

Traditional wisdom of post-harvest processing and value addition of arid land food

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Arid region are unique in terms of agro-climatic features, bio-diversity of flora and fauna and adaptations of plants and animals to harsh and extreme climatic conditions. Though a number of arid foods were exploited commercially and are contributing international agricultural trade, however, there are so many under-utilized arid food crops which are used locally by the people. The nutritional and physiological properties are well established but their commercial exploitation require due attention and incentives. The under-utilized arid food crops have unique physiological specialties which make them as wonder crops of arid world. Value addition is current paradigm shift in agriculture focusing on bio-diversity conservation and economic upliftment of rural community. Desert vegetation has great potential for value addition. Arid food crops of other regions of world need to be introduced as exotic species. Plant physiological attributes suggest adaptability of plants for introduction, selection and cultivation. Arid and semi-arid areas are blessed with large underutilized bio-diversity consisting of trees, shrubs and herbs that are partially utilized as food or food product and medicinal derivatives. The commercial production of food products from under-utilized fruit species helped to reduce wastage of fruits and helped in promoting marketing of these items. Sangri, ker, khimpoli, kachri, kumath, phogla, ber, bajara, moth and beria are important traditional value added products of Rajasthan arid eco-system which are transported and happily eaten throughout the country and some of these are exported.

Key words: Arid foods, Marketing, Post-harvest technology, Traditional practices, Value addition

INDIAN agriculture made great strides during the Green Revolution period by devoted efforts of agricultural scientists, extension officers and farmers. Country has not only increased the food grain production to a self-sufficient level but also achieved buffer stock of food grains. At the same time the country has started exporting certain food grains. However, since last decade, it has been realized that the favourable impact of green revaluation on India's agriculture is no more visible but so much so that this revaluation has badly affected the natural resources as people started saying that it was rather agreed revolution in the sense that farmers went on exploiting the natural resources with

least caring their sustainable capacity. India has the largest irrigated acreage in the world but vast areas of water-logged and wasteland on the other. About 65 % of population is striving with agriculture yet our agricultural share of GDP has drastically reduced to 22%. This share however, may be increased by post-harvest interventions and value addition.

One of the important adverse effects of lop-sided progress in agriculture is the fact that the cases of malnutrition in India are the largest in the world. In spite of huge buffer stock of food grain the problem of food security, hunger and malnutrition exist to a great extent. As such one can speculate easily that in India simply increased production

is not going to solve this problem. But post-harvest technology and value addition at the base of production source may definitely go a long way to solve these problems as per thoughts of Mahatama Gandhi. Rural component of India's population is more affected by poverty than the urban population. Obviously extent of literacy in village is far behind cities and due to lack of facilities in villages child death rate in rural parts is nearly twice that the urban population. Therefore, in the worlds of Gandhi, diversified socio-economic facilities will have to be developed in villages which will also include post-harvest infrastructure and cottage industries, so that living standards of rural message may be



Full bearing of *pilu* plant



Full bearing of budded ber Gola plant at farmers field

improved on one hand and also deter public movement towards cities on the other. It is truly said that, “India of Gandhi’s dreams was in villages, yet the villages are still watching towards the Government”.

Value addition is addition of value or price or utility to a product by changing the form of product and the place of utility likewise i.e. storage, trading, processing and quality. Quality of good products refers to addition in protein or vitamin content. Integrated management of value addition in food products is a more holistic approach including all possible external dimensions of production, environment quality and value enrichment of a food product consisting of industrial processing, organic perspective and extension of shelf-life. Therefore, a plant biochemist may reject degraded land environment due to Green Revaluation for production of a

quality food product. Obviously integrated management of value addition in food products essentially warrants a healthy production environment, say land, water and atmosphere. An efficient network of post-harvest/value addition cottage industries in the rural area may empower people in general and farm-women in particular with appropriate purchasing power, so that they will enjoy food security with respectable life. Due to inclusion of more input responsive varieties in the cropping system the cost of cultivation has increased nearly more than double since last decades. However, the farmers are facing problems for disposal of his produce at reasonable price. Very recently instances were noticed when large number of farmers dumped their truck load of tomato on the roadside for want of suitable price, because even the transportation of crop from farm to

mandi would earn negative profit. If such situation continuous the farmers may not oblige to produce food for urban life. The rising cost of inputs will have to be rewarded or may be subsidized.

