

# Designing effective groundnut breeding strategies through farmers-breeder interactions in Northern Nigeria

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**Abstract-** *Nigeria is the largest groundnut producing country in West and Central Africa and the crop is grown largely under small-holder system and rain-fed conditions. Demand for improved groundnut varieties has been increasing over the years making it imperative to develop varieties suitable to different agro-ecological zones of Nigeria. ICRISAT has been working with national partners to develop improved groundnut varieties. Results of the participatory varietal selection and paired-wise ranking exercises revealed that resistance to pests and diseases, early maturity, pod yield, oil yield, haulm yield, pod and kernel features, and drought tolerance are the important groundnut traits to the farmers indicating a perfect alignment of farmers preference with breeders concerns on the development of improved groundnut varieties in Northern Nigeria.*

**Index Terms-** *Breeding strategy, groundnut, Nigeria, pair-wise ranking, participatory selection.*

## INTRODUCTION

Nigeria is the largest groundnut producing country in West and Central Africa accounting for 51% of the production in the region with 3.27 million tons of groundnut production annually (FAOSTAT, 2014). The country produces 10% and 39% of the World and Africa's total production, respectively.

Despite Nigeria being one of the largest groundnut producing countries, the average yields of groundnut in Nigeria and most parts of West Africa are lower (903 kg ha<sup>-1</sup>) than those in South Africa (2000 kg ha<sup>-1</sup>), Asia (1798 kg ha<sup>-1</sup>), or the rest of the world (1447 kg ha<sup>-1</sup>) (FAOSTAT, 2014). The low groundnut yield is attributed to many factors including biotic, abiotic and other socio-economic constraints. Variable rainfall, drought, rosette (GRD) and foliar diseases and aflatoxin contamination are important constraints affecting the groundnut productivity

and quality especially under present day climate change scenario. The gap between potential and realized yield is large in subsistence farming.

To address these issues, ICRISAT has been working with national partners in the region to improve productivity of groundnut with the support from Tropical Legumes and groundnut upscaling projects through development and large scale adoption of improved groundnut varieties.

## MATERIAL AND METHODS

On-farm trials were established at four locations viz: Gumel (Jigawa State) and Zango (Katsina State) locations were managed by ICRISAT with support from extension agents of the Agricultural and Rural Development Authorities (ADPs). Alongside, ICRISAT and IAR established and directly managed similar validation demonstrations at Minjibir (Kano State) and Samaru (Kaduna State) locations. At all locations, the demonstrations consisted of 15 elite breeding lines and 3 ruling varieties as checks making a total of 18 entries, all selected from four exposures: *rosette, aflatoxin, foliar diseases and drought*. A standard randomized complete block design with three replicates and six entries per block was used with each replicate having three blocks during 2015 main season to document farmer preference and identifying candidates for new groundnut varieties in Nigeria. Three independent participatory varietal selection exercises were conducted at three out of the four locations during the 2015 cropping season with a total of 92 (45 female and 47 male) farmers.

## RESULTS AND DISCUSSION

Results of the pair-wise ranking exercise revealed that resistance to pests and diseases, early maturity, pod yield, oil yield, haulm yield, pod and kernel features, and drought tolerance are the important groundnut traits to the farmers involved in the participatory varietal selection exercise,

irrespective of sex and location (Table 1). This is an example of perfect alignment of farmers preference with breeders concerns on the development of improved groundnut varieties in Northern Nigeria. Based on this exercise and results of the demonstrations, selected elite breeding lines are being validated in targeted agro-ecological zones during the 2016 main season for their release.

**Table 1: Summary of Paired-wise Ranking Exercise Farmer Selection of Groundnut Varieties in Northern Nigeria**

Farmer desired attributes	Ranking			Additional information from discussion with farmers during participatory assessment sessions
	Gumel	Zango	MJB	
Resistance to pests and diseases	1 <sup>st</sup>	Not cited	1 <sup>st</sup>	Attribute underlines varieties that withstand prevailing pests and diseases
Early Maturing	2 <sup>nd</sup>	Not cited	9 <sup>th</sup>	Escapes negative effects of end of season drought
High pod yields	3 <sup>rd</sup>	6 <sup>th</sup>	3 <sup>rd</sup>	High returns and brings cash income
High oil content	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	Attribute mostly emphasized by female participants for purposes of processing into oil
Easy to sell/ marketability	5 <sup>th</sup>	4 <sup>th</sup>	Not cited	Attribute emphasizes color, oil content and haulm yield
By-products (cakes including Kulikuli)	6 <sup>th</sup>	NA	Not cited	Attribute emphasizes the ease of processing; argument put forward mostly by female participants
Household Consumption	7 <sup>th</sup>	NA	Not cited	Attribute underlines the nutritious value of groundnut and derived products (soup, snacks, pap, etc.)
Color of kernel	8 <sup>th</sup>	8 <sup>th</sup>	4 <sup>th</sup>	Varieties that are reddish are easily sold, have good and produce much more oils
High haulm yield	9 <sup>th</sup>	7 <sup>th</sup>	7 <sup>th</sup>	Attribute underlines the dual purpose of groundnut; feed for ruminant livestock and cash income source especially in the dry season
Pod and seed size	10 <sup>th</sup>	1 <sup>st</sup>	5 <sup>th</sup>	Attribute has two elements; yield ability, roasting and generation of cash income through sale as confectionary type.
Generates	Not	2 <sup>nd</sup>	Not cited	Attribute seems to

cash income	cited			be included in others: pod size, seed size, color and oil content
Easy to process	Not cited	3 <sup>rd</sup>	Not cited	Attribute underlines the need for varieties that are soft, hence easy for manual processing by women
Drought toleranance	Not cited	Not cited	2 <sup>nd</sup>	Attribute highlights the importance of early maturing varieties in a context of climate variability
Good taste	Not cited	Not cited	8 <sup>th</sup>	Attribute complements that of household consumption and marketability of emerging varieties

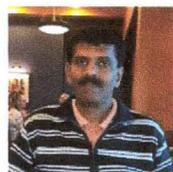
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#### ABOUT THE AUTHOR



**Dr. Babu N Motagi** is a Groundnut Breeder with ICRISAT, Kano, Nigeria. Prior to this, he served at University of Agricultural Sciences, Dharwad, India as researcher and teacher for about 15 years. He has over 50 research papers in national and international journals of repute and several book chapters. His research accomplishments include development of foliar fungal disease resistant groundnut variety GPBD 4 under Spanish bunch background which is being used as source of resistance globally for improvement of groundnut varieties for foliar disease resistance through Marker Assisted Selection (MAS). He is involved in Plant Germplasm Registrations of *Mutant-III* (INGR 98003) and GPBD-4 (INGR 01031) in groundnut and Mutant No. 1022 (IC0582890; INGR10047) in Sesame with NPBGR, New Delhi, India and release of cultivars viz., GPBD-4, GPBD-5, Dh-4-3, G-2-52 and Dh-101 (Groundnut); JS-9305 and DSb-21 (Soybean), DGGV-2 (Greengram), DBGV-2 (Blackgram) and DC-1-47 (Cowpea) in India. Actively involved in promotion of Community Based Organisations(CBO) for profitable seed production of improved varieties of grain legumes in modified Seed Village program.