it is known as Under five mortality (U5M). In India the U5Mortality Rate (U5MR) is highest amongst ST population (169 per 1000 children in Madhya Pradesh). Due to constant monitoring and prompt actions of the Government of India, the U5MR has come down to 65. In the tribal population of the Dangs the U5MR is 86. Therefore, there is an urgent need to check the death of children by providing them with nutritious food and the treatment of diseases they suffer due to undernutrition.

Local flora of the Dangs has potential to provide nutritious food that can be made locally available from its flora. As stated above there are plants having potential to provide protein rich food and also plants having carbohydrate rich food. Also its flora contains plants that can boost the immunity of the children (*Tinospora cordifolia),* plants that can be used to effectively treat diarrhea and dysentery (*Holarrhena antidysenterica and Pterocarpus marsupium)*, jaundice (*Mitragyna parviflora*), and a large number of plants that can be used to treat pneumonia and chest congestion.

Need for biodiversity conservation:

As reported by Tadvi (2013) a large number of plants including medicinal and food plants have not been reported in their study, there is an urgent need to find out the causes of their absence from the Dangs. The observations of the present researcher in last 20 years indicate that the neglect of important plants by the locals is the root cause of loss of plants from the flora of Dangs. The author has seen loss of field races of rice due to adoption of new high yielding varieties by the locals. Also germplasm of many wild sorghum and bamboo species, *Chorophytum borivillianum etc.* has become unavailable due to overexploitation. Absence of employment at local level has forced people to cut forest for the purpose of agriculture at the cost of loss of flora is not new in this area. In order to prevent malnutrition and treat the children suffering from various ailments and in the better interest of future generation it is essential that the flora of the Dangs be conserved with participation of the local people.

Need for further research:

From the above mentioned information on the nutritional values of the lesser known food plants used in the Dangs and elsewhere as food it becomes very clear that there is no uniformity in the analysis of various nutrients from these plants. The nutritive values have been expressed as per the need of the researcher. For some plants minerals are shown and for others vitamins. All the aspects of the nutrition like carbohydrates, protein, fat, minerals and vitamins need to be analyzed in order to evaluate a particular plant for use as food alternative or better local alternative. When this is done, and when the nutritional requirements of the malnourished children is known one can easily suggest the locally available plant/s as a remedy for the deficiency in the nutrition.

In the present case *Madhuca longifolia, Schleichera oleosa* and *Spondias pinnata* are the candidates for solving the problem of protein energy malnutrition in the Dangs. Similarly for solving the problem of vitamin A deficiency *Portulaca olererecea* can be used.

Table 1 Plants used by the people of Dangs as food

	Family	Species	Plant parts used
1	DILLENIACEAE	*Dillenia pentagyna* Roxb.	Whole plant
2	PORTULACACEAE	*Portulaca oleracea* L.	Tender fruits
3	BOMBACACEAE	*Bombax ceiba* L.	Tender Fruits
4	RUTACEAE	*Aegle marmelos* Corr.	Tender fruits
5	BURSERACEAE	*Garuga pinnata* Roxb.	Seeds
6	SAPINDACEAE	*Schleichera oleosa* (Lour.) Merr.	Fruit
7	ANACARDIACEAE	*Buchanania cochinchinensis* (Lour.) M.R.Almeida	Fruit
8	ANACARDIACEAE	*Mangifera indica* L.	Fruit
9	ANACARDIACEAE	*Spondias pinnata* (L.) f.	Leaves
10	FABACEAE	*Abrus precatorious* L.	Tender leaves
110	CAESALPINIACEAE	*Bauhinia purpurea* L.	Seeds
12	COMBRETACEAE	*Terminalia bellirica* (Gaertn.) Roxb.	Roots
13	RUBIACEAE	*Hymenodictyon orixense* (Roxb.)Mabb.	Fruits
14	RUBIACEAE	*Morinda citrifolia* L.	Fruits
15	RUBIACEAE	*Tamilnadia uliginosa* (Retz.) Tirveng. & Sastre	Flowers and Seeds
16	SAPOTACEAE	*Madhuca longifolia* (J.Konig ex L.) J.F.Macbr	Fruits
17	APOCYNACEAE	*Carissa congesta* Wight.	Fruits
18	EUPHORBIACEAE	*Emblica officinalis* Gaertn.	Tubers
19	ORCHIDACEAE	*Nervilia discolor* (Bl.) Schltr.	Stalk of young inflorescence, and Pseudo stem
20	MUSACEAE	*Ensete superbum* (Roxb.) Cheesman	Calyx
21	DIOSCOREACEAE	*Dioscorea belophylla* (Prain) Voigt ex Haines	Tubers
22	DIOSCOREACEAE	*Dioscorea bulbifera* L.	Tubers
23	DIOSCOREACEAE	*Dioscorea hispida* Dennst.	Tubers
24	DIOSCOREACEAE	*Dioscorea oppositifolia* L.	Tubers
25	DIOSCOREACEAE	*Dioscorea pentaphylla* L.	Tubers
26	DIOSCOREACEAE	*Dioscorea wallichii* Hk. f.	Tubers
27	ANTHERICACEAE	*Chlorophytum borivilianum* Sant. & Fernand.	Leaves
28	ANTHERICACEAE	*Chlorophytum tuberosum* (Roxb.) Baker.	Leaves
29	ANTHERICACEAE	*Chlorophytum malabaricum* Baker.	Leaves
30	ARACEAE	*Amorphophallus bulbifer* (Roxb.) Blume	Tuber
31	ARACEAE	*Colocasia esculenta* (L.) Schott.	Leaf and Rhizome
32	POACEAE	*Dendrocalamus strictus* (Roxb.) Nees	Young shoots

(Source: Tadvi, 2013)

Table 2 Traditional varieties of rice and their characteristics

Sr No	Name of the variety	Characteristics
1	Lal kada, Lal kavchi, Hara, Dodi lal	Extra early and Red rice
2	Sat paniu, Dodiu, Jiryu, Dodibhat	Extra early
3	Dhan had,Ambamor	Aromatic
4	Bhadravi	Fine grain
5	Kali tapki	Early

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