

Reorientation of Investment in R&D of Millets for Food Security—The Case of Sorghum in India

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Food Security is achieved "when all people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" [1996 World Food Summit in Rome]

Introduction

Underlying objective of food security programme in India is to ensure the availability of foodgrains to the common people at an affordable price. As we all know that once India used to import foodgrains, the situation has appeared to have improved overtime due to the food security policy which has allowed the poor to have access to food. It has essentially focused on growth in agriculture production, and on support price for procurement and maintenance of rice and wheat stocks. The Green Revolution of the 1960s and 1970s helped India become agriculturally self-sufficient net exporter of food in the last four decades. Procurement and storage functions are undertaken by FCI and distribution function by the States' Public Distribution System (PDS).

The demand vs supply scenario of foodgrains in India in the recent past became quite unstable due to serious mismatch between the rising internal demand and irregular production. Particularly 2006-07, this mismatch between demand growth and output growth has worsened, necessitating large-scale imports of wheat. Debate is on whether it is the lower production or low inventory that has led to wheat crisis? It has exposed how insecure is our food security? The cereals security is very important for a country like India which was characterized by a history of droughts and famines, has vast and expanding population, and social structure is still not fully evolved up to the expectation of our civil society.

Food and Nutritional Security

The increased productivity during the last four decades has been accompanied by increases in personal income and stimulus to national economy. Increased incomes will normally lead to decline in consumption of cereals mainly coarse cereals. It is further triggered by the policy of Government of India. The PDS system in India is based on the *wheat and rice* model, which in many areas were never the staple grains for household consumption. It was millets and pulses which were core to dryland farming and consumption in the country. During the past four decades in millets too especially in sorghum, the productivity increases were made through High yielding hybrid technology. This technology kept their production

levels stable despite the area decline, under given home consumption demand situation. PDS has significantly changed the food habits of people across the country, but led to a complete neglect of so called coarse grain such as millets, which are otherwise extremely nutritious. Now it is a known fact that the food security programme based on rice-wheat supply through PDS system has not completely attained the desired objective of reducing hunger in the country¹. The country must, therefore, work towards achieving complete food security, even though elimination of hunger may have been the primary objective, the nutritional security also may be simultaneously planned and visualized.

Millets inclusion in the food security on the contrary would have strengthened not only the food security objective but nutritional security (millets are known as nutritious cereals as they are rich in minerals and vitamins). Such a shift at least now can be encouraged in those States where millets are known to be produced and consumed. As the data on food security index points at that sorghum growing States are either moderately secure to moderately insecure despite supply of subsidized rice and wheat through PDS. This calls for alteration in investment strategies on agricultural policy and its R& D.

Any measure aiming at increasing the millet production by creating their demand especially on nutritional grounds is likely to bridge the deficit gap of foodgrains facing in the present day situation. This will enable us to avoid import of foodgrains such as wheat especially on medium to long-term period. Millets inclusion will widen the food security basket through. Millets deserve to be reclassified as "*nutritious grains*" due to their desirable nutritive properties.

Sorghum—A Case Study

Sorghum though known traditionally as a staple diet, its consumption (direct) is declining secularly due to positive growth in standard of living of the rural poor. As a result its area especially kharif sorghum area (dominated by hybrids) drastically came down. Sorghum production was stable till early 1990s due to high productivity growth countering negative growth in area. However, the productivity growth since 1990s has been staggering,

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keeping the negative growth rate in production during the decade. However, lowering of sorghum's demand as food crop has primarily contributed to this decline in sorghum's cultivation area.

According to NSSO's latest quinquennial rounds data the per capita consumption of sorghum grain in rural sector has declined from 9.7 kg/year in 1993 to 5.7 kg/year during 2003. It is expected that this would further fall to 3.9 kg/year by 2011 if the present policies are continued. However, in general cereal consumption as such is expected to decline, which is primarily triggered by decreasing demand for coarse cereal consumption. The causal factors for this decline in consumption are raising per capita income levels, change in food habits and tastes and availability of fine cereals at cheaper price through PDS. Considering the present food-grain crisis this trend must be reversed which may not be a easy task. True commitment on the part of both the government and researchers in terms of investments, will and tangible efforts must be forthcoming.

According to NCAP, 2006 on review of foodgrain situation for 11th plan pointed that the likely demand of sorghum for other uses has been projected to be 7.2 million tonnes in 2011; the required growth rate in productivity should be around 6 per cent which is of very high order. It appears to be an all-time greatest challenge posed to researchers working for the benefit of the dryland farmers and to secure the foodgrain situation of the country. But the question is even if such a growth is attained, without a long-term policy on inclusion of sorghum in PDS these shortages of fine cereals would continue to pose problems to food security. Here comes the role of Government to intervene in framing a policy on long-term basis which would generate sufficient demand for sorghum. Such a measure is sustainable and will help in circumventing the present food-grain crisis and can be targeted in those sorghum consuming States immediately during the first three months after harvest (as storability is a constraint in sorghum) replacing rice and wheat. Rice wheat supply may be resumed after the three months of sorghum supply. Apart from its inclusion in PDS, the demand creation on food uses can be aggressively taken up by targeting rabi sorghum/normal kharif grain as a "health food" due to its rich constitution of nutrients including high fiber content and its suitability for diabetic prone population.

