Bringing Hope to Rural Kansas and Globally One Grain at a Time - Grains for Hope

Sajid Alavi
Kansas State University

Food Security Engagement Symposium – April 4th 2016

Bringing Hope To Rural Kansas and Globally One Grain at a Time - Grains for Hope

Dr. Sajid Alavi
Department of Grain Science & Industry

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Sabetha High School and Wenger Manufacturing, Inc.

K-State Extrusion Lab

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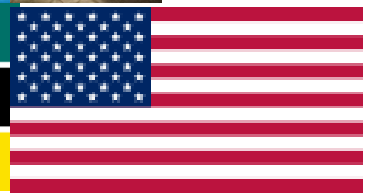
Country Profile - Mozambique

Area:	**0.31 million sq mi**
Population:	**22.9 million**
GDP:	**$19.8 billion (PPP); 9.8 billion (nominal)**
GDP per capita:	**$933 (PPP)**
Ag GDP:	**21% (only 12% 90 million acres of arable land cultivated)**
Ag labor force:	**75%**
Population below poverty line:	**70%***
Unemployment:	**21%***

Source: Wikipedia



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Partnership for Science Education,
Global Outreach and
Food Security

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Feeding Villages in Mozambique and Haiti

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International Experiences

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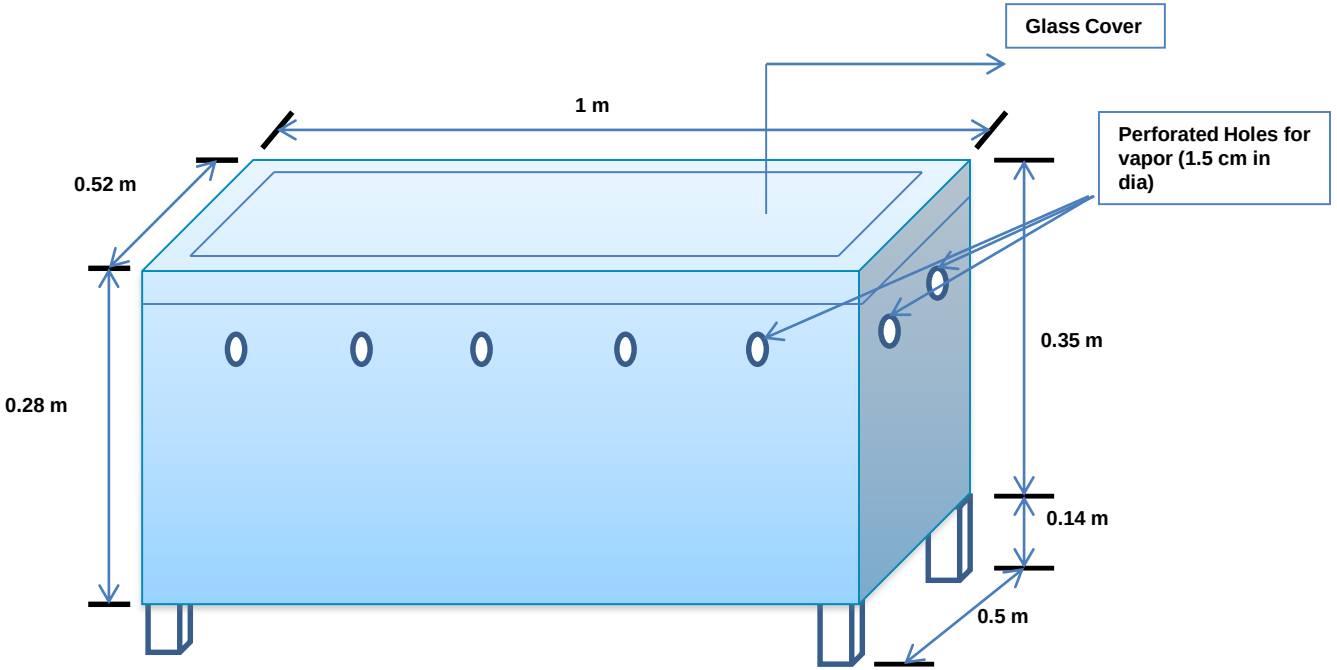
KSU – Grains for Hope STEM Initiative

