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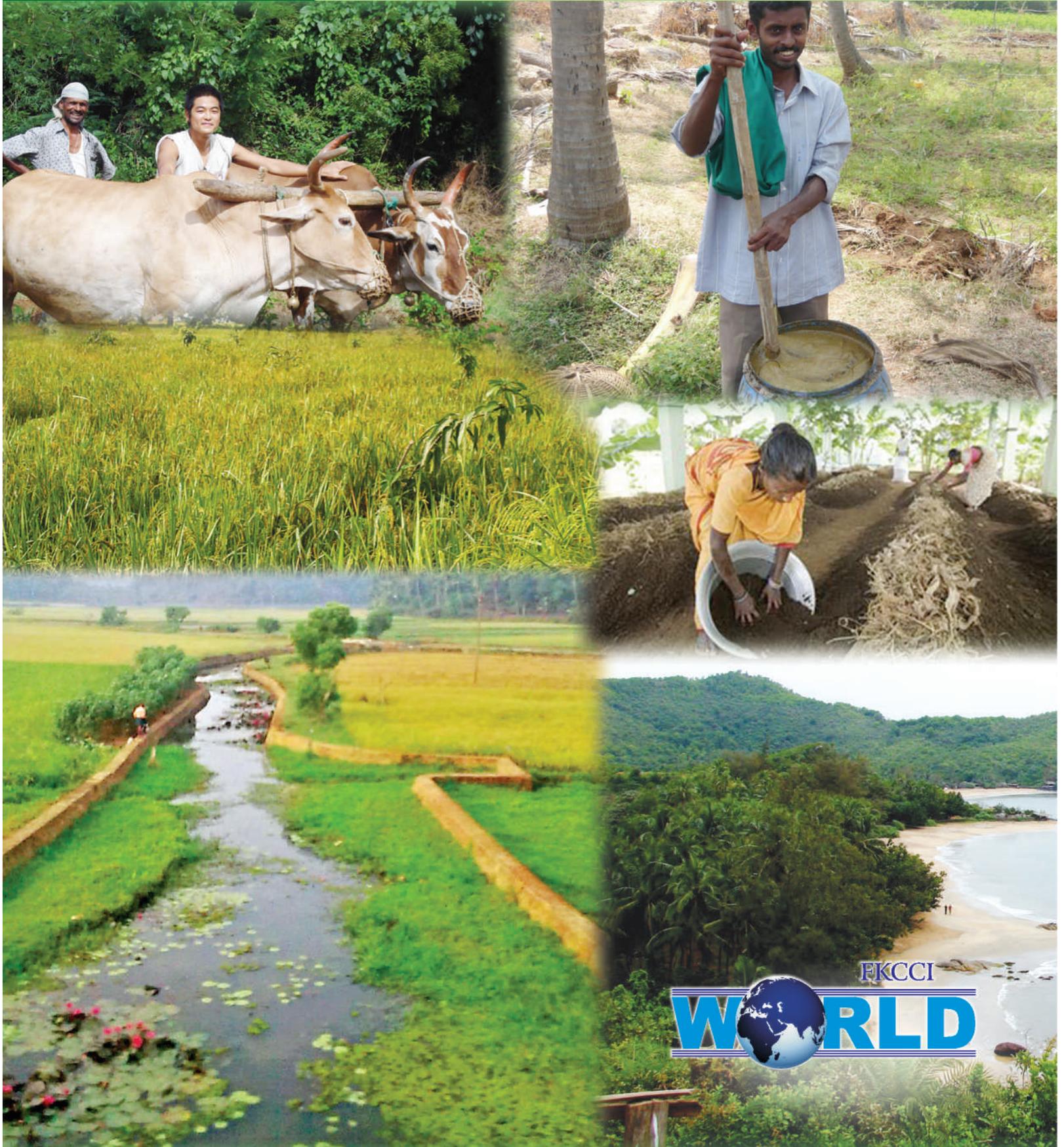
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Green Development for Sustainable Agriculture

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Preamble

Ever since the green revolution, with the policy support to rice and wheat, and the associated rise in real incomes of farmers, small millets (fox tail millet, little millet, proso millet, kodo millet), were rendered inferior goods as their income elasticity of demand became negative and price elasticity of demand positive. India, being the largest cultivator and consumer of millets, the growth rate in area and production are negative. The Table 1 highlights this negative growth in all millets (Jowar, Bajra, Ragi, Barley, Total Coarse Cereals). Rice and wheat contribute 78 percent of the total food grains production while millets contribute to 15 percent. Green revolution virtually wiped out nutritive, healthy, cost effective and low water using millets due to policy support to the expensive and water intensive rice, wheat.

