# illumina

## Agriculture Consortia Processes and Milestones

#### What is an agriculture consortium?

Illumina categorizes projects that facilitate food, feed, (bio) fuel, fiber, forestry, and friends (companion animals) as "agriculture." The Agriculture Consortium program provides a framework for researchers to pool resources to develop biomarker/SNP genotyping or sequencing tools for various species. Confidentiality is maintained throughout the process.

#### What advantage does a consortium offer?

Each species or research community can have unique needs. Within each community, researchers often have overlapping goals that are best addressed by a combined effort and the development of a single tool (or set of common tools). By this collaborative approach, consortia help reduce the barrier of entry for individual researchers to adopt genetic analysis tools into breeding programs.

Fre-ConsortiaEngagementEstimated time 2-8Estimated time 8-14CommercializationFre-ConsortiaFreductionEstimated time 2-8Estimated time 8-14SellingEstimated time 8-14SellingStainated time in this phase is variableEstimated time 1000Estimated time 2-8SellingEstimated time 8-14SellingCommercializationStainated time in this phase is variableEstimated time 1000Estimated time 2-8Selling <td< th=""><th></th><th>Sk.</th><th>( Salesy</th><th>The second secon</th><th></th></td<>		Sk.	( Salesy	The second secon	
Pre-ConsortiaEstimated time variable and dependent upon state of the scienceSellingEstimated time 2-8 weeks, dependent upon whether public or privateEstimated time 8-14 weeks, dependent upon number of attempted bead types and whether Add-On Content is includedEstimated time 4-6 weeks, dependent upon complexity of the diversity set of samples for creating the cluster filePre-ConsortiaEstimated time variable and dependent upon state of the science benetic torthibutorsEstimated time 2-8 weeks, dependent upon whether public or privateEstimated time 8-14 weeks, dependent upon number of attempted bead types and whether Add-On Content is includedCommercialization conting ent upon a decision by Illumina and agreement of consortium membersGain understanding of community pacesDevelop FAQ document on potential contentCommunicate deadline to receive ordersComplete product QCAnalyze samples with					Commercialization
Fre-ConsortiaEstimated time variable and dependent upon state of the scienceSellingEstimated time 2–8 weeks, dependent upon number of attempted bead types and whether Add-On Content is includedCommercialization contingent upon a decision by Illumina and agreement of consortium membersPre-ConsortiaIdentify SNP sources & content contributorsDetermine timeline for chip accessInitiate manufacturingReceive diversity set of samples for cluster file generationGain understanding of community peedsDevelop FAQ document on potential contentCommunicate deadline to receive ordersComplete product QCAnalyze samples with				Production	Estimated time 4–6 weeks, dependent upon complexity of the diversity set of
EngagementEstimated time variable and dependent upon state of the scienceEstimated time variable and dependent upon or privateEstimated time 2–8 weeks, dependent upon number of and whether Add-On Content is includedCommercialization contingent upon a 			Selling	Estimated time 8–14	the cluster file
Pre-Consortia   State of the science   consortine   consortine   consortine   consortine   consortine   consortine   consortine   consortine   Receive diversity set of samples for cluster file generation     Estimated time in this phase is variable   Develop FAQ document on potential content   Communicate deadline to receive orders   Initiate manufacturing   Receive diversity set of samples for cluster file generation		Engagement Estimated time variable and dependent upon	Estimated time 2–8 weeks, dependent upon whether public or private	weeks, dependent upon number of attempted bead types and whether Add-On Content is included	Commercialization contingent upon a decision by Illumina and agreement of
Estimated time in this phase is variablecontent contributorschip accessInitiate manufacturingReceive diversity set of samples for cluster file generationGain understanding of community peedsDevelop FAQ document on potential contentCommunicate deadline to receive ordersComplete product QCAnalyze samples with	Pre-Consortia	Identify SNP sources &	Determine timeline for		consortium members
Communicate Develop FAQ file generation   document on document on deadline to receive   Gain understanding of potential content deadline to receive   community peeds orders Complete product QC	stimated time in this	content contributors	chip access	Initiate manufacturing	Receive diversity set of samples for cluster
Receive permission consortium-developer	iain understanding of community needs	document on potential content Receive permission	Communicate deadline to receive orders	Complete product QC	file generation Analyze samples with consortium-developed
Define project expectationsletter to share SNPs from content contributor(s)Receive samples for QC of synthesisComplete volume manufacturing forproduct	Define project expectations	letter to share SNPs from content contributor(s)	Receive samples for QC of synthesis	Complete volume manufacturing for	product Finalize Illumina bead-
Quantify consortium interest levelInitiate inquiries to potential sampleReceive POs to meet pricing requirementQC'ed productpool manifest (SNP list) and cluster file	Quantify consortium interest level	Initiate inquiries to potential sample	Receive POs to meet pricing requirement	QC'ed product	pool manifest (SNP list) and cluster file
Develop list of potentially interested parties Establish confidential interest list with potential sample Ship product Train technical support on product   Image: Strain technical support on product Ship product Ship product Support on product	Develop list of potentially interested parties	Establish confidential interest list with potential sample	Finalize SNP list	Ship product	Train technical support on product and commercial launch of product
Yes/No     Turnoers     Yes/No     Yes/No to       to Engagement     Yes/No to Selling     to Production     Commercialization     Ship Product	Yes/No to Engagement	Yes/No to Sellina	Yes/No to Production	Yes/No to Commercialization	Ship Product

The process for creating a new product through a consortium occurs over a series of strategic phases. During each phase, a set of milestones must be met before the process can continue on to the next phase. This ensures the greatest probability for success by enabling consortium members to make well-informed decisions along the path to product development. The product may be a base content or an Add-On Content beadpool (or may include both).