In addition, demand for sorghum can be enhanced through alternate uses such as poultry feed, animal feed, alcohol and others. The likely demand for sorghum as poultry feed and cattle feed primarily depends on availability and price of maize. Dayakar *et al* 2004 projected that by 2010 A.D. the likely demand of sorghum for poultry feed/cattle feed alone would be around 3 million tonnes. Blackened kharif grain (due to rains at the time of harvest) may be targeted for alternate uses which actually go out of human food chain. The utilization of grain for fodder or dairy/poultry feed in turn indirectly contributes again to either nutritional

security or food security. The use of cereals as animal feed does not contribute to hunger and under nutrition. Globally, some 660 million tonnes of cereals are used as livestock feed each year. This represents just over a third of total world cereal use. If these cereals were not used as feed, they would probably not be produced at all, so would not be available as food in many cases. More likely, the lack of demand for cereals for livestock production would lead to lower crop production.

The total sorghum production demand of 11.4 million tonnes by 2011 can be effectively allocated between kharif sorghum and rabi sorghum areas. Ninety per cent of the direct consumption demand of 4.2 million tonnes of grain in 2011 can be expected from rabi sorghum while the rest from kharif/summer sorghum.

Rabi sorghum production is characterized by the spread of improved cultivar i.e. M-35-1 and its variants rather than hybrids as in kharif. Rabi sorghum is grown in marginal soil environments with receding soil moisture. It is grown where crop alternatives are rare; however, its grain is of good quality though the yields are low. Thus, rabi sorghum offers a stable source for direct food consumption. Obviously its grain price is 2-2.5 times of kharif grain mainly due to its quality and taste. It has a great demand in many urban areas too. It can also be promoted as organic food as mostly it is grown either with low or no fertilizers. The R&D investment options should revolve around the technology options for making it more viable which are given below :

R&D Investment Areas for Direct Food Consumption/Health Foods in Rabi Sorghum

1. High yielding cultivars "maldandi" quality types
2. Chapathi maker
3. Pearling
4. Incorporation of gluten gene of wheat in to sorghum for improving dough quality
5. Composite flour composition
6. Advertisement /publicity

R&D Investment Areas for Direct Food Consumption/Health Foods in Kharif Sorghum

Normal sorghum grain (with out blackening) can be better utilized for human consumption. Its price is normally 60-70 per cent of the rabi grain price.

1. Harvesting at physiological maturity and artificial drying
2. Pearling
3. Grain mold tolerant cultivars
4. Composite flour composition
5. Advertisement /publicity

Suggested R & D Strategies and Policy Measures

1. Sorghum grain especially rabi grain should be included in PDS as a supplement to rice and wheat which will gain instant popularity as it is highly valued among those places where is largely grown, and in urban areas as branded nutritious cereal. Unlike kharif grain the shelf life of rabi grain is more. If it is kharif grain, it should be distributed within three months of its procurement, after which regular rice and wheat supply may be resumed. It can also be promoted as flour or even blended with the flour with other grains.
2. Minimum support price (MSP) of sorghum should be fixed based on individual crop's cost of cultivation rather than as group as millets. Vigilance on the part of Government is required to intervene when ever the market price goes below MSP and to ensure a fair price for their produce to marginal farmers. Procurement of sorghum grain will be a prospective measure of intervention.
3. Popularization of sorghum as health foods is to be taken up on a large-scale through advertisements and media. Providing choices to the end users in terms of nutrient—and food preparation-specific grain type, and greater emphasis on composite flour and ready-to-eat foods at reasonable costs will also promote its consumption. Due to its nutritious tag it can be even introduced in school as apart of mid day meal school. To encourage the processing industry involving the value-addition, concessions in the form of subsidies/tax exemption in procurement of raw material, production and marketing spheres and tax holidays should be given.
4. Enhancing agriculture productivity: There is no time to relax on the food production front. We need to bring about productivity; quality (including food safety), profitability and sustainability revolutions in sorghum based farming systems approach. In either case, the productivity levels has to be higher (projected growth rate of 6%) to bring their cost of production lower to make sorghum a sustainable choice for both the farmers and the end users alike in the dry land regions of the country. Government of India's FLD programme may be re-oriented so as to focuss on spreading the new HYV cultivars with high yield potential in contributing to the overall sorghum productivity in the country to meet the emerging challenges. New non-traditional areas such as sorghum in rice fallows and other irrigated areas will have to be explored.
5. There is an urgent need for enhancement of investment in rural infrastructure development such as storage structures, rural godowns and encouraging farmers by creating effective marketing network by involving National Institute of Agri Marketing, Jaipur to provide storage functions.
6. Involving all the stake-holders including private sector funding and other agencies will go a long way by devising a transparent sharing of benefit system on mutually agreeable terms.
7. Introducing sorghum in futures trading either through NCDEX, Mumbai will enhance its demand and marketability to the farmers which assures a fair proportion of consumer rupee.
8. Use of Agricultural biotechnology can be a powerful tool in the development of improved sorghum varieties. Internationally it is now agreed among the scientific fraternity that crops derived through biotechnology are safe to eat as food and feed and beneficial for the environment. These and other promising technologies are now being directed at improving the sorghum production. While it is prudent to make investment where conventional breeding could not make a dent in solving the world's food problems. The frontier areas of research involving development of transgenic, molecular markers etc. in sorghum production may be employed for resolving the impending problems of pests and diseases looming this crop.

Conclusions

The revival of sorghum economy can be effectively linked up with food security and nutritional security alike which may result in transforming the poor soil and water environments it is facing now despite threat facing from competent crop enterprises. The opportunity galore of sorghum revival is never as bright as today both in terms as a food, feed and industrial crop, provided that investments are forth coming. In addition, the policy support is crucial for it to fulfill the role as one of the food security crop as well as other roles of sorghum as food, fodder, and industrial raw material. Sorghum production should be re-oriented to and go beyond the precincts of dryland to non-traditional areas such as rice fallows. Above mentioned actions and options would go a long way to sustain it offer the twin roles of food /fodder and nutritional security atleast in the millet growing regions in the country.