SCIENCE AND INDUSTRY ENDOWMENT FUND

CASE STUDY OF IMPACT
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Securing the world's future food production capability

The Plant Breeding project aims to develop major food crop varieties which will enable the feeding of a global population of 9 billion

The challenge

Food security is one of the greatest challenges facing the future of our planet. By 2050, the world will need double the amount of food produced today to feed an expected 9 billion people. To be able to do this effectively, the level of food production must be significantly increased in a sustainable way, on existing arable land, and against the challenges posed by climate change. Societal expectations of modern agribusiness demand decreased dependence on chemicals and increased stewardship of land and water resources, conserving them for future generations.

Plant breeding programs together with improved management regimes have led to steady increases in crop yields over the past five decades. However, the rate of improvement in yields has plateaued and the relatively small annual incremental improvements in yield (around 0.5-1.5 per cent a year) are not sufficient. Better, high yielding crops are urgently needed.

Sustainable plant breeding techniques have been developed to enable the effective feeding of the world's ever-expanding population.

The response

The SIEF-funded Plant Breeding project aimed to provide new approaches to plant breeding that have the potential to create and perpetuate major yield increases.

The first component of the project has conducted research designed to develop new approaches to hybrid plant breeding (heterosis) which have the potential to create and perpetuate major yield increases from hybrid plants. This section of the project has resulted in collaboration with research organisations such as the University of Technology Sydney, the Global Institute for Food Security, The Rice Research Institute, Sichuan Agricultural University, and commercial entities such as Nuseed Ltd, to explore the effect of heterosis on major crops such as lentils, grain legumes, and rice.

The Plant Breeding research team has also explored ways to induce and control asexual reproduction (apomixis) in major food, feed, and fibre crops which do not currently engage in this form of reproduction. This aspect of the research has resulted in a five-year $US 22 million CSIRO-led project supported by the Bill and Melinda Gates Foundation, involving a total of seven international institutions including Pioneer DuPont.

Each of the partners is contributing their particular expertise. In addition, the apomixis project team has developed bioinformatics tools to visualise genes in a model apomict. There are very large potential benefits from this research in relation to food and fibre production from plants. It's estimated that increases in plant yields of 15-30 per cent are possible.

The impact

The Plant Breeding Project is developing, in conjunction with major international research and commercial organisations, approaches to plant breeding which will enable existing arable land to provide food in a sustainable way for a global population of 9 billion by 2050.

Based on conservative valuations, the net present value of benefits of the Plant Breeding project to 2035-36 is $2.82 billion. The project has a benefit-cost ratio of almost 460[1].

[1] ACIL Allen Consulting. 2016. SIEF Impact Case Studies. Canberra: ACIL Allen.

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This case study was developed by ACIL Allen and CSIRO in 2016 as part of an overarching review of SIEF's Impact.