## The word "consortium" is frequently used to describe research communities for various species. How does Illumina qualify potential consortia?

Illumina relies on the wider agricultural community to identify species that are a good fit for a consortium approach. In many cases, existing consortia will approach Illumina to inquire about developing a tool through a community effort. Conversely, Illumina will sometimes drive the formation of a consortium if many independent researchers' inquiries suggest that pooling efforts might be a useful approach. There are a number of flexible options for a consortium approach. The consortium can remain confidential or open, as preferred by consortium members.

#### Are there particular products that consortia use or can any of the products be accessed?

Typically an iSelect<sup>®</sup> custom genotyping BeadChip can meet the research goals of multiple groups. These BeadChips are based on Illumina BeadArray<sup>™</sup> technology and are compatible with the well-proven Infinium<sup>®</sup> HD assay. The iSelect platform supports densities of 3,000 to 1,000,000 attempted bead types. Depending upon the content, this means that up to 1,000,000 SNPs and insertions/deletions (indels) can be simultaneously queried per sample.

#### Benefits, Roles, and Responsibilities

#### What is the benefit to participants of a consortium approach?

Researchers can typically access a higher density of SNP markers and a lower per-sample price than the budget of a single contributor might otherwise allow. Through the consortium, the cost of beadpool synthesis is spread over more samples than might be possible from a single institution. The minimum order for participating in a consortium is 48 samples, providing that all orders for a private iSelect BeadChip total at least 1,152 samples.

#### What types of projects are appropriate for an agriculture consortium approach?

The consortium approach can be applied to any agriculture project that may benefit from pooling resources to develop a genotyping tool that will meet the needs of multiple researchers.

## Is it required for consortia to be willing to commercialize content to participate? What about private consortia?

While several Illumina genotyping products for commercial agriculture were developed through consortia, commercializing the content is not a requirement. In addition to non-commercial open consortia, private consortia are an integral part of the Illumina agriculture program. Illumina maintains strict confidentiality around private consortia, so these projects are not publicized. The only requirement for content (candidate SNPs or indels) in consortia projects is that it can be shared with other members of the consortium. Depending upon the goals of the content contributors, content may be maintained confidentially within a small group or content can be made publicly available. If consortium members are amenable to sharing content publicly, Illumina and consortium members can further explore developing a commercial product together.

#### What is the difference between a "content contributor" and a "sample contributor" in a consortium?

Content contributors are typically subsets of researchers that have driven the discovery efforts of SNP content and genome assembly for a species or species group. Sample contributors include anyone in the research community interested in the targeted species or species group. Illumina requests permission from content contributors to share final content with sample contributors. For sample contributors, Illumina will communicate a deadline by which purchase orders (POs) must be received to participate in the consortium. The final sample count for all orders received by the PO deadline will determine the per sample price.

#### What are the responsibilities of consortium members and users of the tool?

Content contributors should be referenced in any publications, public presentations, press releases, or public announcements resulting from use of the genotyping content. The standard terms and conditions for Illumina products and services will also apply.

#### Forming, Joining, or Participating in Consortia

#### Do I need to have my draft genome and all SNPs in hand before inquiring about a consortium?

It is not necessary to have all content defined before exploring the consortium option with Illumina. In fact, many groups benefit from the experience Illumina has in helping define a streamlined path for discovering, validating, and finalizing content. Depending upon goals for the content (e.g., even-spacing versus gene centric), a draft genome may not be necessary for a community to benefit from the development of a genotyping tool.

# What if the timelines of the community change after entering into a consortium with Illumina? For example, what if we evaluate the available data and believe that additional SNP/biomarker discovery is needed before finalizing content?

Illumina works closely with content contributors to revisit timelines to make sure that goals of the consortium and the research community are best addressed. We offer customers the ability to augment content on existing BeadChips with the latest advances from genome-wide association studies, next-generation whole-genome sequencing, and exome sequencing studies for variant confirmation, fine mapping, and target validation. iSelect+ Add-On Content provides customers with the flexibility to add newly discovered content to a custom array after the initial design period is completed.

#### What is Add-On Content and how can I use it with a Consortium Project?

Infinium Add-On Content enables customers to incorporate new custom genomic content from new discoveries to an existing Consortium product. The new consortium product + Add-On Content is a unique custom product only available to you (and any others you designate). The amount of Add-On Content you include depends on the amount of base content of the initial consortium product and the remaining available space on the BeadChip. Most consortium products use a 24-sample format that allows space for up to 90,000 total attempted bead types.

