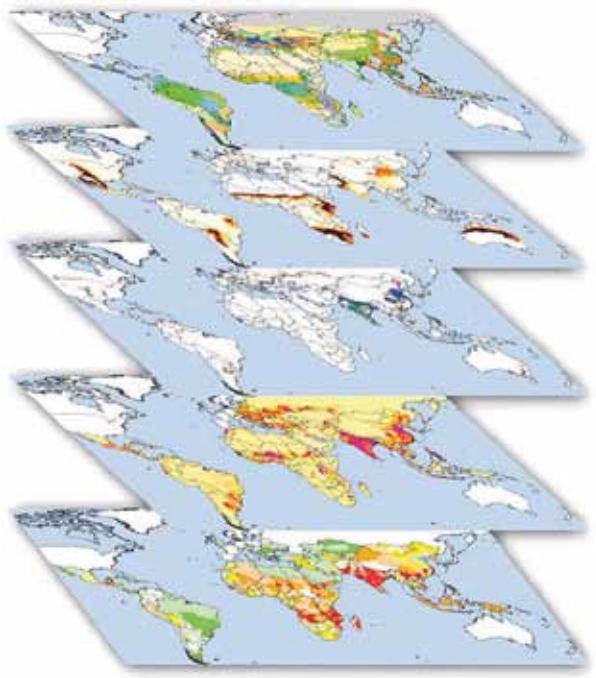
Where in the world do we start?

Pinpointing global 'hunger hotspots' by merging worldwide data on poverty, drought and crop production

With the ongoing food crisis, stagnating yields and burgeoning poverty, never has the need been greater for precise information to accurately target and prioritise agricultural research and interventions. To meet this need, the CGIAR Generation Challenge Programme (GCP) commissioned a study to more precisely pinpoint the areas – in the developing world – which bear the brunt of the combined effects of poverty, drought and poor yields.

This study is a tool for objective and sound investment decisions in agricultural research and development, based on solid empirical evidence so that resources are targeted to the greatest need, and also for greatest impact. Nearly three quarters of the world's stunted children are in GCP's priority farming systems.

Generation Challenge Programme



15 priority farming systems based on aggregating data on:

drought
+
irrigated area
+
crop area
+
number of stunted children

As a starting point, the study drew on previous work by Dixon in 2001, which classified farmlands worldwide into 63 farming systems. Dixon defines a 'farming system' as an area with similar natural resources, farm activities and household livelihoods. For the study reported in this brief, crop production data were collected for each of the 63 farming systems, and data on child stunting rates were used as an indicator of poverty (see illustration). Within each system, data on the probability of drought were used to compute a Potential Drought Impact Index (PDII), which ranked systems based on their susceptibility to drought.

Reaching the poor

Researchers then aggregated the datasets to determine which farming systems suffered the combined onslaught of the highest levels of poverty and most severe susceptibility to drought. From this aggregation, 15 high-priority systems emerged; five in South Asia, four in East Asia and the Pacific, five in sub-Saharan Africa and one in Latin America and Caribbean (see table). More than 70 percent, or 135 million, of the world's stunted children reside in these 15 systems, which are now GCP's priority systems.

J Gethi

Orange-fleshed sweet potatoes.

Priority crops for greatest impact

There are 13 crops that account for most of the harvest across all 15 systems. Of these 13 crops, maize, millet, sorghum, groundnuts and rice are found on nearly all of the 15 systems.

Maximising objectivity and impact

Not only does this study pinpoint geographical areas of importance, it also illustrates the newfound ability to make objective and sound investment decisions based on solid empirical evidence. Where a decade ago, data and computing limitations prevented such efforts, today's technological prowess can ensure agricultural research funds are targeted where they are most needed, and where they will have the largest impact.

From problems to solutions

While these findings are an excellent foundation for objective research targeting, efforts have not stopped here. A GCP-commissioned study is digging deeper into each of the GCP priority farming systems to assess crop production constraints and provide guidance for future research (see *Further reading*).