Table 1:

Compound growth rates of area, production and productivity of major crops in India

Crop	(as per cent per annum with base TE 1981-82=100)					
	1980-81 to 1989-90			2000-01 to 2009-10		
	Area	Production	Yield	Area	Production	Yield
Rice	0.41	3.62	3.19	-0.03	1.59	1.61
Wheat	0.46	3.57	3.10	1.21	1.89	0.68
Jowar	-0.99	0.28	1.29	-3.19	-0.07	3.23
Bajra	-1.05	0.03	1.09	-0.42	1.68	2.11
Maize	-0.20	1.89	2.09	2.98	5.27	2.23
Ragi	-1.23	-0.10	1.14	-3.03	-1.52	1.57
Small millets	-4.32	-3.23	1.14	-5.28	-3.58	1.78
Barley	-6.03	-3.48	2.72	-1.41	-0.25	1.17
Total Coarse Cereals	-1.34	0.40	1.62	-0.76	2.46	3.97
Total Cereals	-0.26	3.03	2.90	0.09	1.88	3.19
Gram	-1.41	-0.81	0.61	4.34	5.89	1.48
Tur	2.30	2.87	0.56	0.26	1.82	1.56
Other Pulses	0.02	3.05	3.03	-0.34	-0.32	0.02
Total Pulses	-0.09	1.52	1.61	1.17	2.61	1.64
Total Foodgrains	-0.23	2.85	2.74	0.29	1.96	2.94
Sugarcane	1.44	2.70	1.24	0.77	0.93	0.16
Oilseeds	1.51	5.20	2.43	2.26	4.82	3.79
Cotton	-1.25	2.80	4.10	2.13	13.58	11.22

Source: <http://indiabudget.nic.in/es2010-11/echap-08.pdf>

Even though the Minimum support prices announced for millets are almost on par with those of rice and wheat, farmers are not responding to cultivation of millets due to (1) absence of procurement by State or Federal Government

agencies. (2) lack of consumer demand due to niche markets, (3) poor value addition in millets. The rice and wheat are procured at huge transaction cost. For instance, Government procures rice at Rs. 1000 per quintal and spends Rs. 1043 per quintal towards procurement and distribution, and wheat at Rs. 1120, spending Rs. 424 per quintal towards procurement and distribution. The transaction cost of rice procurement is 104 percent of rice price, while that for wheat is 38 percent of wheat price. This shows the lopsided support to superior cereals at the cost of millets.

