Company Overview: NRGene is a computational Agri-tech company that provides premium genomic services to leading molecular breeding companies to reduce their breeding costs and time.

Headquarters: Energin .R Technologies 2009 Ltd. (NRGENE), CN 514240779
5 Golda Meir St., Ness-Ziona 7403649 Israel | Tel: +972-72-220-3750 | Fax: +972-8-648-9897
US office: NRGene Inc. 8910 university Center Lane, Suit 400, San Diego 92122 CA USA

Solution Overview

ArrayMAGIC is a high throughput, high resolution genotyping technology. ArrayMAGIC provides a cost-effective solution for genotyping large populations with the highest resolution currently available in the market. ArrayMAGIC technology is based on extensive public and proprietary data-bases of genomic data and NRGene unique GenoMAGIC platform tool-kit that utilizes cloud computing and AI in order to analyse very low density sequencing data (~X0.01) and/or low resolution SNP array data (down to 3K SNPs) and enhance it (impute) through high-accuracy predictions to yield high-resolution SNP array results.

Audience – Target Market/Customer

- **Medium to large breeding entity** that is looking for cost-effective genotyping solution with a very high-resolution enabling checking of multiple traits and/or complex predictive models involving multiple QTLs per trait.
- **Best/advantageous fit for: (currently available for Maize and Soy only)**
  - **Row crops** such as Maize, Soy, Canola with a vast market volume and a large public genomic data.
  - **Specialty crops** such as tomato, cotton or Sunflower with a growing interest in traits development.

Customer Pain

- Current genotyping solutions can only handle low resolutions array in reasonable pricing. Higher resolution arrays are sold as premium services that cost a great deal. Due to this, traits development and tracking is limited in quantity and quality per breeding cycle.

Business Benefit

- Cost effective high-resolution genotyping is offered with lower cost per data-point.
- Higher resolution of SNPs (based on a standard commercially available set) is available for significantly lower prices.
- Better genetic gains per cycle and ability to develop and analyse multiple traits simultaneously.
- Enhancement of low resolution and legacy SNP array data to the highest commercially available SNPs set.

When to Engage / When Not to Engage

- Engage:
  - Maize and Soy breeding company.
  - Have legacy data that requires enhancement.
  - Interested in fast evolution.
- Not-engage:
  - Any other crop.

Key Features

- Highest commercially available SNPs markers set available.
- Competitive pricing per data-point.
- Illumina whole genome sequencing approach which delivers high accuracy and much lower bias to any restriction enzymes regions, PCR amplifications etc. that are present in other genotyping methods.

Customization

ArrayMAGIC is a complete solution that is a part of the **GenoMAGIC** platform all-inclusive holistic solution. With ArrayMAGIC researchers may obtain high resolution SNPs array data and with high accuracy level. In addition, ArrayMAGIC SNP-based solution can be utilized to enhance lower resolution SNP-arrays or GBS data (e.g. 3K SNP array) to get the highest commercially available resolution.

Differentiator

1. Highest SNPs resolution for a competitive price (down to 30% of the standard copetition).
2. Highest SNPs resolution can drive more traits selection and more accurate predictor models.
3. The results are stored and can be re-used for multiple assays and queries using an online web interface.

FAQs

Question: How do high-resolution SNPs arrays enhance breeding efforts?
Answer: High resolution SNPs array contains much more information than common low-resolution arrays. This highly increases the chances of finding a high-linkage of SNP to the trait QTL in the genome, significantly improving the accuracy and prediction capabilities of the assay. Additionally, more traits can be tracked in a single genotyping cycle because more SNPs allow more traits to be checked for screening of undesired samples and thus, shortening the time-to-market of elite lines that contain the best traits combinations.
Question: How can my legacy data, with low resolution SNPs arrays, be used?
Answer: ArrayMAGIC has 2 versions: Sequencing based and SNPs based. In the Sequencing based version NRGene is responsible to perform all services including, DNA extraction, genomic libraries construction, producing sequencing data and analysis of the samples. The SNPs based version can utilize legacy data such as, the results of other SNPs arrays or GBS data and enhance them to the highest resolution commercially available for the crop. NRGene ArrayMAGIC utilizes vast databases of both public and NRGene's own data to create the world's largest genomic database for a crop.
Question: Do the parental lines need to be sequenced and assembled?
Answer: Yes, the parental lines need to be sequenced and analysed in order to retrieve maximal call rates. When sequencing the parental lines, ArrayMAGIC can analyze the unique haplotypes in the genotyped population differing from the haplotypes that already exist in NRGene's vast haplotypes database.
Question: How Whole Genome Sequencing approach is different from other genotyping methods and why it is considered better?
Answer: WGS approach is the basis of our ArrayMAGIC solution- the sequencing of the plant DNA in a way that sequencing is quite random along the entire genome. Hence, the sequencing is not limited to specific regions of the genome that fit the amplicons, the primers or the restriction enzymes sites, limitations found in other genotyping methods. This gives a much more accurate and complete picture of the genomic content. On top of that, sequencing is done using Illumina machines that are known to have relatively low error rate in sequence-reading compared with other methods. Using the new high throughput NovaSeq 6000 machine along with using a very low coverage (skim-sequencing) of X0.01 brings the price of this analysis to be competitive and affordable, yet retaining the high quality and accuracy.

Customer / Case Study Reference

We've validated the technology by running a POC project on Maize, comparing the results to the highest resolution array that is commercially available by Axiom. The results show ~98% of the call rate of Axiome and less than 0.85% errors for the sequencing based version and ~87% of the call rate of Axiome and less than 0.15% errors for the SNPs array version. Overall very similar results to the Axiome benchmark with only a fraction of the price (~25%).

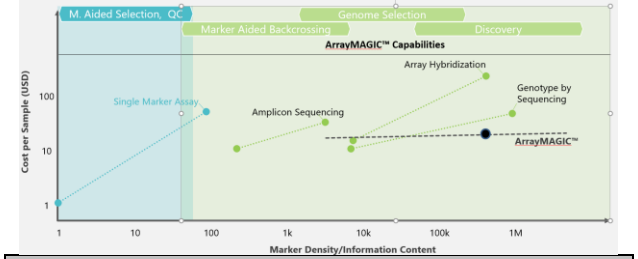
Population Input data	median call rates	% call rate compared with Axiom™	average error rate (%)
Axiome™	590,321	-	-
Low pass sequencing (0.01x)	578,331	97.97%	0.82%
3K SNPs	513,322	86.96%	0.13%

Contacts

EMEA & APAC Contact
Name: Mr. Josh Peleg, General Manager APAC & EMEA
Phone: +972-549-79246 Email: josh.peleg@nrgene.com
Americas Contact
Name: Mr. Nitay Gold, General Manager Americas
Phone: +1 (612) 419-8614 Email: nitay.gold@nrgene.com
Support Contact
Phone: +972-72-220-3750 Email: info@nrgene.com

Comparisons

Comparing the ArrayMAGIC to other genotyping methods shows a great advantage in acquiring highest resolution for a very affordable price. While other genotyping methods prices are going up rapidly with the increased resolution needed, ArrayMAGIC provides the highest resolution at a constant and low price.



Additional Resources

Website (www.nrgene.com)

- **Publications** www.nrgene.com/publications/
- **Press-releases** www.nrgene.com/press-releases/
- **Videos and Presentations** https://www.nrgene.com/videos/