Rich Indian heritage in value addition

Traditional indigenous knowledge regarding food products value addition is full of excellent information with special consideration on healthy and nutritive products. The grand mothers in rural India generally mention several names of such food products, probably most of them are becoming extinct now; say *kutti rabdi* (crushed mixture of *bajara* + hot water), plain *rubani* (*bajara* flour fermented with hot water in sun), *kheechdo* (*bajara* crushed with green gram dal), *gulichara* (barley sprouted grains crushed and cooked) preparation and *fofalia* (dry parts of



Watermelon in farmers' field



Kachri fruits cutting for pickles



Limon fruit



Pomegranate fruit

cucurbit vegetable) etc. The housewives were expert processors in the sense that they prepared delicious *namkeen* (*chabena*) out of seeds of rainfed watermelon, fried in oil with some amount of spices. Traditional Marwari song and proverbs are full of health values of such products, say:

1. “*Bajaria tharo khechado lage ghanu sawad, Lage ghanu sawad-bajara lage ghanu sawad*” (Cooked preparation of crushed *bajara* known as *kheechado* taste very delicious).
2. “*Jeeo marwar men chalyo re, Patali peego rabadi mutaya margo re*”, (A fermented product of *bajara* flour known as *rabdi* help as diuretic action leading to blood purification).

It is reported that reduction in area of coarse grain like barley in Rajasthan directly resulted to loss of cultural heritage. Since 1970 by advent of Green Revolution more attention was given to wheat, which brought about a drastic shift in the food pattern. It was also reported that drastic increase in cases of gall bladder stone are the result of diet fine grain like wheat and paddy that is lacking fibres, micro-nutrients and enzymes. On account of more roughage and protein content yet without any pesticide residues, these indigenous food products are more anti-diabetes and anti-blood pressure. Scientists at Boston University, USA established that barley porridge used in break-fast not only add deliciousness to the product but also

useful for health. The avenanthramoid content of this product being antioxidant does not allow clogging of arteries i.e. it acts against heart problems.

Arid food processing

Available literature indicated that on the basis of quality coarse grains produced in arid and semi-arid areas are better nutritional source than wheat and rice. We have additional advantages of coarse grains grown in rainfed areas as human or cattle feed being produced in organic conditions. Arid food value addition may be diversified nature depending on the basic source of input; like arid crops, agri-horticulture, agro-forestry and underutilized desert plant bio-

diversity.

Arid land crops

Value addition of arid crop may be increased at different stages of production procedure i.e. cultivation, protein content and duration of production post-harvest processing. It is further ascertained by storage and efficient transportation and selling of organic food and ready to use products like organic wheat and wheat flour to higher income groups in hygienic packaging. Such type of value addition is started now in cities by supply of non-processed or semi-processed food products in packed containers. A number of arid crop items i.e. flour, broken grains, broken pulses, *dal* etc. (Table 1). are cleaned

Table 1. Traditional value added products from arid land crops

Local name of crop	Common name/botanical name of crops	Traditional value added products
<i>Bajara</i>	Pearl millet (<i>Pennisetum glaucum</i>)	<i>Namkeen</i> , flour pack, <i>kheechdi</i> , <i>rabadi</i> , <i>dalia</i> , <i>mal pua</i> , <i>sogra</i> (Chapatti) and <i>choorma</i>
<i>Moong</i>	Greengram (<i>Vigna radiata</i>)	<i>Dal</i> , organic pack, <i>namkeen</i> , <i>papad</i> , <i>pakoda</i> , <i>laddoo</i> , <i>halwa</i> and <i>mangodi</i>
<i>Moth</i>	Moth bean (<i>Vigna accontifolia</i>)	<i>Dal</i> , <i>bhuja</i> , <i>namkeen</i> , sprouting seeds, <i>barya</i> , <i>daliya</i> etc.
<i>Chola</i>	Cowpea (<i>Vigna unguiculata</i>)	<i>Dal</i> , <i>namkeen</i> , <i>papad</i> , <i>pakoda</i> , <i>badi</i> etc.
<i>Til</i>	Sesame (<i>Sesamum indicum</i>)	<i>Gajak</i> , <i>Rawadi</i> , oil, <i>til papdi</i> , <i>til laddoo</i> and animal feed cake
<i>Channa</i>	Chickpea (<i>Cicer arietinum</i>)	<i>Dal</i> , <i>namkeen</i> , pickle, green vegetables, <i>chattani</i> , boiled grain, water soaking grain, <i>besan</i> , <i>pakodi</i> , <i>gundi</i> , <i>laddoo</i> etc.
<i>Barley</i>	Barley (<i>Hordeum vulgare</i>)	Pearl barley, bear, <i>dhani</i> , porridge, <i>sattu</i> , <i>dalia</i> , <i>chapatii</i> , <i>ghat dalia</i> , <i>rabdi</i> etc.
<i>Mateera</i>	Watermelon (<i>Citrullus lanatus</i>)	<i>Fofalia</i> , <i>namkeen</i> , juice, salad and seed used for medicinal purpose.
<i>Kachri</i>	Kachri (<i>Cucumis pubescens</i>)	Dried <i>kachri</i> , dried powder, <i>punchkuta</i> , vegetable, salad and pickles.