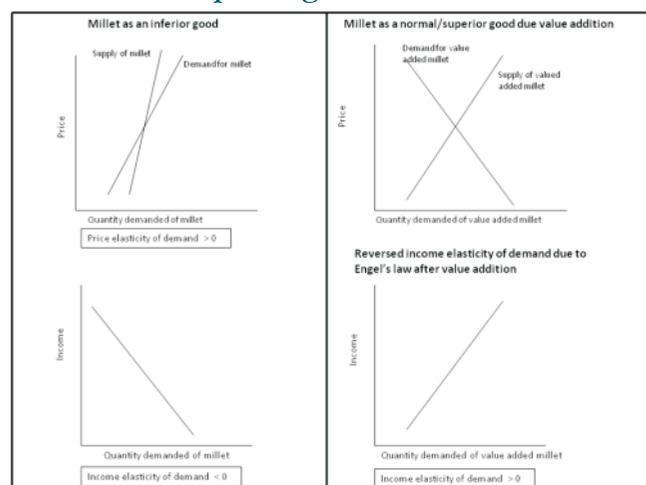
Value addition can reverse Engel's law

Value addition and awareness due to technology can reverse the income and price elasticities of demand (as in the case of maize in India). Maize (*Zea mays*), a coarse grain turned out to be a normal and superior good due to value addition not only as poultry feed but also as corn flakes, corn flour, corn oil, corn starch and so on. Similarly, Ragi (*Eleusine coracana*) (a small millet) is turning out to be a superior good gradually due to value addition, awareness and capacity building explaining the medicinal properties. Thus, value addition in millets can turn them from inferior to normal and superior goods, apart from fetching socio economic, environmental and natural resource benefits with larger social welfare (Fig 1).

Threat to food security

India's food security is currently under threat due to climate change. Rainfed agriculture contributes 40 percent of India's food production where small and marginal farmers who constitute 80 percent of India's farmers are predominant. In addition, they are resource poor, capital poor, and with little or no access to markets and have barely limited livelihood opportunities. Millets are grown on 35.46 ml ha in the world producing 28.52 ml

Fig 1: Demonstrating how inferior goods can be normal / superior goods after value addition



tonnes of which India shares 60 % of area and 65 % of output being the largest cultivator, producer and user of millets. The productivity is 8.76

quintals per ha due to lack of input use and low market prices due to lack of demand as a result of support to major cereals. Among the grains, small millets, foxtail millet and proso millet outperform cereals such as wheat and rice in their nutritional composition (Table 2). Since millets have higher fiber, they cause for slow release of glucose in the process of digestion. They also prevent constipation and help in lowering blood cholesterol and serve as the best diabetic food due to their low glycemic index. India has the world's largest diabetic population and farmers are increasingly becoming victims of diabetes. The practice of cultivating and consuming millets is relegated and is also responsible for increasing diabetic population. However their production, consumption, value addition is relegated *inter alia* due to imperfect markets, market failure, missing information and lack of policy support.

Table 2 : Nutritional composition of millets (per 100 gms)

Food grain	Protein (g)	Carbo hydrates (g)	Fat (g)	Crude fiber (g)	Mineral matter (g)	Calcium (mg)	Phosphorous (mg)	Iron (mg)
Finger millet	7.3	72	1.3	3.6	2.7	344	283	3.9
Kodo millet	8.3	65	1.4	9	2.6	27	188	12
Proso millet	12.5	70.4	3.1	7.2	1.9	14	206	10
Foxtail millet	12.3	60.9	4.3	8	3.3	31	290	5
Little millet	7.7	67	4.7	7.6	1.5	17	220	6
Barnyard Millet	6.2	65.5	2.2	9.8	4.4	11	280	15
Wheat	11.8	71.2	1.5	1.2	1.5	41	306	5.3
Rice	6.8	78.2	0.5	0.2	0.6	45	160	

Source: All India Coordinated Small Millets Improvement Project, A Profile, Indian Council of Agricultural Research, University of Agricultural Sciences, Bangalore (undated)

Green revolution largely due to irrigation

According to IWMI “.....currently, over 80% of irrigated agriculture in India is supported by groundwater, resulting in severe overexploitation of this resource¹. As green revolution was largely for wheat and rice which are water intensive, its growth

is unsustainable unless India switches towards small millets. Small millets are drought tolerant and thrive in harsh agroclimatic conditions. Hence they indirectly conserve the precious and expensive groundwater resource. The small millets and gender are closely associated as women who have preserved the culture of both cultivating and cooking millets also form the major family labor. A majority of the farm operations are carried out by women in these areas. Cultivation of millets not only is low external input demanding, but also



reduces physical stress, and also complements nutritional needs of the farm family. However, the post harvest processing of millets is in infancy and with no policy support to millets, millets are further relegated. Thus, applied field and lab oriented research on nutrimillets would address the key issues of natural resource conservation, food, nutritional, livelihood and economic security, gender balance in the wake of climate change.

