



Fighting Climate Stress with Orphan Legumes

Edwin M Southern

Kirkhouse Trust, UK and formerly Whitley Professor of Biochemistry, Department of Biochemistry, Oxford, UK

Crop species which are adapted to hot and dry climates will become increasingly important as the world warms. The Kirkhouse Trust (KT) has supported research on legumes because of their importance in providing high quality protein in the diets of resource-poor farmers. Among these crops are many stress tolerant legume species found in India and Africa, that are relatively minor, neglected crops. A new programme called 'Stress Tolerant Orphan Legumes' (STOL) for KT aims to support systematic studies of their potential to address the loss of agricultural productivity in areas of the globe that are suffering the greatest climatic stresses.

A major region for our focus will be the semi-arid Sahel which stretches as a belt 100-600 km in width across the entire African continent south of the Sahara desert from Senegal in the West to the Red Sea coast in the East. The population of the Sahel, around 100 m, is already experiencing the effects of failed crops; many go hungry and as a result, many of the migrants we now see attempting to reach Europe are from the countries of the Sahel. The population is projected to treble to 300 m by 2050; there will be another 200 m mouths to feed. Other desert regions, such as the Thar desert of the North-West of the Indian sub-continent and the Kalahari of southern Africa are similarly stressed.

There are clear signs that climate change is already having severe effects on the agriculture of the Sahel: crops such as cowpea, an important staple, which thrived in the region, are now failing as a result of the changed climate. In addition to direct effects of heat and drought on crops, the region is suffering soil loss due to the southward spread of the Sahara. Over-grazing, intensive cultivation, removal of tree cover, poor water management have all been cited as reasons for this loss; the fact remains that large tracts of land are being taken out of production.

What can be done to mitigate this looming disaster? We see three ways in which adoption of stress tolerant legume species may help farmers fight the ravages of

climate stress: production of grain to feed the family and provide income; fodder and forage to feed livestock; ground cover to remedy soil degradation. For this reason, our research programme will include a diversity of species; we intend to study around ten species in our initial survey. Some of the crops may prove to be multipurpose, providing grain and fodder for example; others may be specialised for one function such as soil remediation.

Our choice of crop species is determined by factors such as the location at which they are found and the opinions of experts. KT has direct experience of *Dolichos lablab*, moth bean, horsegram, rice bean and marama bean. Others have suggested Bambara, Lima bean, greengram, pigeon pea and tepary bean. Controls will be cowpea and common bean for regions where these crops are already grown. We plan to carry out field trials in a number of locations in stressed regions to compare the responses of the diverse species and up to 50 accessions of each species. The first stage, which is already under way is to gather the accessions needed for the study. A second stage, again already under way is multiplication to generate enough seed for field trials. The planned field trials will be carried out by agronomists. Inputs of local farmers should guide the progress of the studies; they will tell us if the unfamiliar species outperform the cowpea that they are accustomed to, and how the new crops may fit into their systems. We anticipate that very few of the species will pass the first trials.

Kirkhouse Trust has had a decade of experience in region-wide breeding programmes for the improvement of two legume crops in Africa: the West African Cowpea Consortium (WACC), working in seven countries, has generated a number of improved cowpea lines; the African Bean Consortium (ABC) working in five countries has introduced a number of improvements to common bean. This experience has taught us that coordinated efforts in well organised consortia are the key to effective progress across the large areas represented by African countries. This is the model we

*Author for Correspondence: Email- ed.southern@bioch.ox.ac.uk

intend to follow for our STOL programme. However, we can see that the geographical reach must be even wider for the STOL programme than those of the WACC and the ABC. We hope to find common ground with the growing cooperation between India and Africa by forming a joint programme embracing centres in the two regions; we have plans for such collaborations.

As may be expected, different countries have different procedures for accessing their genetic resources, so this process is taking some time and effort. We would be very grateful for any help in obtaining the materials for the studies. The need is urgent!