#### How do I design my genotyping tool? How are SNP and indel probes designed?

Researchers can design probes for SNPs or indels for any species using the Assay Design Tool (ADT), available through Mylllumina, Illumina Technical Support, or FastTrack Services. The ADT scores each submitted design to provide a relative confidence level that a probe will successfully query a particular SNP or indel based on the surrounding sequence. The output file finalized by content contributors can then be submitted to the Illumina orders group to place the final order.

#### How are SNPs selected and content validated?

Research communities considering a high-density genotyping tool often have access to several sources of SNP content with varying levels of validation. The state of the research will dictate whether additional validation might be useful before finalizing the SNP list. Illumina will work with content contributors to identify methods that might reduce risks before finalizing content. Design scores generated by ADT for each potential SNP are well-established indicators of the likelihood that a probe design will be successful.

#### Access and Pricing

## I only need to run one plate (96 samples) and have previously not been able to meet the minimum sample number needed for running an iSelect project with Illumina. How can I benefit from a consortium?

Researchers with as few as 48 samples can benefit from a consortium. Because the beadpool and the BeadChips will be manufactured for the entire consortium at one time, as long as the community meets the minimum sample order (1,152 samples), individual researchers can order as few as 48 samples' worth of BeadChips for many consortia.

#### How many samples can I assay on a BeadChip?

The number of samples that can be assayed on a single BeadChip depends on the number of attempted bead types (or probes) needed. For assays targeting up to 90,000 bead types (up to 90,000 SNPs), a 24-sample format is used. For assays with over 90,000 bead types, a 12-sample or even 4-sample format may be used in manufacturing. Information about the chip format for publicly available consortium chips can be found in the FAQ document for each consortium.

#### What reagents and equipment do I need to run the consortium BeadChips after they are shipped to me?

The per-sample price includes BeadChips and all reagents required to run the Infinium HD or Infinium HTS assay. Illumina recommends a minimum of 200 ng of DNA (> 50 ng/µl as measured by a fluorescent method of quantification) for best results. Access to an Illumina iScan<sup>®</sup> or HiScan<sup>®</sup> System is required for BeadChip scanning. For help finding a local service provider or core facility, or for information about Illumina FastTrack Services, contact Illumina Technical Support or your local account manager.

#### What is the consortium price?

Consortium pricing will depend on the number of total attempted bead types and the number of samples submitted by the deadline determined by the consortium. For any given consortium opportunity, the appropriate density of markers and anticipated sample numbers will differ. Illumina will work directly with content and sample contributors to help identify possible pricing scenarios.

#### What is the minimum order I can place?

Minimum orders are for 48 samples (the smallest reagent kit configuration), if the minimum sample number (1,152) is achieved by the consortium. Reorders can be placed for a minimum of one year after beadpool manufacture.

#### Is there a limit to how many samples I can order at the consortium price?

There is no limit to the number of samples that can be ordered, provided the order is in 48-sample increments (47-sample increments for FastTrack Services). The smallest reagent kit configured for a shipment is based on a 48-sample format.

#### Can I reorder additional BeadChips?

The beadpool is manufactured in liquid phase and is available for a minimum of one year. When orders are filled, the liquid beadpool is stabilized onto BeadChips and processed through quality control, and these BeadChips are under warranty for a minimum of six months. This means that the effective time period during which experiments can be run on a beadpool is 18 months. Reorders can be submitted any time during the lifetime of the beadpool.

#### Data Analysis and Sharing

## My research competes with other interested parties, so I do not want my sample numbers widely publicized. Is it a requirement that other members know about my experiments?

Any information about sample numbers or experiments from each institution will be kept confidential. Individual consortium members can decide whether they are comfortable revealing the goals of their experiment to other consortium participants. Illumina will only divulge the total sample numbers pooled by all participants that will secure the consortium price.

## Does Illumina software discriminate among the three heterozygote and the two homozygote clusters in tetraploid genomes?

Illumina GenomeStudio<sup>®</sup> Data Analysis Software currently supports automated calling and genotyping for both diploids and polyploids. Contact Illumina for the latest information about automated polyploid calling in GenomeStudio.

#### How do I participate?

Researchers interested in the Agricultural Consortium program can contact a regional agriculture specialist by emailing consortiamanager@illumina.com. A specialist will be able to answer any additional questions and help place orders.

Illumina • 1.800.809.4566 toll-free (U.S.) • +1.858.202.4566 tel • techsupport@illumina.com • www.illumina.com

#### FOR RESEARCH USE ONLY

© 2011–2014 Illumina, Inc. All rights reserved. Illumina, BeadArray, BeadXpress, DesignStudio, GenomeStudio, HiScan, Infinium, iScan, iSelect, the pumpkin orange color, and the Genetic Energy streaming bases design are trademarks of Illumina, Inc. in the U.S. and/or other countries. All other names, logos, and other trademarks are the property of their respective owners. Pub. No. 370-2010-026 Current as of 16 April 2014