Cultivation of small millets on rainfed / dry lands:

The millets such as Little, Proso, Foxtail, Kodo are the most nutritious but their popularity faded resulting in negative growth in area, production and consumption, as they cannot compete with other remunerative crops due to poor market, policy support and consumer awareness. The extension efforts towards their cultivation and consumption are relegated. Advent of irrigation in the villages gradually replaced the area under millets by rice, maize and commercial crops. Due to low market price their cultivation is uneconomical, but there is market failure as the market fails to capture the nutritive value of millets. Millet cooking is thus popular in dry lands, however the recipes may have undergone changes in irrigated areas, peri urban and urban areas

The PL 480 grains

Green revolution did bring food security to India putting a halt to starvation deaths and 'ship to mouth' existence of the PL480 project era. However, in the post green revolution period, India continued to emphasize on the superior cereals (rice and wheat) and despite the richness in nutritional and medicinal properties of millets and emphasis on organic agriculture, small millet cultivators (growing fox tail millet, little millet, proso millet, kodo millet) are relegated and these crops are gradually disappearing in traditional areas. Small millets are now inferior goods with negative income elasticity of demand and positive price elasticity of demand.

The post harvest processing, value addition, awareness, capacity building of farmers, consumers, processors, and market linkages can bridge the constraints both producers and consumers are

facing in respect of meeting the millet needs. Paradoxically while producers are unable to find the market, while consumers are unable to access millets even though they are in need, especially the diabetic population. It is hence necessary to bridge this gap.

Knowledge base, complements, low marketable surplus, status symbol

Knowledge regarding cooking millet rich food is with (elderly) farm women belonging to different castes. The preparations are traditional / ethnic and specific to certain castes in the villages. While cooking millet dish, the complements are crucial and are in vernacular (Eg. Ragi rotti - Hucchallu Chutney; ragi huriittu with milk, ghee and jaggery). However, as eating habits die hard, small millets are cultivated on a minute area in the farm, to meet immediate farm family requirements and hence with low marketable surplus. Most often farmers who cultivate millets are also consumers of those millets. There is also a status symbol attached to consumption of millets (and indirectly the cultivation of millets) as their appearance may not be as fine/neat/great and palatable compared with rice/wheat.

Subsistence scale cultivation, Low external input users

Cultivation of millets is limited to farm level and not market oriented as the width of the market is getting narrowed and effective demand is falling. Data on farmers cultivating them / cooking them are not documented. Snowball sampling is crucial to locate them. Crop duration of millets is smaller compared to cereals and at least 10 to 15 percent of the crop duration is saved with the cultivation of millets (for Eg. Fox tail millet comes to harvest in 75 days). They are users of low external inputs as it is not so economical to use agrochemicals and they are also tolerant to pests and diseases.

What is required for Green development

For sustainable agricultural growth it is necessary to promote food, nutritional and economic security through sustainable cultivation of nutri-millets by small and marginal farmers in semi arid regions of India, with value addition in the wake of climate change. This



requires baseline study of the small millet cultivators covering income, employment, savings, investment, gender and natural resource dependence and coping mechanisms in the wake of climate change. The socio-economic, cultural aspects of cultivation of small millets and their impact on household food, nutrition, health, livelihood and economic security including economics of cultivation of millets for different classes and locations of farmers with environmental sustainability are crucial. The techno-economic assessment of existing post

harvest technologies and for value addition, for applied research and innovations to standardize the post harvest technology for nutrimillets is necessary. Provision of backward and forward linkages for value chain in nutrimillets using the standardized post harvest technologies through domestic and international markets is desirable. Capacity building for social capital formation among farmers and consumers regarding their cooperation for millet cultivation and consumption considering their nutritional, medicinal properties is the need of the hour.



Circular No.17/2011- Customs

F.No.450/26/2011-Cus.IV

Ministry of Finance

Dated 8th April, 2011.

Subject: Implementation of 'Self-Assessment' in Customs – regarding.
The Finance Bill, 2011 stipulates 'Self-Assessment' of Customs duty in respect of imported and export goods by the importer or exporter, as the case may be.

This notification provides the process of Self-Assessment

(Source: http://www.cbec.gov.in/customs/cs-circulars/cs-circulars11_circ17-2k11-cus.htm)

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