

## AN UNVEILED CROP, YET A GLOBAL SOLUTION TO HUNGER AND MALNUTRITION (WITH SPECIAL REFERENCE TO INDIA)

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### ABSTRACT

Our globe is heading on to significant climatic changes due to industrialisation, changing lifestyles of people and an ever-increasing population. According to The State of Food Security and Nutrition in the World 2018, climate variability undermines the progress in tapering food insecurity, malnutrition, and hunger. Though there have been several solutions to overcome food and nutritional insecurity, resilient pathways are lesser focused on. One such variety of crops that are less ventured yet have the potential to contribute to sustainable food systems under climatic change are the “Orphan Crops”. The term ‘orphan’ refers to crops that either originated in a geographic location or those that have become indigenized over many years (100 decades). Traditional and indigenous crops have a great potential; however, they have less value chains due to their limited development. They can also be deployed as a part of efforts to champion economic advancement of smallholder farmers. Several orphan crops are nutritious, resilient, adaptable to niche marginal agricultural environments. They also represent a broad gene pool for future crop improvements. Their suitability to a low-input environment offers opportunities for low greenhouse gas emissions. Their status as a sub-set of agro-biodiversity gives us the opportunity to address socio-economic and environmental challenges as well. Gaps in knowledge concerning these crops inhibit the capacity to exploit the value of these crops. This paper gives an insight on “orphan crops” that could be a pathbreaking and futuristic approach to the problem in hand.

**Keywords:** Orphan crop, Food security, Sustainable, Nutritional security

### INTRODUCTION

Climate change due to human-caused reasons is going to influence the quantity and quality of food. The next century’s global burden in disease will depend on our capacity to ensure food and nutritional security with the ongoing biophysical changes (Myers *et al.*, 2017). In the future, global demand for food is expected to rise at a highly steep pace. Now, we are facing increasing constraints in our capacity to appropriate new lands, new water, or new fisheries to meet these ever-growing demands (Whitmee *et al.*, 2015). The yield of crops is being easily affected by temperature and water availability (Lobel *et al.*, 2012). Increasing CO<sub>2</sub> levels are altering the nutritional value of the crops (Myers *et al.*, 2014). The projected increases in CO<sub>2</sub> will decrease the global availability of dietary nutrients by 19.5% for protein, 14.4% for iron and 14.6% for zinc due to the expected technology and market gains by 2050. As a result, the numerous countries having high levels of nutrition deficiency would continue to be affected, disproportionately. The effects of climatic environmental change will be greatest among populations that are already subject to food and nutritional insecurity which includes women, young children, the elderly and those with existing health problems within poor, displaced and marginalized communities (Robert H Beach *et al.*, 2019).

Considering the situation in hand, the policies made on our agricultural and food systems should be aligned to the 2030 Agenda for Sustainable Development. Food systems must – 1) enable all to benefit from nutritious and healthy food, 2) they must reflect sustainable agricultural production, 3) they should mitigate climatic changes and build resilience, 4) they should encourage the renaissance of rural territories (Caron *et al.*, 2018).

Around 821 million people, mostly in South Asia and Africa are undernourished. There is a need to invest in agricultural strategies that give sustainable diets and are nutrition sensitive.

Orphan crops are a diverse set of minor crops that tend to be regionally important but not traded around the world. However, they can play an important role in global food and nutritional security. Specifically, orphan crops will majorly contribute to-1) sustainable and healthy food systems, 2)

genetic resources for future crop improvement and 3) agricultural sustainability under climate change (Tafadzwanashe Mabhaudhi *et al.*, 2019).

### Beneficial Properties of Orphan Crops

The major groups of orphan crops are cereals, legumes, and fruits (Tadele, 2019). Few orphan crops with the area of cultivation and nutritional properties are listed in Table 1.

**Table 1: Cultivated region(s) and benefits of crops cultivated**

CROP NAME	REGION(S) CULTIVATED	BENEFITS	REFERENCE
<i>Pearl Millet</i>	Africa, Indian subcontinent	Tolerance to moisture deficit	Kholova J <i>et al.</i> , 2010
<i>Finger millet</i>	Semi- arid regions of Asia and Africa	Adaptation to unfavourable climatic conditions especially drought; popular among diabetic patients due to low glycemic index	Tafadzwanashe Mabhaudhi <i>et al.</i> , 2019; Chandrashekar 2010
<i>Bambara groundnut</i>	Africa	Adequate quantities of essential nutrients- protein (19%), carbohydrates(63%) and fat(6.5%)	National Research Council 2006
<i>Cowpea</i>	African countries- Niger, Nigeria, and Burkina Faso	Tolerant to drought and heat	N. Sanginga <i>et al.</i> , 2000
<i>Cassava</i>	Nigeria, DR Congo, Brazil, Thailand	Tolerant to drought	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Linseed</i>	Russia, India, Canada, China, USA, Ethiopia	Nutritious and healthy	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Noug</i>	Ethiopia, India	Quality oil	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Sesame</i>	Sudan, India, Myanmar, Tanzania, Nigeria, South Sudan, Ethiopia	Oxidatively stable oil	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Yam</i>	Nigeria, Ghana, Togo, Sudan	Rich in vitamins, minerals and fiber; cancer fighting properties; controls blood sugar	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Banana</i>	India, Brazil, China, Tanzania, Rwanda, Uganda	Nutritious and healthy	FAO, IFAD, UNICEF, WFP and WHO 2019
<i>Plantain</i>	Uganda, Nigeria, Tanzania, Philippines, Colombia	Nutritious and healthy	FAO, IFAD, UNICEF, WFP and WHO 2019

### **Economic Advantages of Orphan Crops**

Orphan crops play an incredibly significant role in the livelihood of the developing world (Tadele 2018). These crops have a low cost of input for farmers as they require only low levels of inputs such as pesticides and fertilisers (Dansi *et al.*, 2012). Additionally, they are resistant to pests and diseases and are tolerant to environmentally extreme conditions (Tadele, 2018). They can contribute to promoting food and livelihood security for vulnerable communities. These communities can be empowered economically and sustainably (Hlahla *et al.*, 2016).