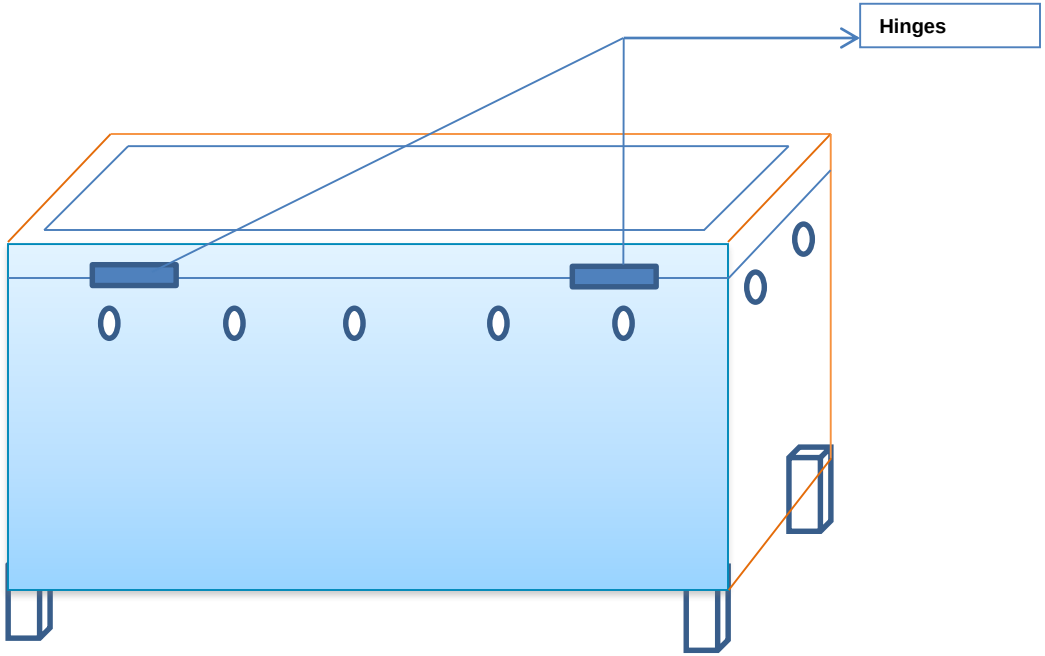
Dr. Jackie Spears, Professor and Director Center for Science Education
Sara Heiman, Coordinator, GROW and EXCITE
Dr.Hulya Dogan, Professor, Grain Science & Industry

- Solar drying applications in Africa (Dr. Alavi, Professor, Grain Science & Industry)
- Unmanned aircraft systems (Dr. Ajay Sharda, Professor, Biological & Agricultural Engineering)
- 3-D printing technology (David Schall and Jacob Slous-President, Electronic Design Club)

Solar Drying of Bean Analog - Front View of Dryer Design



Solar Drying of Bean Analog - Rear View of Dryer Design



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DRYING CHARACTERISTICS OF BEAN ANALOG – A SORGHUM BASED EXTRUDED PRODUCT

AKINBODE A. ADEDEJI,[1,2] ELSIE SUHR,[1] SUBRAMANYAM BHADRIRAJU[1] and SAJID ALAVI[1,3]

[1]Department of Grain Science and Industry, Kansas State University, Manhattan, KS
[2]Department of Biosystems and Agricultural Engineering, University of Kentucky, Lexington, KY

[3]Corresponding author.
TEL: + 785-532-2403;
FAX: ;
EMAIL: salavi@ksu.edu

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ABSTRACT

Bean analog is a novel bean-like re-formed product made from the extrusion of three flour combinations (sorghum, wheat and soy). This product was evaluated under three drying conditions, namely oven, infrared and solar drying, and were fitted to empirical and semi-empirical models. Infrared drying produced the highest drying rate of all methods. Effective moisture diffusivity (EMD), which is an indication of drying rate, ranged from 6.8×10^{-10} to 1.74×10^{-9}, 2.05 to 9.22×10^{-9} and 8.70×10^{-10} to 6.10×10^{-9} m^2/s for the oven, infrared and solar dried bean analog, respectively. Low EMD for oven drying, against expectation, is attributed to low heat transfer due to limited air circulation. Page equation fitted the drying data better than Lewis, and Henderson and Pabis, with higher R^2 values. Oven dried samples rehydrate better compared with others, which can be attributed to slower drying impact on structural changes.

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Thanks!

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