The 15 priority farming systems ranked by number of stunted children

SA, South Asia; SSA, sub-Saharan Africa; LAC, Latin America and the Caribbean; EAP, East Asia and the Pacific; PDII, Potential Drought Impact Index

Farming System		Stunted children ('000s)	Drought rank probability[1]	PDII [2]	Crops [3]
SA	rice–wheat	28,310	15	4	rice, pulses, millet, wheat, maize, beans
SA	rainfed mixed	24,547	25	1	rice, millet, sorghum, chickpeas, beans, groundnuts, maize, wheat
EAP	upland intensive mixed	15,435	33	5	maize, rice, wheat, sweet potatoes, potatoes, beans
EAP	lowland rice	13,368	37	2	rice, maize, wheat, sweet potatoes, groundnuts
SA	rice	11,668	46	7	rice, pulses
SSA	cereal–root	6,319	24	3	sorghum, millet, pulses, maize, groundnuts, cassava
SSA	maize mixed	6,318	20	8	maize, cassava, sorghum, pulses, groundnuts, millet, beans, sweet potatoes
SA	highland mixed	5,162	30	24	rice, maize, wheat, potatoes, groundnuts, pulses
SSA	root	4,989	39	10	maize, cassava, rice, sweet potatoes, cowpeas, sorghum, groundnuts, beans
SA	dry rainfed	3,610	18	14	sorghum, millet, chickpeas, groundnuts, beans
SSA	agropastoral millet–sorghum	3,135	8	6	millet, sorghum, pulses, groundnuts, maize
LAC	maize–beans	2,837	26	15	maize, beans, sorghum
SSA	highland temperate mixed	2,761	23	21	maize, wheat, sorghum, barley, millet, pulses
EAP	temperate mixed	2,596	21	23	maize, wheat, potatoes, groundnuts, millet
EAP	highland extensive mixed	2,537	48	28	rice, maize, wheat, potatoes, groundnuts, pulses

Notes:

[1] The rank (out of the 63 farming systems) refers to the mean probability of drought (intensity) in cultivated areas within the farming system.

[2] The PDII (Potential Drought Impact Index) estimates the extent of cultivated area affected by drought. The PDII is the drought probability (0–100%) × crop area in hectares, or the number of hectares susceptible to drought.

[3] Crops which are planted on more than 5% of the total land in the farming system; crops listed first comprise the largest percentage of the system. 'Pulses' is an FAO cluster for chickpeas, cowpeas, lentils and pigeon peas.

"We're now studying the agricultural capacity of these drought-prone regions to adopt new technologies and crop varieties," notes the lead researcher Glenn Hyman.

Most of the areas have a diverse crop mix, and drought conditions also vary, suggesting that effective technological solutions for these systems must consider the characteristics of a highly complex ecology.

As a stepping stone towards such solutions, Hyman and his team are also working on an online global-scale Generation Atlas for release in 2010. This Atlas generates user-defined maps on a range of socioeconomic and biophysical parameters such as child stunting, income, soil conditions and sowing seasons.

Acknowledgements: This brief summarises studies by Glenn Hyman, Sam Fujisaka, Peter Jones (CIAT); Carmen de Vicente (GCP); Stanley Wood (IFPRI); and John Dixon (CIMMYT).

Further reading

Generation Challenge Programme (2009). A call for collective action in agricultural research: A multi-faceted approach to solve a multi-faceted problem. *Pathways to Impact Brief No 2*.

Generation Challenge Programme (2007). Where do poverty and drought-prone crop production coincide?

Hyman G, Fujisaka S, Jones P, Wood S, de Vicente MC and Dixon J (2008). Strategic approaches to targeting technology generation: Assessing the coincidence of poverty and drought-prone crop production. *Agricultural Systems* 98 (1):50–61. Also published as a CIAT Working Paper (Hyman et al, 2007).

Hyman G (2008). *Study Helps Identify Regions Most Threatened by Drought*. Challenges & Innovations. CIAT.

J Nelson

Women tilling legumes in Nigeria.

T Fulton

Millet in the field.

J Nelson

Women pounding grain.

Pathways to impact briefs

1. ***Where in the world do we start?*** Pinpointing global 'hunger hotspots' by merging worldwide data on poverty, drought and crop production
2. ***A call for collective action in agricultural research:*** A multi-faceted approach to solve a multi-faceted problem
3. ***Molecular and conventional breeding through an economic lens:*** Facts and figures to shed light in a heated debate

Briefs and datasets on GCP's socioeconomic studies are publicly accessible at: **http://www.generationcp.org/sp5_impact**