In Ethiopia, tef (an orphan crop) is grown by around 7 million farmers. The production value was approximated at 2.8 billion USD in 2016-2017. The value of commercial surplus of tef is much higher than the surplus of all the other cereals in the country combined. The production and productivity of tef is increasing at a fast pace and its markets are improving with time (Solomon Chanyalew *et al.*, 2019).

Conclusively, orphan crops can be accessible and affordable along with adequate nutritional content.

### **Orphan Crops in India**

#### **I. Rice Bean**

Rice bean is sold in the unorganised local markets of India. It has a current private value for people living in vulnerable agricultural systems. However, the commercial potential of the crop is underestimated. This crop has numerous useful traits like disease resistance, aluminium toxicity tolerance, drought tolerance and being abundant in nutrients can address deficiencies in micro-nutrients in affected areas. The bean is rich in niacin (Vitamin B3), riboflavin (Vitamin B2) and thiamine (Vitamin B1), all of which are essential vitamins. It can be compared with low-fat grain pulses. The *in vitro* protein digestibility of rice bean is much more than cowpea and mungbean. There is an untapped potential for genetic improvements in rice bean, which can significantly contribute towards sustainable food production. It also provides an option of cultivating legumes in arid zones and less fertile lands (Pattanayak *et al.*, 2019).

#### **II. Horse Gram**

The major producer of horse gram is India. However, it remains confined to small-scale farming systems and is alienated from mainstream agriculture. This crop is suitable to develop functional food and to address the micronutrient deficiencies among poor rural communities. It is a nutrient dense legume and has remedial health-promoting effects because of the presence of various bioactive compounds. It also possesses high adaption in risk-prone farming systems in arid and semi-arid regions.

Presently, there is a scanty basic research on this crop and no attention is paid to factors such as yield improvement, processing, reduction of anti-nutritional factors and value additional in order to suit consumer needs (Aditya *et al.*, 2019).

#### **III. Grass Pea**

It is considered one of the most resilient legume crop to climatic changes. It is survival food during the drought-triggered famines. It can meet its own nitrogen requirements and has a positive effect on subsequent crops.

There is an overemphasis on its toxic properties due to which its positive agronomic properties and dietary advantages are neglected. With the problem of global climatic change in hand, it is an adaptable and nutritious orphan crop that needs more attention. Green pea has the potential to become a wonder crop if its reputation as a toxic plant can be disregarded (Fernand Lambein *et al.*, 2019).

### **The Role of Orphan Crops in Food and Nutritional Security**

Around 820 million people in the world are hungry as of today based on the FIES (Food Insecurity Experience Scale). Hunger is increasing in the sub-regions of Africa. There is 11% undernourishment in Asia. In all the continents, food insecurity is higher among women than men (FAO, IFAD, UNICEF, WFP, and WHO 2019).

Food security has four pillars. Namely- 1) food availability referring to availability of sufficient quantities, 2) food access which is having sufficient resources for acquiring a nutritious diet, 3) stability which means accessibility and availability of food every time, 4) utilization which refers to appropriate use of food-based knowledge. Based on these four pillars, the worst situation is faced by Africa followed by Asia (FAOSTAT 2006).

The current scenario of food security could be improved by focusing on both the major and orphan crops of the world (Fahey JW 1998). Orphan crops play a major role in the economy of the developing countries as they provide income for small scale farmers. There is a need to focus on orphan crops to meet the demand for food (Tafadzwanashe Mabhaudhi *et al.*, 2019)

Orphan crops are particularly important to the local populations, as they ensure subsistent, diverse, and nutritious diets. They have a better response to climate threats by contributing to diverse agricultural systems (Tadele 2018).

### Conclusion

The resources allocated for breeding orphan crops are not anticipated to increase dramatically. Therefore, orphan crop breeding must be achieved by efficiently using data, tools, and information. (Jean-Marcel Ribaut *et al.*, 2010)

Although recent research investments are made, from the breeding perspective, they do not receive enough funding (Jean-Marcel Ribaut *et al.*, 2010). Digitalisation of breeding reduces the technical challenges to sharing data, institutional memory, and collaboration. It does not remove social, institutional, or behavioural barriers that prevent change (Rebecca Einsberg 2006). Innovations in breeding are imperative to meet the growing demand for crops. Orphan crops play a significant role in improving quality and productivity, particularly in developing countries.

Orphan crops prove to be economically viable and nutritious. They also contribute to the income of farmers in developing nations. If enough innovations in breeding, funding and research is being done on this front, orphan crops would prove to be a global solution for food and nutrition insecurity.

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