Rainfed mungbean



Anola candy

of external impurities as stone pieces, dust and plant remain, then packed in attractive bags and many be sold to customers, restaurants, hostels etc. ready to use snack mixture and other breakfast items sold by organizations in cities may also be stated in large villages as small-scale industries. We have a great potential of small scale units dealing in sprouted grains, grass oil, barley malt and broken grain. Many multinational companies have started their business in the remote rural areas yet appreciating the responses.

Agri-horticulture

Agri-horticulture is a type of farming system where fruit trees and vegetables are grown with agricultural crops to aid in the quality of product and insurance against diseases or insect outbreak. The horticulture component here consists of fruit trees as *anola*, date palm and citrus and vegetables like tomato,

brinjal and cucurbits. General fruits and vegetables mostly employed for value addition are *anola*, *ber*, citrus, tomato and peas (Table 2).

Food production in agro-forestry

Agro-forestry is the type of farming system, which includes growing of multipurpose tree species with the agricultural crops simultaneously. A variety of food products are received from forest trees and also several trees and shrubs grown with agro-forestry provide very rich nutritious fodder for cattle, thus helping productivity of milk and milk products. The most important constituents of this system are given table 3.

Forest trees also contribute to a variety of edible fruits and gum material that are used for several other value added products like sweets and confectionary industry, say *shami* tree also provides a special type of gum used for *ladoo* preparation in

rural areas.

Underutilized desert bio-diversity

Arid and semi-arid areas blessed with large underutilized bio-diversity consisting of trees, shrubs and herbs that are partially utilized as food or food products and medicinal derivatives. There underutilized desert bio-diversity provide valuable raw material for processing industries. It was reported that commercial production of food products from underutilized fruit species helped to reduce wastage of fruits and helped in promoting marketing of these items. *Sangri*, *ker*, *khimpoli*, *kachri*, *phogla*, *kumath*, *ber*, *pilu* and *beria* are important traditional value added products of Rajasthan arid eco-system which are trans posted and happily eaten throughout the country and also some of these being exported. As per statistics of Jodhpur market, cost of these products ranges from ` 100 to 300 `/kg on dry weight basis.

Table 2. Common value added products from fruits/vegetables

Hindi name	Common name	Scientific name	Value added products
Awala	Anola	(<i>Emblca orfincinalis</i>)	Squash, murabba, powder, candy, ladoo, pickles and chyawanprash
Anar	Pomegranate	(<i>Punica granatum</i>)	Juice, anardana, syrup
Ber	Ber	(<i>Ziziphus mauritina</i>)	Squash, jam, candy, chutney and pickles
Amrood	Guava	(<i>Psidium guajava</i>)	Jelly and Jam
Limbu	Lemon	(<i>Citrus limon</i>)	Squash, syrup, chutney and toffee
Tamatar	Tomato	(<i>Lycopersicon esculentum</i>)	Sauce, juice, kechap and powder
Matar	Peas	(<i>Pisum satium</i>)	Dry packing and frozen
Kachri	Kachri	(<i>Cucumis pubescens</i>)	Dried <i>kachri</i> , <i>kachri</i> powder, punchkutta, pickles
Mirach	Chillies	(<i>Capsicum annum</i>)	Powder, longi mirch and pickles

Marketing of processed food products

At present organization of economic and marketing activities are needed on a large-scale in the value addition sector. As and when value addition in food products is attained to a desired quality standard the market will automatically entre in the segment. So far, there is no organized and systematic internal marketing system of arid food value-added products, however, they are cultivated collected and sold as fresh or dried packages through middle men to local or distant markets. The process



Mature kachri fruits



Rohida intercropping with sesame

of value addition is profitable in the basic sense that it will avoid commodity glut in markets yet the final product may fetch still more prices. For efficient marketing of value-added products facilities of grading, transport, market intelligence and network of industrial or *khadi* and village industry centers may be created. The prevailing spectrum of food processing and value addition in the country is only 10%, however efforts are in progress by the Government of India to increase this figure to 20% by next 10 years.

