COMMERCIALIZING DRYLAND CEREALS THROUGH PRODUCT DEVELOPMENT, SCIENTIFIC VALIDATION AND ENTREPRENEURSHIP

ABSTRACT: With the objective to promote the dryland cereals Sorghum (*Sorghum bicolor*), Pearl millet (*Pennisetum glaucum*) and Finger millet (*Eleusine coracana*) which are rich sources of energy (protein, fat, carbohydrates) and micronutrients, the NPK program of AIP has undertaken product development activities based on understanding of nutritional and functional traits of the crops. Products having different nutritional and functional properties have been developed and validated targeting different segments of the population. These include dryland cereals based products for addressing hidden-hunger/malnutrition (Energy and Nutrient Dense Food-ENDF) and lifestyle diseases such as diabetes and obesity. Besides nutritional profiling, starch digestion rate related to the quantification of slowly digestible starch (SDS) was undertaken for select varieties of the three dryland cereals. Further the developed technologies and related products have been successfully transferred to entrepreneurs and commercialized through innovative business models by the ABI and INP programs of AIP.

INTRODUCTION

- Dryland cereals are nutritious, gluten free, diabetic friendly and rich source of antioxidants[1].
- Low commercialization due to lack of:
  - ✓ R&D on use of dryland cereals in product formulation.
  - ✓ Understanding of nutritional and functional properties.
  - ✓ Knowledge on processing dryland cereals.
  - ✓ Validation on content and claims of products using dryland cereals.
  - ✓ Support to SMEs and market linkages for the farmers.
- Need for an ecosystem to create market demand for dryland cereals **(Fig. 1)**.

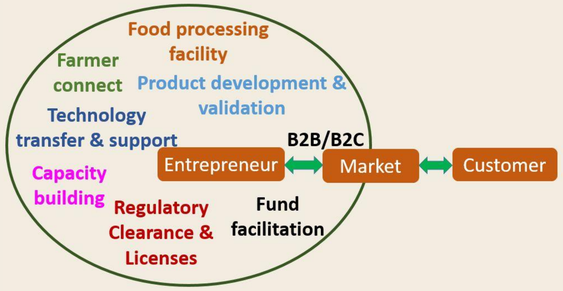


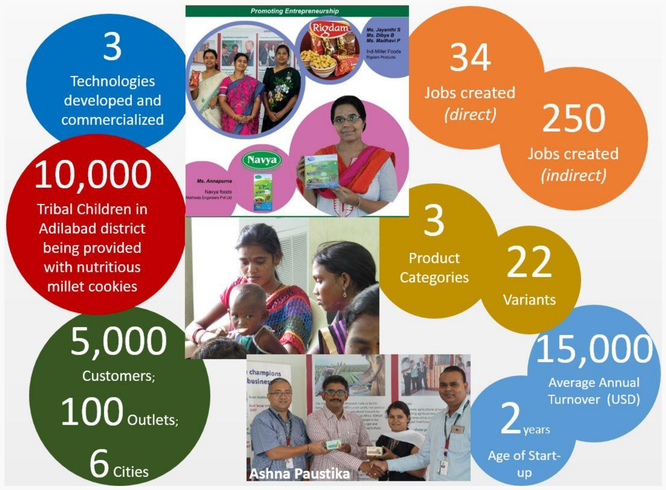
Fig. 1: Ecosystem at the Agribusiness and Innovation Platform (AIP), ICRISAT to promote dryland cereals through product development, scientific validation and entrepreneurship

RESULTS

Products formulated and validated

Product	Product Description and Technology	Validated parameters
 Smart Brkfast	• "Smart Brkfast" a single serve **ready-to-eat breakfast cereal concept**. • Roasted flakes from sorghum and pearl millet with honey and nuts. • All natural, gluten-free, sugar-free, and prebiotics. • **Millet/Sorghum component in formulation: 70%.** • **Technology used: Flaking.**	• Product acceptability. • **Slowly digestible starch (low glycemic).** • **Prebiotic properties.** • Energy and fat content. • Shelf-life.
 Millet Cookies	• **Gluten and lactose free** millet cookies. • Pearl millet/sorghum/finger millet/foxtail millet and natural fruit pulps. • Trans-fat free, and source of prebiotics and slowly digestible starch. • **Millet/Sorghum component in formulation: 52%.** • **Technology used: Baking.**	• Product acceptability. • **Slowly digestible starch (low glycemic).** • **Prebiotic properties.** • Energy and fat content. • Shelf-life.
Extruded Snacks	• **Gluten free extruded snacks.** • Pearl millet/sorghum/finger millet with spicy seasonings. • Gluten-free, trans-fat free, and source of prebiotics and slowly digestible starch. • **Millet/Sorghum component in formulation: 80%.** • **Technology used: Extrusion.**	• Product acceptability. • **Prebiotic properties.** • Energy and fat content. • Shelf-life.
 Energy and Nutrient Dense Food (ENDF)	• **Gluten free and lactose-free, prebiotic rich.** • Cost effective and prepared using locally available crops (groundnut, sorghum/millets, chickpea,). • Rich in sulfur containing (growth promoting) amino acids. • Contains both **Type 1 and Type 2 (growth promoting)** micronutrients. • Designed to address severe **underweight, wasting and stunting (Energy= 475 Kcal**, adheres to WHO recommendations[3]). • **Dryland crop components in formulation: Millet/Sorghum (20-25%), Peanut (30-35%) Chickpea (15-20%).** • **Technology used: Malting, roasting, blending.**	• Product formulation including micronutrients as per **WHO/NIN guidelines.** • Product acceptability. • Prebiotic properties. • Energy and fat content. • Shelf-life.

Enterprises promoted linked to validated products



- Millet based products developed and validated on content and claims of products.
- An ecosystem to generate market demand for dryland cereals established and implemented.
- Products successfully commercialized through support to SMEs.

MATERIALS AND METHODS

- Products formulated using sorghum/millet as ingredient.
- Nutritional profiling and shelf-life as per standard protocols.
- Validate products for: sorghum/millet content in formulations, prebiotic and probiotics[2], claim of "diabetic friendly" parameters.
- Sensory analysis to ensure product acceptability (triangle test and acceptability studies).
- Pilot scale-up trials at third party manufactures for process optimisation.
- Technology transfer, business incubation and marketing support by ABI & INP program.

DISCUSSIONS

Scaling of the proven models of commercializing dryland cereals using an ecosystem that facilitates sustainable entrepreneurship development is the way forward for creating demand pull for these crops. Strengthening of partnerships with the private sector and the government agencies involved in addressing malnutrition (ICDS-supplementary nutrition programs and the mid-day meal schemes) are being pursued to further increase the demand.

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RESEARCH PROGRAM ON Dryland Cereals — LED BY ICRISAT — IN PARTNERSHIP WITH ICARDA — and public and private institutes and organizations, governments, and farmers worldwide

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