The integrated aspect of value addition in food product, not only warrant internal marketing of the product but precisely seek dimension of export to get maximum level of profits. Obviously APEDA is working in this direction and that is responsible for:

- Development of database on product, marketing and service.
- Extension of technology information.
- To control foreign business responsibilities organization.
- To organize product processing and arrange visits of foreign trade responsibilities unit to other countries.
- To established cooperation with foreign planned international trade.
- Distribution of newsletter and information system from APEDA.
- To make available consultation and consulation services to business and trade.
- Solution of public organization problems; RBI, taxation and import-export dimensions.

APEDA also provide financial assistance for export of processed products to producers, trade

organization and Government agencies for works as per details:

- For product sample, bulletin and export regulation and market development.
- Survey and study leading to data base preparation.
- Value addition.
- Development of infrastructure.
- Research and development.
- Quality standardization for packing.
- Human resources development.

SUMMARY

Post-harvest handling is the final stages in the process of producing high quality fresh produce. A grower who can meet these challenges, will be able to expert his or her marketing opportunities and be better able to complete in the market place with quality produce. Management of

Table 3. Composition of agro-forestry system

S.No.	Name of trees	Product	Name of shrubs	Products
1.	<i>Khejri (Prosopis cineraria)</i>	Sangri and gum	<i>Bordi (Ziziphus mauritiana)</i>	Fruit and fodder
2.	<i>Bael (Aegle marmelos)</i>	Fruit	<i>Sarkanda (Sachhrum munjha)</i>	Fodder, rope, hut and other handy craft items
3.	<i>Anjan (Hardvikia binata)</i>	Fodder	<i>Karonda (Carrisa carandus)</i>	Fruit and vegetables, chutney, sauce
4.	<i>Lasoda (Cardia mixa)</i>	Pickles, vegetable and punchkutta	<i>Jharber (Ziziphus nummularia)</i>	Fruit and fodder, pala (dried leaves for goat and sheep in arid situation)
5.	<i>Ardu (Ailenthus exelsa)</i>	Fodder	<i>Babool (Acacia Arabica)</i>	Gum, fodder, fencing, wooden item for house holds
6.	<i>Kumath (Acacia Senegal)</i>	Fodder, gum and punchkutta	<i>Ker (Capparis deciduas)</i>	Pickle, vegetables, <i>punchkutta</i> and powder
7.	<i>Pilu (Salvadora persica)</i>	Fruit, fodder, juice and wooden item	<i>Mehndi (Lowsonia inermis)</i>	Leaves, powder, medicinal uses
8.	<i>Rohida (Ticomella undulata)</i>	Cent, oil, fodder and leaves	<i>Kheemp (Leptadenia pyrotechnica)</i>	Roof making in desert area and cooling in hut, soil erosion management
9.	<i>Phog (Calligonum polygonoied)</i>	Leaves for fodder and medicinal purposes	<i>Thore (Euphorbia royleana)</i>	Fencing fodder and medicinal purposes



Punchkutta items (Ker, lasora, kachri, sangri, kumath)



Punchkutta pickle



Lahsora fruits for pickles



Sangri for pickles

value addition for arid and semi-arid food products have a significant scope with respect to improving the GDP share of agriculture short boosting food security in the rural areas on the other specifically for those marked as BPL families. Following the system of food processing cottage or cooperative industries in rural areas will also help

a lot in creating employment opportunities for land less laborers and empowerment of women using our traditional heritage and wisdom. The process of value addition is very profitable in the basic sense that it will avoid commodity glut in markets yet the final product may fetch still more prices. For efficient marketing of value-added products facilities of

grading, transport, market intelligence and network of industrial or *khadi* and village industry centers may be created.

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Jai Kisan, Jai Vigyan

- A total of ` 788.33 crores have been sanctioned for opening six new agricultural colleges for eastern India under Central Agricultural University, Imphal, and a new Central Agricultural University in Meghalaya.
- For the establishment of two new agricultural research institutes in Asom and Jharkhand, a sum ` 100 crores is allocated.
- First academic session of the Rani Lakshmbai Central Agricultural University has been allocated for four new agricultural colleges in Datiya and Jhansi.
- An Memorandum of Understanding was signed for transforming the Rajendra Central Agricultural University, Pusa, Samstipur, Bihar. A proposal of ` 400 crores is submitted in EFC.
- Post-Graduate Institute of Horticulture is being established in Amritsar, Punjab.
- Foundation stone of the Indian Institute of Agricultural Biotechnology is laid at Ranchi for promoting agricultural biotechnology.